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War Department, Surgeon General's Office.**

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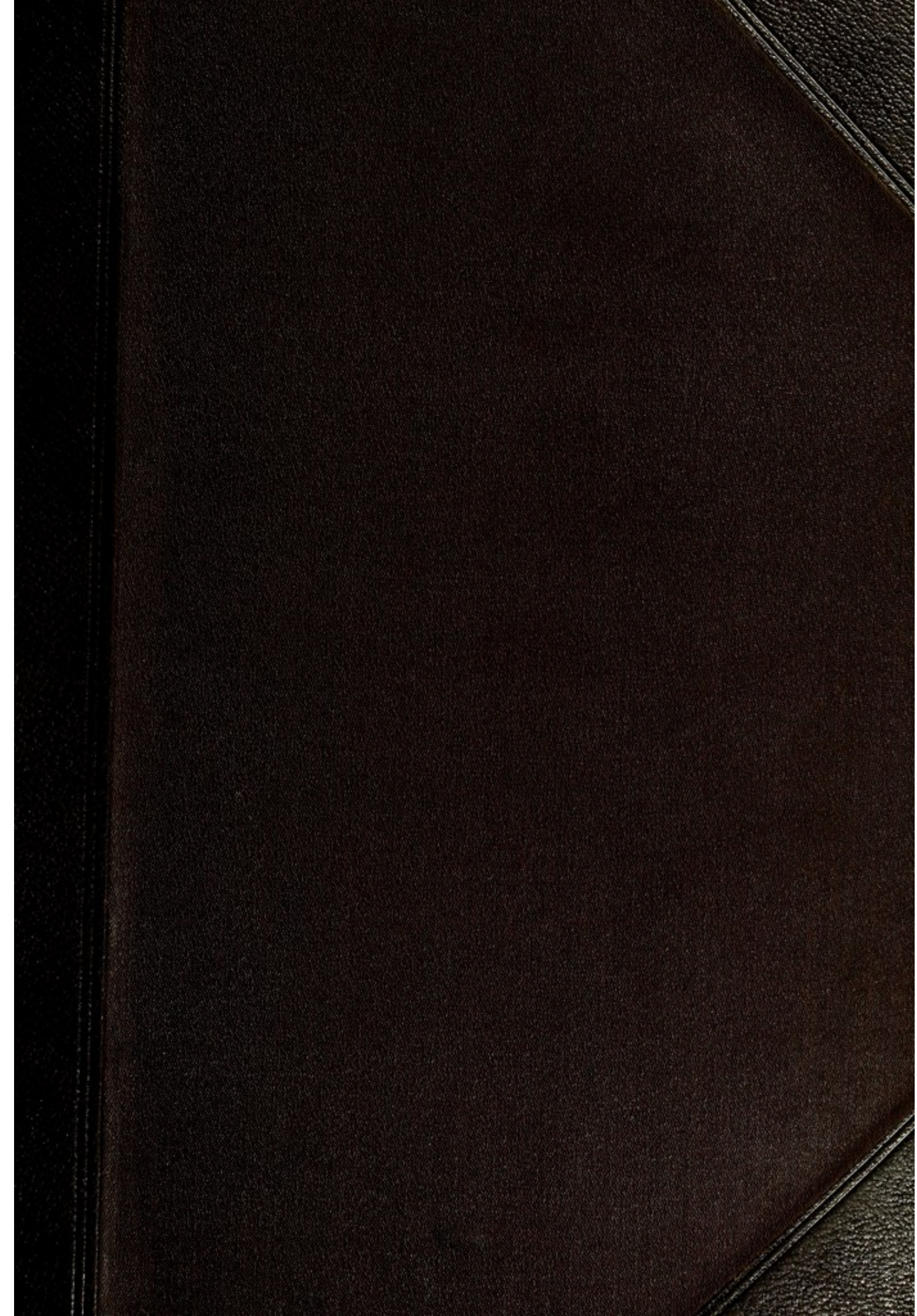
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CIRCULAR No. 4.

WAR DEPARTMENT,
SURGEON GENERAL'S OFFICE,

WASHINGTON, DECEMBER 5, 1870.

A REPORT

ON

BARRACKS AND HOSPITALS,

WITH

DESCRIPTIONS OF MILITARY POSTS.

WASHINGTON.

GOVERNMENT PRINTING OFFICE.

1870.

CIRCULAR No. 4.

WAR DEPARTMENT,

SURGEON GENERAL'S OFFICE,

Washington, December 5, 1870.

The following report on the Barracks and Hospitals of the United States Army, with descriptions of the principal military posts, is published for the information of Officers of the Army.

JOSEPH K. BARNES,

Surgeon General United States Army.

REPORT
ON THE
BARRACKS AND HOSPITALS
OF
THE UNITED STATES ARMY.

BY JOHN S. BILLINGS,
ASSISTANT SURGEON UNITED STATES ARMY.

SURGEON GENERAL'S OFFICE, WASHINGTON, D. C.,
December 1, 1870.

GENERAL: In accordance with your directions, I have the honor to submit herewith a report on the Barracks and Hospitals of the United States Army, with descriptions of the principal military posts in the United States; the latter compiled from special reports made by medical officers of the Army.

These special reports were furnished under the following circumstances: During the spring of 1868, a large blank book, entitled "Record of the Medical History of the Post," was furnished to each permanent post, with the following instructions from this office:

It is desired that this book shall, so far as possible, show all the conditions and causes which affect the health of the troops at the post; and, also, that it shall serve as a record of the sanitary recommendations of the medical officer, and of the action taken thereon. The record for each month, and the entries on the first eighty pages* of the book, are to be signed by the medical officer who makes them; and each medical officer should continue, and endeavor to make more complete, the observations of his predecessors in relation to the natural history of the vicinity of the post. When a medical officer is relieved from duty, he will note in this book the exact sanitary condition of the post, the troops, and the hospital. His successor will enter his remarks upon the same. When the medical director, or an inspector authorized by him, shall visit the post, he will note in this book the results of his inspection.

Soon after these books had been sent out, the following order was issued:

[Circular Orders No. 4.]

WAR DEPARTMENT, SURGEON GENERAL'S OFFICE,
Washington, D. C., August 25, 1868.

On and after the 31st of December, 1868, a sanitary report will be prepared by the senior medical officer on duty at a post, on the 31st of December and the 30th of June of each year. * * With the first report, medical officers will forward a special report, describing, in detail, the post buildings, water supply, drainage, &c. This report should contain the information and data which have been obtained for and entered in the "Record of the Medical History of the Post." * *

* The first eighty pages are devoted to a description of the post and vicinity, including botany, geology, &c.

Upon examining the special reports forwarded in accordance with the above order, it was found that they contained much information which would probably be of interest and value to many officers and other persons who could not have access to the files of this office. In editing them for publication I have endeavored to keep the following objects in view, viz: 1st. The preservation of interesting historical memoranda. 2d. The presentation of all facts bearing upon the hygiene of the post and the sanitary condition of the troops. 3d. The furnishing such information as would be of interest to officers ordered to a post new to them. In addition, I have tried to give an idea of the general character of the barrack and hospital accommodation of the Army.

As the reports were furnished nearly two years ago, many of them did not fairly represent the present state of affairs. By combining reports, and by writing for missing data, I have endeavored to make the necessary corrections, but it is improbable that all errors have been avoided; nor are some of the descriptions as complete as would be desirable. It has been much more difficult to obtain facts than opinions, even when the former have been specially requested. For the sake of brevity I have omitted many passages of minor importance in the reports; and in those headed "information furnished by," &c., I have prepared the description from such data as I could collect. The plates and wood-cuts have, in all cases, been made from recent drawings.

For information furnished I am much indebted to the offices of the Adjutant General, Quartermaster General, and Chief of Engineers; to the Chief of the Bureau of Medicine and Surgery, United States Navy; to General F. A. Walker, Superintendent of the Census; to the Supervising Architect of the Treasury, Mr. A. B. Mullett, and to Assistant Surgeons J. J. Woodward and G. A. Otis, United States Army, of this office.

Although the following descriptions contain, for the most part, their own commentary, it may perhaps be not out of place or useless to preface them with a few remarks on the general principles which should be kept in view in judging the merits of the plan or construction of a post, and to refer to the most prevalent errors, the evils to which they give rise, and to the best and most practical means of correcting them.

The most important structures at a post, in a hygienic point of view, are the barracks proper, or soldiers' quarters, the guard-house, including the prison-rooms or cells, and the hospital; and the object to be kept in view in their construction is to furnish shelter without diminishing that supply of pure air and light which is necessary to health. The merits of locality, exposure, plan, construction, and mode of heating and ventilation are to be estimated mainly with reference to the manner in which they secure the above object. In every room occupied by men, a supply of fresh air, such that no occupant shall be compelled to breathe air which has recently passed from the lungs, or which is vitiated by the products of combustion, is, if not absolutely essential, so very desirable that a strong effort should be made to secure it. Air just breathed is unfitted for respiration, in part because it contains less oxygen and more carbonic acid than is desirable and in part because it is loaded with moisture, and contaminated with organic matter which has a strong tendency to putrescence, and has been well described as a sort of "aerial filth;" or, as Becquerel expresses it, "a physiological miasm," which is directly and positively hurtful when introduced into the system. Taking into consideration the well-known dangers attending the aggregation of large numbers of men, and the fact that a man can preserve life and comparative health for a time, with an allowance of

air which would be utterly insufficient if furnished to each of a hundred men placed together, it would almost seem as if the organic matter above referred to were less harmful to the one who has produced it than to others, or, in other words, that this excretion of a man is more or less of a specific poison to other men. That this is the case with a person affected with small-pox or whooping cough will be readily admitted; nor is it hard to understand that the organic emanations from a case of pneumonia, or typhoid fever, in which rapid retrograde metamorphosis is going on, will be much more damaging to a neighboring case of rheumatism, or wound, or to a man in ordinary health, than to the pneumonic or fever patient himself. If a man is eliminating an undue quantity of carbonic oxide, sulphuretted hydrogen, or some of the compound ammonias, his system being already permeated by the gas or vapor, will not readily reabsorb that which has been thrown off, nor will its presence in the surrounding atmosphere be so offensively perceptible to him as to others. Whatever be the explanation, the fact remains that the more men are placed together the greater should be the amount of air supply per head.

The minimum amount of air with which life can be supported is not precisely known. Dr. Read states that he was able to remain between one and two hours "in an air-tight, oblong, metallic box, not larger than was necessary to contain me in the horizontal position, and the door being carefully cemented and soldered, so that no air could either enter or escape."* This experiment, somewhat modified, has been many times repeated, although for a very different purpose, in the so-called "sweat-boxes" of the Navy. These are wooden closets, just large enough to contain a man standing upright. A few inch auger-holes are usually bored through the door and sides. Two hours' confinement in one of these boxes usually exhausts a man greatly, and several instances have been related to me in which men were taken out insensible. The symptoms presented are said to be much like those observed in men overcome by heat in furnace rooms. This form of punishment, although not uncommon at one time, is now considered discreditable and illegitimate.

The evil results of insufficient air supply are, however, rarely so marked as to be perceived at once, or if noticed they are attributed to some other cause, such as a cold, or indigestion, and a cough mixture, or a pill, is no doubt often taken when the true remedy would be a supply of fresh air to the sleeping-room. It is only of late years that the insidious effects of foul air in sapping vitality, and producing or aggravating destructive forms of fever or lung disease, have been fairly appreciated, and a corresponding change has taken place in the estimate of necessary allowance of air supply. This estimate has been made in various ways. The calculations of Peclet, as followed out by Mr. Thomas Box, are as follows:

An ordinary man makes twenty respirations a minute; therefore, admitting that air should not be respired a second time, we have $\frac{20 \times 40 \times 60}{1728} = 28$ cubic feet of air thus vitiated per hour. Putting the amount of air vitiated by vapor at 187 cubic feet per hour, he proceeds: We have a total of $28 + 187 = 215$ cubic feet per hour. This is the minimum quantity necessary for cleanly and healthy persons. For prisons, work-houses, &c., it should not be less than 350 * * * * feet per head.†

* Illustrations of Ventilation. London, 1844; page 179.

† Practical Treatise on Heat. London, 1868; page 178.

I have given the above statement in full, as being a recent one in a scientific manual, and as giving a view of the subject which is not uncommon, although rarely formulated so clearly. The fallacy in it lies, of course, in the assumption that the air expired does not mix with the surrounding air. If a man inspired fresh air from one reservoir, and expired into another entirely separate, the above calculation would have some value. The true mode of calculation, however, is that of Dr. De Chaumont.* Assuming that air begins to seem impure to the senses when the amount of carbonic acid reaches 0.6 per 1,000 volumes, and that this should be the maximum impurity permissible, also that a man expires 0.6 of a cubic foot of carbonic acid per hour, it can be readily calculated that 3,000 cubic feet of air per hour are necessary to properly dilute the air expired by an adult in good health; and this is the standard accepted by Dr. Parkes.

The amount of carbonic acid given above, as expired by a man per hour, viz., 0.6 per 1,000, is too large for a man sleeping, the amount being about 0.4 per 1,000 under such circumstances, as shown by Dr. Edward Smith;† and this is the amount upon which the calculations of Dr. Craig are based in his very valuable and interesting report, which will be found in the appendix. But as in cold and stormy weather the men occupy their barracks during the day, and as the amount from cutaneous transpiration must be taken into account, the figures of Drs. De Chaumont and Parkes may be accepted as more nearly correct for our purpose than the lower number.

Dr. Foster states that "air which by respiration has acquired more than .08 per cent. of carbonic acid should be considered as unfit for further respiration.‡ It is a little doubtful, from the context, whether Dr. Foster really means that the .08 per cent. is to be derived solely from respiration; if so, as remarked by Dr. Parkes, the air would be very offensive, as this would make the total percentage, 0.12.§ General Morin fixes the proper allowance for men in barracks at 1,053 cubic feet of fresh air by day, and from 1,404 to 1,755 cubic feet at night.|| It appears to me that 2,000 cubic feet per hour per man may be accepted as a proper allowance for soldiers in barracks.

But it is important to remember that it is not the carbonic acid that is specially hurtful. This gas, in the proportion in which it would be found present in the worst ventilated of our barracks, is probably not specially deleterious, as has been shown by Bernard, Pettenkoffer, and others. But its quantity is usually in proportion to that of the organic matter—carbonic oxide, &c.—which are the true poisons, and in this consists its real importance. The air of a tent, especially of a wet tent, may be very deleterious with a low proportion of carbonic acid, as the gas would pass through the canvas, while the organic matter, being molecular, would remain.

The removal of the vitiated air rapidly, regularly, and in such a manner that disagreeable drafts or currents of air are not produced, is what is to be effected by ventilation. This subject of ventilation is one that has been darkened by a multitude of counsel, and the popular idea of it is that it is to be effected by the use of certain mysterious appliances called ventilators. Those who have made themselves most prominent in connection with this subject are in many cases persons who desire to make money by some

* Edinburgh Medical Journal, May, 1867; page 1024.

† Phil. Trans., 1859.

‡ Watt's Dictionary of Chemistry. Article, "*Respiration*."

§ The experiments of Dr. Craig are believed to be the only ones of the kind in which a discrimination has been made between the carbonic acid derived from respiration and that previously existing in the air.

|| Manuel Pratique du Chauffage et de la Ventilation. Paris, 1868; page 38.

patent which is to be a universal panacea, or men zealous, but without corresponding knowledge, who exaggerate the evils of mismanagement as the best means of drawing attention to the subject and to themselves. For such carbonic acid is the great bug-bear, and the Black Hole of Calcutta the favorite illustration, although an unfortunate one, as the deaths in that case were probably not due to carbonic acid.

To have good ventilation without discomfort a certain amount of cubic space per man is necessary, and in fixing this amount the main consideration is the possibility of furnishing the requisite air supply without causing unpleasant currents. A man requires the same amount of fresh air per hour whether the space allotted to him be great or small; and if the ventilation be insufficient the large room will in time become as foul as the small one. When rooms are empty a large part of the day, cubic space becomes important in itself as affording a stock of fresh air to commence with; but in places constantly occupied, its value, though great, is secondary. This point must be insisted on, for it will be found in examining the following reports that the subject of air supply has been very rarely considered at all, even where cubic space seems to have been specially attended to. When cubic space alone is to be considered, the allowance fixed by the Metropolitan Board of Health of New York seems a fair one, and is as follows:

SEC. 133. That no owner, lessee, or keeper of any tenement-house, lodging-house, boarding-house, or manufactory shall cause or allow the same to be overcrowded, or cause or allow so great a number of persons to dwell, be, or sleep in any such house, or any portion thereof, as thereby to cause any danger or detriment to life or health; nor shall more persons than one for 1,000 feet of cubic contents be allowed to sleep in any apartment of any such boarding-house, tenement-house, or lodging-house; nor shall more than one person for every 1,000 cubic feet of contents be allowed to dwell in any such last-mentioned houses. And for the purpose of computing such space, no cellar, nor any closet, hall, cupboard, nor any room not properly lighted and ventilated, nor any room or space not used as a part of the dwelling apartments of the family or other occupant, shall be computed or taken into account.*

The cubic space allowance in soldiers' barracks has varied much in different countries and at different times, but the constant tendency has been to increase it. M. Boudin states (*Annales de Hygiene*, 1853) that the allowance was, in French infantry barracks, 421 cubic feet; in French cavalry barracks, 491 cubic feet; in Prussian barracks, 631 cubic feet.

The subject was carefully investigated in behalf of the English government by a royal commission, which reported that "the air in barrack rooms can be kept sufficiently pure with about 600 cubic feet ('air space') per man, provided the local position of the barracks be open and airy, the structure of the buildings simple and admitting of free external and internal movement of the atmosphere, and provided the barrack rooms, as well as all internal parts of the buildings, are duly ventilated."†

The allowance of 600 cubic feet per man in barracks had been fixed by a previous commission, and made a part of the regulations of the English army, which provide that—

The Medical Director General is to be consulted on the plans and site of any new barracks. The Inspector or Deputy Inspector General (a medical officer) is ordered to see that all regulations for protecting health in barracks are carried out. He makes a monthly inspection, examining into ventilation, warming, lighting, latrines, closets, and all other points. The regimental medical officer

* Code of Health Ordinances and Rules and Sanitary Regulations adopted by the Metropolitan Board of Health at a meeting held April 20, 1866.

† Report on Barracks and Hospitals. London, 1861; page 35.

performs the same duties. He is also especially ordered to see that every soldier has a separate bed; that the beds are not placed at a less distance than six inches from the wall; that the beds are aired every morning for at least an hour; that the windows are opened in the morning as soon as possible, and kept open as far as weather and season will permit. The walls and ceilings are ordered to be limewashed twice a year. Each man is allowed 600 cubic feet of space, and the number of men located in each barrack room is to be painted on the door. This is a most important rule, which should be strictly enforced; if it is not so, it is to be stated in the annual report.*

With regard to the French service the accounts are somewhat contradictory. Rossignol states that from 12 to 16 cubic metres (421.2 to 561.6 cubic feet) per head are allowed in barracks.†

The regulations of the Prussian army fix the surface area per man in barracks at from 42 to 45 square feet.‡ Kirchner states that the allowance in barracks is from 420 to 495 cubic feet, and in hospitals 1,200 cubic feet per man.§ In the Russian army Kirchner states that the allowance is 491.4 cubic feet per man.

In the Austrian service the condition of things is shown by the following extract from a very interesting letter of Surgeon J Neudörfer, of the Austrian army, formerly medical director with Maximilian in Mexico:

VIENNA, September 24, 1870.

Order No. 581 from the War Department, dated July 25, 1850, directs that in hospitals each patient shall have 202.13 square feet of surface area without regard to the height of the room. In solitary and dark confinement 477.4 cubic feet per man is prescribed for each prisoner, by Order No. 52, dated Headquarters of the Army, May 9, 1857. In barracks from 537 to 596 cubic feet of air space have been prescribed by Order No. 6505, dated November 30, 1861.

Before giving the following data relating to the barracks in and around Vienna, I may remark that the dormitories, mess-rooms, and day-rooms are not yet separated, one barrack room being designed for all these purposes.

In the beautiful Rudolf's barrack one room for infantry, 125.75 feet long, 11.944 feet wide, and 12.4 feet high, contains 16 men, allowing 1,164 cubic feet air space per man; the room for cavalry allows 1,167 cubic feet of air space per man.

	BARRACK ROOMS.				PRISON ROOMS.				CELLS.		
	Number of room.	Cubic feet of air space.	Number of men for which intended.	Cubic feet of air space per man.	Number of room.	Cubic feet of air space.	Number of men for which intended.	Cubic feet of air space per man.	Number of room.	Cubic feet of air space.	Number of men for which intended.
Salzgries barracks	138	10,216.8	20	510.8	112	4,752	9	528	18	243.29	1
	142	10,454.4	21	497.8	75	10,454.4	24	435.6			
	143	10,454.4	20	522.7							
	154	10,792	20	539.6							
Franz Joseph's barracks || .....		9,266.4	17	545.08						544.43	1
		9,741.6	18	541.2							
		9,979.2	19	525.2							
		11,167.2	21	531.7							
		7,128	13	548.3							
Arsenal	Each room.	14,102.65	20	705.13	Each room.	13,058.97	19	687.05	Each room.	650.23	1
Art'y barracks Am Rennweg.	Each room.	12,654.78	18	703.04	Each room.	7,528.96	9	836.55	Each room.	370.26	1
Josefstädter cav'y barracks.		17,339.93	32	541.87							
		19,963.80	36	554.55							
		10,387.21	19	546.69							
		11,118.22	20	555.91							

* Parkes's Hygiene, third edition. London, 1869; page 305.

† Rossignol. *Traité d'Hygiène Militaire*. Paris, 1857; page 238.

‡ Heerwesen und Infanteriedienst der Kön. Preuss. Armee. Berlin, 1869.

§ Militär-Hygiene. Erlangen, 1869.

|| All rooms.

A hospital for from 20 to 25 patients we do not possess, but use thus far common barrack rooms for from 20 to 25 sick in quarters. (Leichtkranke.)

The United States Army regulations for 1863 provide for every six soldiers 225 superficial feet, north of 38° north, and 256 square feet south of that, which, with 10 feet as the average height of rooms, would give 375 and 425 feet respectively. Even this allowance is, however, practically denied by the following clause: "But the amount of quarters shall be reduced *pro rata* by the commanding officer when the number of officers and men renders it necessary." Practically there is no regulation on the subject.

With reference to barracks we may assume that, in temperate climates, each soldier should have at least 600 cubic feet air space, of which between 50 and 60 feet should be surface area in his dormitory, and that these figures should be increased to 800 cubic feet and 70 feet area at posts below latitude 36° north. But this allowance is not to be considered as doing away with the need for ventilation, cubic space allowance being merely the A B C of the main problem. The point is clearly stated by M. Desjobert:

The mere allowance of cubic space to men is insufficient; no good can be effected except by a ventilation regular, constant, independent of the care of superintendents, or of the will of the soldier, and combined with heating for the seasons that demand it.*

How, then, is this ventilation to be effected? An excellent *résumé* of the various plans is given by Dr. Parkes in his "Military Hygiene," a book which has been placed in the hands of every medical officer of our Army, and which renders it unnecessary to go into details. One elementary proposition or axiom is so generally unknown or forgotten, that I will state it. Air will not pass out of a room unless other air can pass in to replace it, and *vice versa*; hence ventilation of a room is not to be effected by simply inserting a single tube or shaft.

In a properly constructed dormitory, which should be 24 feet wide, 12 feet high at least, and, for thirty men, 67 feet long, we have to introduce, distribute, and remove 60,000 cubic feet of air per hour. During warm weather the easiest mode of doing this is by the windows, which, for this purpose, should be on opposite sides, one to every two beds, and should have both sashes made to slide. To the top of the upper sash should be fixed a light louvre board, sloping toward the ceiling. If the top sash be swung on pivots in the center of its sides, the effect will be equally good. During cold weather the motive power for ventilation must be derived from winds or heat. The former often oppose rather than assist, and to make use of their aspiratory powers cowls should be applied to all shafts of exit. What is known as the Emerson ejector is probably as good a form as any. The modification of it, used by the Architect of the Treasury, is shown in Figure 5 of the plate opposite page XIII. An ingenious and easily made form of cowl is figured and described by Wyman,† and referred to approvingly by Peclet. It is a cone balanced on a point in such a manner that it may be tilted in any direction. The wind blowing upon it depresses the side upon which it strikes, and at the same time elevates the opposite side.

During cold weather, however, heat must be the main agent of ventilation for Army buildings, and although it is better to separate the heating from the ventilating apparatus, as thereby each process can be better regulated, practically it is usually necessary

* Report on the means of improving the sanitary state of the Army. Annales d'Hygiène. 1848.

† Treatise on Ventilation. Boston, 1846; page 361.

to obtain the power of expelling foul air from the same apparatus which warms the room. Hence the form and arrangement of this apparatus becomes an important matter for consideration. A ton of coal or a cord of wood, when burned, will produce only a certain quantity of heat, and no form of stove, grate, or boiler can increase this quantity in the least. All that can be done is to increase the thorough oxidation or combustion of the fuel and to prevent the heat passing up the chimney. But it requires a certain amount of heat to remove the products of respiration and combustion, and this heat cannot, at the same time, be used to warm the room. The heat which passes up the chimney is ordinarily spoken of as wasted, and many have been the plans to retain and utilize it. It seems to be often forgotten that it is doing work, and good and necessary work. This was clearly stated by Wyman: "The whole system is a waste of fuel. The question is, how much air is to be allowed to each individual in the twenty-four hours? The less he is allowed, the greater will be the saving."*

In all northern latitudes stoves are the usual means of heating barracks. If this could be supplemented by a system of hot-water pipes, sufficient to warm and distribute about one-half of the fresh air introduced, it would be desirable, as doing away with complaints about currents of cold air; for soldiers care very little for the, to them, unknown evils of vitiated air, in comparison with the palpable and present discomfort of cold, and they will render useless the best system of fresh air inlet if it produces a draught of cold air upon them.

In a hygienic point of view it is well known that radiant heat is much the best. This does not raise the temperature of the air directly, but warms the walls of the room and the bodies of the inmates much better than any system of warm air supply can do.

Why radiant heat is preferable to conducted heat is not precisely known; but it certainly adds to a man's comfort and health that the heating of the air inspired beyond a temperature of about 45° F. should be accomplished in the lungs, rather than previously by artificial means. It is possible that this depends upon the increased transpiration when cool air is breathed, and that this favors the removal of effete organic matter or of volatile organic bases.

When air is heated its capacity for taking up moisture rapidly increases. Air inhaled at 45° F., and expired at 95° F., will take up 50 per cent. more vapor than air inhaled at 65° F., supposing the previous relative saturation to have been the same.

When the transpired vapor is condensed into a liquid the organic matters fall with it, as shown by the fetidity of the fluid. As the most dangerous impurity is thus removed, it is evident that when the difference between the external and internal temperature is so great that the vapor arising from the breath is condensed on the windows or the walls, that this exercises a temporary purifying effect on the air.

Coal stoves are, moreover, objectionable by reason of their contaminating the air with carbonic oxide gas—a direct poison, even in small quantities—and the evil effects of which are strongly insisted on by Dr. Derby.†

With stoves alone it is difficult to distribute the fresh air in a satisfactory manner. Tubes and openings intended for inlets will sometimes perversely act as outlets, and

* Wyman on Ventilation. Boston, 1846; page 175.

† Anthracite and Health, by Dr. Geo. Derby. Boston; 1868.

VENTILATING DOUBLE FIREPLACE.

Figs. 1, 2, & 3

- A. Central Air-Chamber
- B. opening by which it communicates with the air box beneath the floor.
- C. Pipes, for escape of hot air into the room, controlled by damper.
- S. Smoke flue.
- D. Grate space.

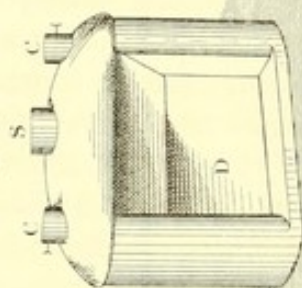


Fig. 1.

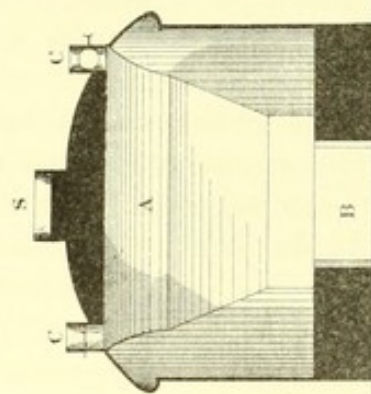


Fig. 2.

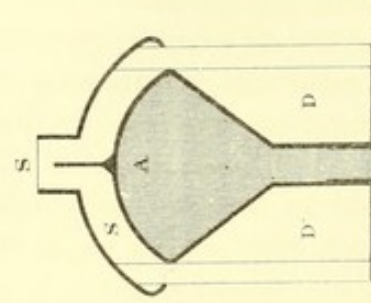


Fig. 3.

Scale for Figs. 4 and 5.
5, 10, 15, 20, 35 feet

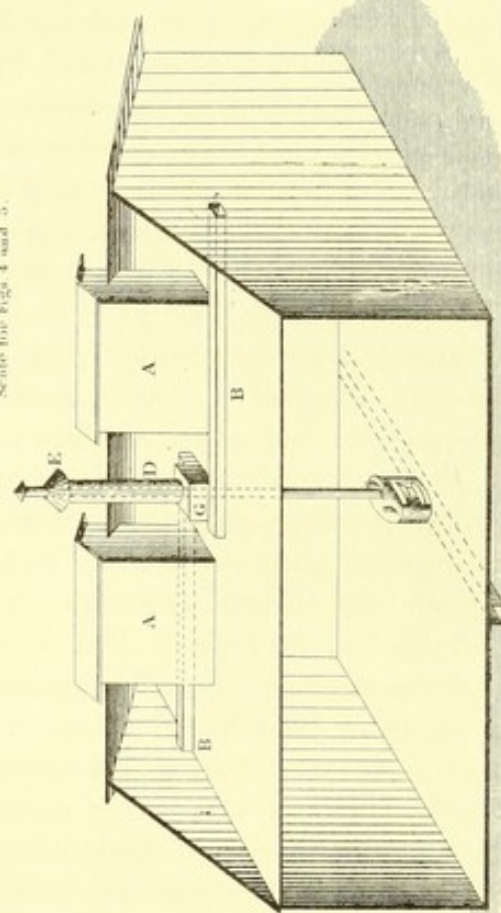


Fig. 4.

ISOMETRIC DRAWING OF WARD WITH VENTILATING APPARATUS.

- A.A. Air-boxes for summer ventilation.
- B.B. Air-boxes for winter ventilation.
- C. Box of sheet iron into which, Dowsy & Rogers.
- E. Cap for tube D pierced by the stoppage.
- D. Ventilating shaft.

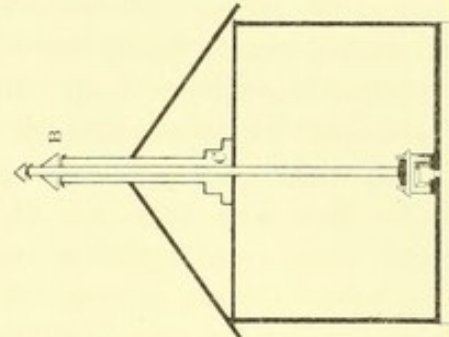


Fig. 5.

TRANSVERSE SECTION OF WARD THROUGH THE CENTRE.

- B. Cap corresponding to E in Fig. 4.
- C. Sheet iron box corresponding to C in Fig. 4.

vice versa; men will complain of draughts, whether the cold air be introduced at the ceiling or the floor, and will close the apertures if possible.

To secure the greatest effect from heat as a ventilating power, the fresh, cool air should enter at the bottom of the room and the warm, foul air pass out above. This will not, however, secure the satisfactory distribution of the air which is essential, for it is possible to pass a superfluity of air into and out of a room without properly ventilating it. The openings for fresh, cool air should, therefore, be near the ceiling in cold weather; but, when fires are not used, a mechanical advantage is gained by having them near the floor, and both sets of openings should be inserted with tightly-fitting doors, so that either can be used as required. The exit shaft should be at the highest part of the room. When a room is heated by hot-air supply there is a theoretical advantage in having the exit shaft open near the bottom of the room, *i. e.*, that it secures better distribution, and, as General Morin deems specially desirable, that it removes the effete products as soon as they are formed. Another argument is sometimes advanced, which is thus stated by Dr. Douglass: "The carbonic acid must inevitably fall to the floor, in consequence of its superior specific gravity, (1.52,) and there remain to bide its time of diffusion. * * * It is claimed that its superior temperature will cause the carbonic acid to rise. To this we answer that, according to the well-known rate of expansion of gases by heat, the carbonic acid would require to be heated to 250°, or 150° above the temperature of the animal body, before it will have attained the same specific gravity of (*sic*) the air."* If the expired carbonic acid were pure, this would be good reasoning; but, as the carbonic acid forms but a small part of the expired air, the fact is that it does rise, and that the difference in its percentage at the ceiling or the floor is too small to be of any practical importance whatever.

The plan of ventilation proposed and carried out by the barrack commissioners consists in the introduction of fresh air around the stoves and at the eaves, the openings at the latter points being provided with valves or louvres, to throw the current toward the ceiling, and the removal of foul air by a shaft or shafts, the opening into which is at the highest point in the room.† This is said to afford good and satisfactory results.

I would recommend the following plan of heating and ventilating a barrack-room: The heating is to be effected by one or two ventilating, double fireplaces. Each of these consists of two open fireplaces, placed back to back and inclosing an air chamber between. This air chamber communicates below with an air box, 18 inches square, which passes from one side of the building to the other, beneath the floor. Above, the air chamber communicates with the room by two openings, which may be closed with dampers. The construction of this fireplace is shown in the plate opposite, Figure 1 being a front view; Figure 2 a longitudinal section; Figure 3 a perpendicular transverse section; A, the central air chamber; B, the opening by which it communicates with the air box beneath the floor; C, the pipes for escape of hot air into the room. Figures 4 and 5 show the arrangements for ventilation, when one of these fireplaces is used. Figure 4 is an isometrical drawing of a room, 45 feet long, 24 feet wide, and 15 feet high, being a hospital ward for twelve beds. A A are two boxes, carried from the ceiling to above the roof, and capped by ridge ventilators. Each of these boxes is 10 feet long by 2½

* On Ventilation; Mich. Univ. Med. Journal, June, 1870.

† Report of the Barrack Commission. London, 1861.

feet wide; they are placed 10 feet apart, in the central line of the ceiling, the joists being carried directly across them, and are intended for summer ventilation. They can be closed in winter by trap doors just above the joist. B B are air boxes, each 18 inches square, communicating with the room by openings through the ceiling at the ends, and thence passing above the ceiling and by the side of the summer ventilating boxes to an air chamber, C, just over the center of the ceiling. From this air chamber an exit shaft, D, 24 inches in diameter, passes up through the roof. The pipe from the fireplace, 10 inches in diameter, passes through a close-fitting jacket or collar of earthen ware in the ceiling, and then traverses the air chamber C and the exit shaft D, piercing the sheet-iron cowl or cap, E, of the latter, and being itself surmounted by a similar cap. This plan would appear to combine the advantages of radiant heat from open fires, pure, warm air supply, and thorough distribution of the fresh air.

The fireplace would be most cheaply constructed of cast-iron, with a false fire-back, to be replaced as required; but, on many accounts, it is desirable that the surface exposed to the flame should be of boiler-iron. A vessel for holding water should be arranged in the air chamber, which could be easily done. I desire here, however, to indicate merely the principle of construction, without going into detail. The above plan has been approved for hospital use by the honorable Secretary of War, and I shall again have occasion to refer to it in connection with the subject of hospitals.

The effect of a large window space in cooling a room is great, and must be taken into account in providing means of heating.

The formula given by Hood* is that, in a still atmosphere, one square foot of glass will cool 1.279 cubic feet of air, as many degrees per minute as the internal temperature of the room exceeds that of the external air. At northern posts double windows will be found economical and desirable for this reason.

One objection has been made to good ventilation which it is as well to mention, as one of the strongest arguments in its favor. Men will eat more when they have plenty of fresh air than without. Dr. Reid mentions that men, in large manufacturing establishments, have struck for higher wages where a good system of ventilation had been introduced, as their former wages were insufficient to procure the increased amount of food demanded by their improved appetites. There is little doubt that, if some of our barracks were what they should be, in point of air supply, the post fund would diminish somewhat.

Although it is desirable that, for scientific purposes, the condition of the atmosphere in barrack-rooms should, from time to time, be tested in the manner employed by Dr. Craig, the simple, practical test is to go into the room about 3 a. m., after fifteen minutes' walk in the fresh air. If no musty, unpleasant odor is perceived under such circumstances, the ventilation is probably satisfactory.

In regard to fresh-air supply, it appears, from the following reports, that our barracks are in a bad condition, many of them being overcrowded, and arrangements for ventilation being either totally wanting or insufficient and unsatisfactory. Of the 151 posts described, the amount of overcrowding is shown by the following statement:

Number of posts having less than 251 cubic feet of air space per man in barracks.....	17
Number of posts having over 250 and less than 301 cubic feet of air space per man in barracks.	6

* Hood on Warming, &c., fourth edition. London, 1869.

Number of posts having over 300 and less than 401 cubic feet of air space per man in barracks.	20
Number of posts having over 400 and less than 501 cubic feet of air space per man in barracks.	32
Number of posts having over 500 and less than 601 cubic feet of air space per man in barracks.	27
Number of posts having over 600 cubic feet of air space per man in barracks.....	39
Number of posts not reported.....	10
Number of posts with ridge ventilation in barracks.....	19
Number of posts with shaft ventilation in barracks.....	4
Number of posts with no ventilation in barracks.....	72
Number of posts not reported.....	55

At forty-six posts, therefore, the allowance of air space is decidedly insufficient; at sixty-one it is insufficient, and at only thirty-nine can it be called satisfactory; while, even in these last, the ventilation can only be called satisfactory in about half the instances.

Our military posts are of four classes. The first are permanent fortifications for seaboard and harbor defense. These are the oldest posts; in many of them casemates are used as quarters, and in such the problem of reform is difficult; but, being at present remote from the scene of actual military operations, they are usually garrisoned by such force only as is necessary to keep them in repair, and hence the evil results of their defects have not been marked. If the time ever comes when the number of men, considered the full garrison for these forts, should be crowded into them, the result will be disastrous in the extreme. The report of Dr. Craig may be consulted with especial advantage with regard to this class of posts.

Casemates, if constructed with a view to their greatest efficiency as casemates, are unfit for quarters, by reason of dampness, darkness, and insufficient ventilation if kept properly warm; and it would, no doubt, be good economy to discontinue their use as quarters and lodge the men in proper barracks, even if these had to be destroyed, in case of actual hostilities, every ten or fifteen years to meet the exigencies of the service.

Posts of the second class are the depots for recruits and moving troops, and in them the danger of the occurrence of overcrowding is greatest. The remedy here is obvious; either more barrack room should be provided, or the movements of troops and recruits should be so directed that, under no circumstances, shall the garrison of the post exceed a certain fixed number.

Posts of the third class are frontier posts, intended or supposed to be permanent. Although called "forts," they are really only barracks or cantonments, intended to accommodate from two to six companies. At these posts the evils of insufficient and improper barrack construction are the most frequent, but, at the same time, the easiest remedied.

The last class are the temporary posts or camps established in the immediate vicinity of Indian hostilities; usually constructed of logs or adobe by the labor of the soldiers, and, as a rule, about one-half the size which they should be, if intended as permanent quarters. The difficulties in the way of remedying the evils referred to in this class of posts are great; but, fortunately, the pure air and active exercise obtained by their occupants go far to render them healthy, although uncomfortable. A very little extra labor, however, in the construction of ventilating openings, and the use of open fireplaces as means of heating, would vastly improve these barracks.

A not uncommon error in the construction of barracks, otherwise very satisfactory, is making them too wide, as at Ringgold Barracks, Texas; Forts Leavenworth, Riley,

and Larned, Kansas; and Fort Fred Steele, Wyoming Territory. At Fort Larned the dormitories are 40 feet square and 10 feet high; it is almost impossible to ventilate them properly. A dormitory should never be more than 24 feet wide. The barracks at Fort Sully, Dakota Territory, are disproportionately narrow, and those at Fort Wadsworth, Dakota Territory, Figure 48, are especially faulty in plan, as one side of the room is a dead wall, which is only excusable in barrack construction on account of military necessity. The engineer barrack at West Point, Figure 8, is a sample of a badly arranged barrack on the corridor plan. Examples of barracks, satisfactory in plan, are afforded by the new barracks at Willett's Point and those at Plattsburg Barracks and Madison Barracks. At Fort Griffin, Texas, the barracks are small huts—a satisfactory mode of construction in a sanitary point of view; in this case, however, they are greatly overcrowded. Other essential points to be borne in mind in barrack construction, which have not been above referred to, are as follows: The floors should be raised from the ground, with arrangements for ventilation underneath. In the South, and in malarious regions, the height above the ground should be at least $2\frac{1}{2}$ feet, and in the latter, the dormitories should always be in the second story. There should be a wash-room in immediate connection with each dormitory.

There are one or two other points, in connection with barracks, to which attention should be drawn. Prominent among these, as being a point in which our service is behind the age, and an evil which should be put an end to with the least possible delay, is the use of the double bunk, usually aggravated by placing it in two tiers, and even, as at Fort Buford, in three. These bunks are used in ninety-three, or over one-half, of our posts. It is certainly time that the use of such bunks should be absolutely and imperatively forbidden, and so long as they are allowed to exist in dormitories, so long it is useless to hope that those rooms can be made what they should be. No one acquainted with the first principles of sanitary science will approve of their use. They have long been discontinued in the service of European armies, and the following sentence from Parkes shows that they would now be looked on as curiosities: "Formerly two, and even three, men slept together. I have been told that, as late as 1842, one of the old beds with two tiers was to be seen at the Guards' barracks, in Portman street, London, though it had, of course, been long disused."* And Dr. Gordon remarks that these bedsteads have, for many years, ceased to be used in English barracks, and that "it is consolatory to think that, however tardy may have been the progress of sanitation with us, there do exist armies in which it has been still more so."†

The only possible argument in favor of their retention is that they enable more men to be packed in a given space, and that they cost a little less than single bedsteads; neither being worthy of consideration, in view of the evils to which these relics of barbarism give rise, and for which the supposed necessity for their use is now considered as a sufficient apology.

A great deficiency, at the majority of our posts, is the absence of proper bathing facilities. Like fresh air supply, while the necessity of personal cleanliness to health and personal comfort is universally acknowledged, the means for its attainment are rarely furnished. For cleanliness does not mean the washing of face and hands alone;

* Parkes's Hygiene, third edition, page 305, (foot note.)

† Gordon's Army Hygiene.

At least once a week every man should thoroughly cleanse his entire person; and it is economy and good policy to make the facilities for this purpose such that the men shall consider their bath a pleasure and a necessity.

The remarks of the Barrack Commissioners are worthy of repetition here :

Where barracks are within an easy distance of the sea the men have certainly a great advantage as regards bathing in one of its aspects, but not in others. Sea bathing can only be resorted to in certain seasons, and the sea water does not cleanse the skin like fresh water. Sea bathing is more a tonic than a means of cleanliness, and cannot be considered as a substitute for fresh-water bathing. Where men sleep in one common room, and where the difficulties in the way of personal cleanliness are so considerable, as they are under such arrangements, it is essentially necessary to provide, in some suitable locality, for the observance of those habits of personal cleanliness which cannot be attended to in the barrack-room.

Bath-rooms need not be placed so close to barrack-rooms as ablution-rooms should be; neither do they require a covered communication with the barrack. Men go to the bath room at any time of the day most convenient to them, with their clothes on, and return dressed, and they are hence not exposed to the same risks as men who go partly dressed to an ablution-room, situated at a distance.*

Bathing facilities of some kind should exist at every post. Where the supply of water is plentiful, the good example set at the Marine Barracks, in this city, by the construction of a swimming bath, should be followed. The bath referred to is a tank, 20 by 20 feet, and 5 feet in depth, with large inlet and outlet pipes, and constant, abundant, pure water supply. Where the supply is scanty, less water must be made to answer the purpose, and this can probably be best and easiest done by a combination of the steam and douche bath, which, by the exercise of a little ingenuity, could be furnished at any post.

While it may be perfectly true that at almost every post the bath-tub should be considered as important an article of equipment as the cooking-stove, it is still no good excuse for lack of bathing facilities that regular bath-tubs and circulating boilers have not been furnished.

As, at the majority of our posts, water-closets cannot be furnished, it seems desirable that the attention of officers should be drawn to the desirability of the systematic application of the dry-earth system, as the evidence in regard to its value is now unequivocal. Portable commodes, or night-chairs, on this plan, have been furnished to the principal hospitals, and have been found to fulfill their purpose. At two or three posts the system has been applied for the use of enlisted men, as at Forts Adams and Hamilton; and its failure at Fort Wadsworth, New York, is clearly due to the faulty method of application.

A very full report on the subject, by Dr. Buchanan, is contained in the twelfth report of the medical officer of the privy council, (London, 1869,) in which he refers to the use of this process at Wimbledin camp. At this place eight blocks of latrines are used, containing 114 closets and 46 urinals. It is estimated the closets are used each day by about 3,000 persons. About $1\frac{1}{2}$ pounds of earth are used to each discharge, and about 180 pounds of earth per day to each urinal. The results were entirely satisfactory. It is especially desirable that this system should be employed in the prison-rooms and cells of all post guard-houses, and that the tubs and buckets now used in such places be done away with at once and forever.

* Sanitary Report on Barracks and Hospitals, page 47. London, 1861.

GUARD-HOUSES AND PRISONS.

The importance of proper heating and ventilation and of cleanliness is even greater with respect to these buildings than to barracks. The guard are liable to be wet and chilled and to saturate the air of the guard-room with moisture, which should be promptly removed; and the prisoners cannot seek fresh air, no matter how foul and oppressive their place of confinement may become.

The necessity of providing fresh air for prisoners, if they are to be kept in moderately good health, has long been felt, and the first legislation with regard to air space was for their benefit. In 1779 the following became a law :

*And be it further enacted, That such offenders as shall be sent to either of such penitentiary-houses shall, during their hours of rest, be kept entirely separate and apart from each other, and be lodged in separate rooms or cells, not exceeding 12 feet in length, 8 feet in breadth, and 11 feet in height, nor less than 10 feet in length, 7 feet in breadth, and 9 feet in height, and without any window within 6 feet of the respective floors; which rooms or cells shall be dried or moderately warmed in damp or cold weather.**

This gives a minimum of 630 cubic feet per man.

Major Jebb, of the Royal Engineers, fixes the size of the cell at a minimum of 9 by 7 by 9 feet high, which is somewhat less than the above.†

In those prisons which are taken as models, such as the Prison Mazas, Pentonville, and the Philadelphia Prison, the allowance is about 1,000 cubic feet per man. Certainly, in our guard-houses, the allowance should not be less than in barracks, *i. e.*, 600 cubic feet, and the air supply should be the same, if not more.

It will be found, by the following reports, that the guard-houses, and, especially, the prison-rooms and cells of our posts, are, in many cases, unfit for their purpose, and form one of the most frequent subjects of remonstrance on the part of medical officers. Finding the complaint with respect to them so general, I thought it might be of interest to compare them with the lock-ups and prisons of civil life. Letters of inquiry were accordingly addressed to personal friends in some of the principal cities, with the result of some very interesting data, which will, perhaps, be given in full elsewhere. From these I have selected the figures given in the following table :

Table showing cubic space allowance to prisoners in the cells of the station-houses of some large cities.

Location.	Number of cells.	Length, breadth, and height.	Cubic feet of air space.	Intended number of occupants.	Maximum number of occupants.
WASHINGTON, D. C.					
First precinct station	3	5 feet by 4 feet by 8 feet	160	2	4
	1	5½ feet by 5 feet by 8 feet	220	.....	.....
Fifth precinct station	4	13 feet by 13 feet by 10 feet	1,560	.....	4
	8	7 feet by 5 feet by 10 feet	350	.....	1
	6	16 feet by 13 feet by 10 feet	2,080	.....	4

* 19th of Geo. III, chap. 74, sec. 33.

† Construction and Ventilation of Prisons, page 11. London, 1844.

Table showing cubic space allowance, &c.—Continued.

Location.	Number of cells.	Length, breadth, and height.	Cubic feet of air space.	Intended number of occupants.	Maximum number of occupants.
WASHINGTON, D. C.					
Fifth precinct station	1	7 feet by 7 feet by 10 feet.....	490	.....	1
Seventh precinct station	4	5 feet by 2½ feet by 8 feet.....	100	.....	4
	1	.....	.....	.....	.....
	1	5 feet by 4½ feet by 8 feet.....	170	.....	.....
BALTIMORE, MD.					
Middle police station.....	14	7 feet by 4½ feet by 9 feet.....	283.5	1	.....
BOSTON, MASS.					
Police station No. 8	12	8 feet by 6 feet by 7 feet 9 inches.....	372	2	.....
Middle police station.....	14	7 feet by 4½ feet by 9 feet..	283.5	1	.....
BUFFALO, N. Y.					
Station No. 1	16	8 feet by 6½ feet by 9 feet 5 inches	483	3	.....
Station No. 2	5	6 feet 2 inches by 5 feet 9½ inches by 10 feet.	357	3	.....
CINCINNATI, OHIO.					
Olive street station-house*.....	13	6 feet 4 inches by 5 feet by 7 feet 6 inches ...	237.5	.....	.....
Third street station-house†	14	7 feet 6 inches by 5 feet by 7 feet.....	262.5	.....	.....
LOUISVILLE, KY.					
Station-house.....	2	12 feet by 6 feet by 11 feet.....	792	2	.....
	10	6 feet by 6 feet by 11 feet.....	396	1	.....
SAVANNAH, GA.					
Chatham County jail.....	.....	10 feet by 4 feet 6 inches by 8 feet 4 inches..	375	2	.....
NEW ORLEANS, LA.					
First district station-house	13	14 feet by 12 feet by 11 feet.....	1,848	6	20
SAN FRANCISCO, CAL.					
City Hall prison .....	.....	9 feet by 6 feet by 7 feet.....	378	.....	.....

The cells of no guard-house in the Army have been more overcrowded than those of the Seventh precinct police station in the city of Washington, described by Assistant Surgeon Charles Smart, United States Army, as follows:

The prison is a small, brick house, floored with wood, and with cells constructed of stout plank. The only openings in the brick shell are a door in the front and a grated window, 2½ feet by 2 feet, in the rear. Along one side are four cells, each 5 feet by 2½ feet by 8 feet, and furnished with a water-closet seat. A fifth cell, for women, 5 feet by 4½ feet by 8 feet, is partitioned off in an opposite corner. The remaining portion, or hall of the brick shell, is used as a lodgers' room. The only apertures in these cells are holes, one 6 inches by 8 inches, in the upper part of the door, and another, 1 foot square, in the wall over the door. Four and five men are said to have been packed into each of these box-cells, with a few others in the lodgers' room.

* These cells are of open, iron lattice-work; ten are contained in a room, 47 feet 6 inches by 25 feet by 14 feet 6 inches=1,721 cubic feet to each.

† These are iron cells, with open bar tops and fronts, in a room 42 feet by 25 feet by 13 feet=13,650 cubic feet.

The majority of the following reports are not sufficiently definite with regard to the guard-houses to be of much value in a statistical point of view. The following table shows the condition of those in which the figures are given :

Number of cubic feet of air space.

	Under 150.	150 to 200.	200 to 250.	250 to 300.	300 to 400.	400 to 500.	500 to 600.	600 and over.
Number of cells.....	9	4	3	2	12	5	4	3
Number of prison-rooms.....	6	5	3	4	5	5	5	18

The underground cells at Fort Craig are probably the most discreditable example of prison construction to be found in the Army. Other examples of faulty construction are presented at San Antonio, and Forts Richardson and Brown, Texas; at Forts Leavenworth and Riley, Kansas; at Fort Rice, Dakota Territory; and Fort Stevens, Oregon. Examples of overcrowding are given in the reports on Carlisle Barracks, Jackson Barracks, San Antonio, Fort Richardson, Fort Fetterman, &c.; in fact this condition is the rule and not the exception.

The best planned guard-houses appear to be those at Willet's Point, Figure 5, and the one proposed for Fort Totten.

The remarks relative to construction, heating, and ventilation of barracks apply equally to guard-houses; and I have only to state in addition that when practicable it is desirable, for many reasons, that the prison-room and cells should be in the second story, in which case the hot-air supply may be furnished to the prison-room by connecting an ordinary stove-pipe with one of the tubes of the ventilating fireplace. Each cell should have a divided tube ventilator upon the plan of Muir or McKinnel, for description of which see Parkes's Hygiene. The ordinary urine tubs should not be allowed in the prison-room, the dry-earth system of dealing with the excreta replacing them in all cases.

HOSPITALS.

As the evils of improper plan and construction are more directly manifest in hospitals than in any other class of buildings, with the exception, perhaps, of prisons, the attention of physicians, engineers, and architects has long been turned to their improvement. The true principle of hospital construction, as at present understood, was at first declared by a committee of the French Academy of Sciences, which, in 1788, made a final report as to the conditions which a model hospital should fulfill, specifying that the wards should be in isolated pavilions; that each ward should be 24 feet wide, from 14 to 15 feet high, and 115 feet long, and should contain from thirty-four to thirty-six beds; and that the windows should extend to the ceiling. This is known as the pavilion plan, as distinguished from the dwelling-house, block, or corridor plans, and is now recognized as the one best suited to its purpose, the experience gained during the late war having contributed greatly to the recognition of its value in this country. Its essential features, as stated by Miss Nightingale, the Barrack Commissioners, and other writers of authority on this subject, may be stated briefly as follows:

The important part of a hospital is the ward, which should be so arranged as to obtain as much sunlight and fresh air as possible. It should be about 24 feet wide, and 15 feet high, and have windows on opposite sides, one to every two beds, reaching nearly to the ceiling. The length of the ward should be sufficient to allow at least 1,200 cubic feet of air space to each bed. The floor and walls should be non-absorbent, and without cracks or crevices. Each ward should have its own bath-room and water-closet. The ventilation should furnish at least 3,000 cubic feet of fresh air per man, per hour. The kitchen, laundry, and dead-house should be at a distance from the ward—never beneath it or communicating directly with it.

Our post hospitals are all small, ranging in capacity, in most cases, from five to thirty beds, and there should therefore be little difficulty in their proper arrangement.

Previous to the year 1867 examples of a properly constructed hospital at a military post were very rare, those at Key West, Jackson Barracks, and Fort Vancouver being the best.

Circular No. 4, dated Surgeon General's Office, April 22, 1867, and issued by authority of the Secretary of War, embodied the true principle of hospital construction, and was a great step in advance. For plan of the hospital prescribed by this circular see description of that at Fort Delaware, Figure 11; also of those at Forts Independence, Brown, and Harker. It was found by experience that there were a few defects in this plan, but more especially in the system under which the construction of hospitals was to be obtained. These are pointed out, to some extent, in the reports relating to Forts Adams, Wayne, Macon, and Concho; and especially in the special report of Surgeon J. B. Brown, medical director of the Department of the Platte.

Even after the construction of a hospital was ordered by the War Department, it was very possible that it would not be built, as at Carlisle Barracks, Fort Wayne, and Fort Davis. The case of Fort Larned is a good instance of how easily any one of the officers, through whose hands the request for hospital construction or repairs must pass, could hinder or put an entire stop to the work, no matter how great the necessity. When hospitals were built it was usually by contract without intelligent supervision, no medical man being consulted either as to the specifications, or during the construction, the sole object being cheapness, and the results appear in the erection of such hospitals as those at Fort Adams, Taylor Barracks, and Omaha Barracks.

As no separate appropriation was made for the erection and repair of hospitals, it is impossible to say what proportion of the annual appropriation for "barracks, hospitals, and stables" was applied to hospital benefit. The cost of some of the principal hospitals of the plan of Circular No. 4, as obtained from the office of the Quartermaster General, was as follows:

Fort Adams.....	\$11,731 00	Fort Brown.....	\$20,000 00
Fort Delaware.....	21,019 37	Fort Harker, (estimated).....	*11,635 00
Fort Ontario.....	4,500 00	Omaha.....	8,127 00
Fort Concho.....	56,000 00	Angel Island, (coin)	7,775 00

When repairs or alterations were required at a hospital at least two applications had to be made. At one post, after two applications had been made by the post surgeon for some very necessary repairs to the hospital, the attention of the department

* The cost of such a building at the present time is estimated at \$25,000.

commander, who happened to be at the post, was called to the matter, and the post quartermaster was directed to make out estimates. As his stock of lumber, &c., was small, and as his requests for workmen and materials to repair the other buildings at the post had not been granted, he made his estimate a liberal one. It was approved, however, and workmen and materials were furnished. Some of the workmen and part of the materials were at once employed in repairing the commanding officer's quarters, and in fitting up the store-houses, guard-house, &c. The work on the hospital was necessarily delayed, and finally the surgeon was informed that the amount authorized was nearly expended, and that it would be necessary to wait another year. Since the commencement of this report, Circular No. 4, above referred to, has been revised, and an order has been issued by the honorable Secretary of War which puts the whole subject of hospital construction upon a very satisfactory basis. This order is contained in Circular No. 3, dated Surgeon General's Office, November 23, 1870, which also gives the plans and specifications for the various classes of Army hospitals. The system of heating and ventilation authorized for hospitals is shown in the plate opposite Page XIII of this report.

The majority of the cuts of plans of hospitals given in the following reports are simply inserted as samples of ingenious modes of "how not to do it." Special comment upon them is probably unnecessary. The common dwelling-house plan is illustrated by the hospitals at Forts Wood, McHenry, Monroe, Madison Barracks, and Fort Leavenworth. The hospital at Santa Fé, Figure 30, is the only one with a completely inclosed court. That at Fort Warren, Figure 1, shows what can be done in arranging casemates for hospital purposes. The plan of the hospital at Fort Schuyler is in most respects very satisfactory.

Setting aside hospitals of what is known as the pattern of Circular No. 4, the best post hospital that I know of is that at Willet's Point, Figure 6, designed and built by General Abbott, of the engineers. In location, solidity, and thoroughness of construction, convenience of administration, and in the amount of ventilation of the wards, it is not surpassed by any Army hospital. The prison-room is a peculiar feature of this hospital, and a very good one. The marked defect in the plan is the bringing up the staircase and the dumb-waiter shaft from the kitchen, in the center of the main ward, whereby they become, practically, ventilating shafts. Had the staircase been brought up in a hall at one end, the water-closets been separated from the ward by a ventilated passage, and separate ventilation provided for the kitchen and mess-room, it would have been a great improvement. It is manifestly impracticable to plan a hospital which shall be equally suited to the burning mesas of Arizona and to the bleak North Atlantic coast. Nor can it be expected that the hospitals of a temporary post, often little more than a camp, shall be equal in structure and comfort to that of a permanent post. But, even a log or mud hut need not be built in absolute and direct defiance of all sanitary laws. And especially to be deprecated is the turning over of old barracks or officers' quarters to hospital use.

Our hospitals approach more nearly in size and character the so-called cottage hospitals of England than any others. They are satisfactory in one respect—that they are almost all temporary hospitals. This I consider a decided advantage, as I believe that no hospital should be constructed with a view to its being used as such for more than fifteen years. If the money required to put up such structures as the New York civil

hospitals, the Rhode Island hospital, or the Cincinnati hospital, were divided into two equal parts, one-half being used to erect frame hospitals of the same capacity as the stone and brick hospitals actually built, and the other half being put out at interest at 6 per cent., a complete new hospital could be furnished every twelve years for an indefinite period to come. It is therefore good economy to build hospitals in this manner, and there can be little doubt that, as stated by Sir George Ballingall, "such a measure would be favorable to the interests of the sick."

With regard to Army hospitals it is necessary to consider more than present necessities. The whole system of military organization is an education and a preparation for emergencies and circumstances which may never occur. And as troops are drilled in the use of arms, though no enemy be present, so should they be familiar with the system which is necessary on the part of the medical department in time of war or epidemics. And to refuse to furnish the necessary accommodations and facilities to medical officers is very much like refusing to allow soldiers to use muskets, cannon, or horses in time of peace.

Our military system is, or should be, organized on the theory that it is to act as a nucleus and organizing power for the force to be called into existence in time of war. When a war breaks out we must have large hospitals; if these are to be efficient they must be thoroughly organized. The knowledge of this organization is best obtained by practicing it previously on a small scale.

Again I quote from the report of the Barrack Commission:

The contracted space and want of ventilation in our military hospitals do not give to the patients the same chance of recovery as is afforded by the better accommodation of the naval and civil hospitals of this country. Nor is their stunted and meager appearance without its effect on the medical officers themselves. The young man who, on joining the army, arrives fresh from the establishments of London, Edinburgh, or Dublin, where he has seen the civilian patient tended with every appliance which can alleviate his suffering and hasten his cure, can scarcely fail to form a low estimate of the value attached by the Government to the health and comfort of the soldier; nor can those who are in charge of our army hospitals feel that pride in their condition which is so strong an incentive in similar establishments elsewhere to their maintenance in the highest state of efficiency, while they keenly feel that by the public they are considered responsible for a state of things which they know to be far from creditable, but which they have neither power nor authority to remedy.

We have already shown that the director general had not concealed from the secretary of state the opinion he had formed of the state of the hospitals, and of the necessity of creating a new general hospital worthy of the objects to which it is to be directed, and of the nation by which it is to be provided. It is but just to the medical officers to state that the evils complained of in the particular hospitals we have described have been the subject of constant though fruitless representation on their part; but dependent as they are on other departments which have duties to perform to which the efficiency of the hospitals is necessarily secondary, it is not a matter of surprise that their remonstrances should frequently have been unsuccessful. (Report of the Commissioners for the Organization of Military Hospitals, page 37. London, 1858.)

The statistics of the post hospitals of the Army, in time of peace, are interesting as bearing on the question recently discussed as to the relative efficiency of small and large hospitals. When the late Sir James Simpson denounced all large hospitals as producing what he termed hospitalism, and as being almost necessarily injurious, he relied mainly on the statistics of amputations to prove his theory.

The following table, embodying his figures and those adduced by his opponents, together with those furnished by the records of our post hospitals for the past two years, may be of interest:

Table showing mortality rates after amputation.

Authorities and periods.	Amputations.	Thigh per 1,000.	Leg per 1,000.	Arm per 1,000.	Fore-arm per 1,000.	Death-rate per 1,000.
In hospitals United States Army, from January, 1866, to May, 1870; data furnished by Assistant Surgeon G. A. Otis, United States Army.	Primary.....	375	214.2	214.2	125	200
	Secondary	333.3	166.6	333.3	.....	172.4
	Intermediate ..	.....	500	.....	.....	250
	Total.....	333.3	205.2	222.2	103.1	193.5
In private country practice in Great Britain; Sir J. Y. Simpson's statistics, Edinburgh, Medical Journal, 1869.	Primary.....	258	135	40	6	109.9
	Secondary	120	123	56	.....	103.3
	Intermediate ..	.....	.....	.....	.....	.....
	Total.....	185	131	43	5	108
In eleven large and metropolitan hospitals; Sir J. Y. Simpson's statistics, Edinburgh, Medical Journal, 1869.	Primary.....	644	548	401	147	479.4
	Secondary	378	314	282	200	342
	Intermediate ..	.....	.....	.....	.....	.....
	Total.....	465.2	440.4	370.3	163.9	409
Saint Bartholomew's Hospital; comparison of death-rates by G. W. Callender; Saint Bartholomew's Hospital report, 1869, page 243.	Primary.....	304.3	434.7	60.6	51.2	219.8
	Secondary	347.6	278.9	177.7	40	288
	Intermediate ..	.....	.....	.....	.....	.....
	Total.....	343.3	316	128.2	46.8	271.1
Country hospitals in Great Britain; comparison of death-rates by G. W. Callender; Saint Bartholomew's Hospital report, 1869, page 243.	Primary.....	491	280.4	156.4	79.8	252
	Secondary	204	158.7	228	94.8	173
	Intermediate ..	.....	.....	.....	.....	.....
	Total.....	276.7	210	178.1	85.3	211.2
<i>From January 1, 1850, to January 1, 1860.</i> At Pennsylvania Hospital; statistics, by George W. Norris; Pennsylvania Hospital reports, 1868, page 149.	Primary.....	333.3	348.8	35.7	95.2	192
	Secondary	419.3	370.3	300	200	358.9
	Intermediate ..	.....	.....	.....	.....	.....
	Total.....	395.3	357.1	105.2	115.3	256.1
<i>From January 1, 1860, to January 1, 1870.</i> At Pennsylvania Hospital; statistics by T. G. Morton, American Journal of Medical Sciences, October, 1870, page 313.	Primary.....	444.4	371.4	317	100	301.7
	Secondary	363.6	187.5	444.4	125	250
	Intermediate ..	.....	.....	.....	.....	.....
	Total.....	413.7	313.7	340	104.1	288.2
<i>From January, 1822, to January 1, 1850.</i> Massachusetts General Hospital; surgical reports and miscellaneous papers on medical subjects, by George Hayward, Boston, 1855, page 142.	Total.....	275.3	200	90.9	181.8	226.9

The usual plan of our posts is the distribution of the buildings around and fronting on a rectangular plot of ground, used as a parade. For the majority of posts, which are intended for from one to four companies, this arrangement is satisfactory. For the larger posts a very good plan is that of Fort D. A. Russell, (Plate No 8.)

We are fortunate in having very few specimens of the closed court, or Vauban system of barracks, of which Charleston citadel is a good example.

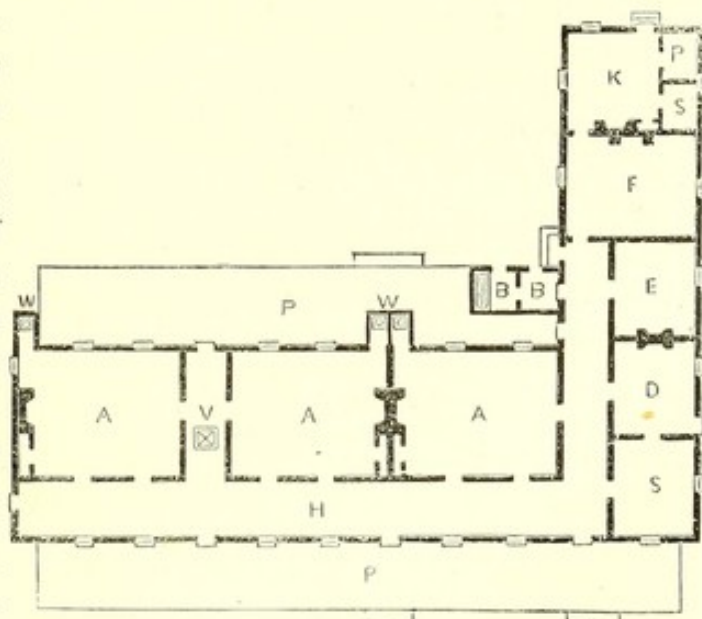
A peculiar plan was proposed for Fort Wingate, (Figure 28,) in which the buildings radiate from a common center, like the spokes of a wheel. This was disapproved, on the ground of economy, and the post is being constructed on the usual plan.

As there is no law or regulation with regard to the arrangement of a post, or in what manner the buildings, the hospital excepted, shall be constructed, and as the cadet receives no special instruction on these points, an officer charged with the establishment of a new post usually copies the arrangement of one of the older posts with which he is most familiar.

It appears to me that the time has come to regulate this matter by an order from the War Department—an order which shall establish the general principles of construction, leaving details to be arranged according to circumstances. This was attempted, in 1858, by Don Carlos Buell, Assistant Adjutant General, then on duty at the War Department, under whose supervision plans and directions for the construction of quarters, hospital, guard-house, and for the arrangement of a camp were drawn up, and, with minute tables of estimates, specifications, &c., were printed, in 1860, at the Government Printing Office, forming a thick quarto volume, which was declared to be the authorized regulations for the construction of barracks and quarters, by John B. Floyd, Secretary of War. This book was, however, never issued, and its existence even is known to but few officers. The plans for officers' quarters are good; for the men's barracks, tolerable; for the hospital, bad.

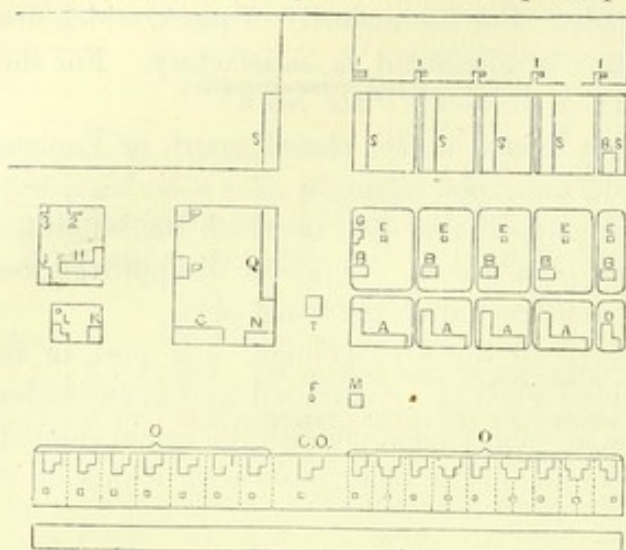
The annexed figure shows the proposed ground plan for a hospital, in which the small wards, shut off from the open air on one side by a hall, the deficient air space, and the presence of the water-closet in one corner of the ward, so to speak, are all in opposition to the first principles of correct hospital construction.*

A, wards, 21 feet by 25 feet; B, bath and wash-rooms; D, dispensary; E, steward's room; F, mess-room; H, hall; K, kitchen; P, verandas; S, store-rooms; V, ventilator in roof; W, water-closets.



* This plan seems to be based upon the one proposed by Dr. Mann. (*Vide Medical Sketches of the Campaigns of 1812-'13-'14, Dedham, 1816, page 238.*)

The annexed figure shows the plan, proposed by General D. C. Buell, for arrange-



ment of a garrison for four companies, in which the cardinal principles of light and air supply to each building are maintained.

A, company quarters; B, laundresses; C, commissary store-house; E, sinks; F, flagstaff; G, bakery; H, hospital; J, chapel; K L, sutler's store and quarters; M, magazine; N, offices; O, officers' quarters; C O, commanding officer's quarters; P, work-shops; Q, quartermaster store-house; S, company stables; B S, band stable; T, guard-house; 1, men's sinks; 2, cow-house; 3, dead-house.

The sutler's establishment is badly placed, and the position of the laundresses' quarters would probably be found not satisfactory.

With reference to the brief summary statement of prevalence of certain classes of diseases subjoined to the description of each post, it may be remarked that they are made up from the monthly reports of sick and wounded, and that they do not include accidents and injuries, or the mortality therefrom. They do not, in some cases, give a fair idea of the relative healthfulness of the posts, for, on account of movement of troops, a large amount of some particular disease may be reported which has been contracted elsewhere.

In the necessarily brief and hasty examination made of these reports, I have been impressed with the value of what may be termed the "personal equation" of a medical officer, in attempting to draw conclusions from his reports.

When, at the same post and with the same troops, the accession of a new medical officer is followed by a marked increase or diminution of the number taken on sick report, or by a marked change in the nomenclature of diseases reported, while the general condition of, and the relative mortality at, the post remains the same, it seems fair to presume that the change is due more to the doctor than to any other cause.

When a new physician arrives at a post the number "taken sick" usually increases at first, as those disposed to shirk duty, and the minor chronic cases, will usually wish to try the new surgeon; but, after this temporary increase passes off, it is found that the ratio of sickness may vary as much as 40 per cent, depending on the physician. As this same cause of error must exist, more or less, in all medical statistics, but is seldom thought of, and, indeed, can only be determined under such circumstances as exist in the Army, I have thought it worth mentioning.

The following table shows the ratio per 1,000 of mean strength, of sickness, and

mortality, (accidents and injuries excluded,) by departments, for the calendar years 1868 and 1869:

Departments.	Years.	Mean strength.	Ratio per 1,000 of mean strength.							
			Of number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.	Deaths.
Department of the East.....	1868	5648.09	2119.29	293.37	377.11	165.54	107.82	5.66	299.56	4.42
	1869	4575.20	2105.91	315.83	353.86	158.68	100.32	4.76	306.87	3.93
Department of the Lakes	1868	1082.38	2605.32	465.63	384.33	153.27	244.82	6.46	367.70	7.34
	1869	986.55	2053.51	518.95	237.17	164.20	211.83	9.12	249.34	7.09
Department of the South.....	1868	2241.48	2410.20	776.33	396.19	218.17	117.34	10.70	177.58	13.34
	1869	1894.12	1854.17	381.71	365.87	205.37	101.89	6.33	212.76	17.42
Department of Texas	1868	4974.71	2394.31	969.30	417.71	121.61	95.48	8.64	130.25	13.06
	1869	5173.67	1868.10	648.27	337.08	134.13	95.48	7.53	125.82	8.89
Department of Missouri.....	1868	5678.95	1435.81	300.75	322.41	128.36	78.35	5.63	173.79	8.27
	1869	5065.20	1234.50	449.53	271.26	97.33	62.38	4.34	143.92	8.09
Department of the Platte	1868	3355.19	1491.11	181.21	304.89	20.59	108.49	4.17	270.62	8.64
	1869	2883.63	1442.29	236.50	197.32	48.20	108.89	3.81	284.36	5.89
Department of Dakota.....	1868	2622.13	1596.43	64.07	275.73	91.14	107.16	4.19	247.05	4.19
	1869	1791.03	1556.11	99.94	252.92	122.27	88.77	2.79	352.87	3.35
Department of Columbia.....	1868	1175.16	1699.30	122.53	283.35	78.28	97.00	1.70	273.99	.....
	1869	970.17	1708.92	91.72	284.47	97.91	147.39	2.06	270.04	2.06
Department of California	1868	1672.79	1708.51	194.28	257.05	184.72	164.99	8.96	242.70	7.17
	1869	1645.38	1578.33	218.79	210.28	238.84	153.76	10.33	224.86	4.86
Department of Arizona	1868	1327.36	3550.54	2090.55	482.89	132.59	119.78	10.54	168.75	15.06
	1869	1538.24	2353.40	1172.79	349.75	100.76	97.51	3.90	137.82	5.85

To furnish means of comparing the present ratio of mortality in the United States Army with that of former years and of other services, the following tables have been prepared:

TABLE A.

Showing ratio per 1,000 of mortality in the United States Army as compared with the United States Navy and the military service of other countries, and with civil life.

Service or locality.	Years.	Deaths from diseases.	Deaths from epidemics.	Deaths from injuries.	Total.	Remarks.
United States Army.....	1840 to 1845 ¹	22.42	1.38	1.03	24.84	White troops.
	1850 to 1855 ¹	19.05	8.32	2.46	29.86	
	1855 to 1860 ²	13.28	4.14	1.99	19.43	
	Year ending July 1, 1867 ³	19.56	17.58	3.77	40.92	

¹ Medical Statistics United States Army, by R. H. Coolidge, Assistant Surgeon United States Army, 1856, page 488.

² Medical Statistics United States Army, by R. H. Coolidge, Assistant Surgeon United States Army, 1869, page 322.

³ Surgeon General's Report for the year 1867.

Table A, showing ratio per 1,000 of mortality of the United States Army, &c.—Continued.

Service or locality.	Years.	Deaths from diseases.	Deaths from epidemics.	Deaths from injuries.	Total.	Remarks.
United States Army—continued..	Year ending July 1, 1867 ¹	38.32	81.68	.....	120.00	Colored troops.
	Year ending July 1, 1868 ²	13.45	12.50	3.93	29.89	White troops.
	Year ending July 1, 1868 ³	26.81	23.87	5.44	56.13	Colored troops.
	Year ending July 1, 1869 ³	9.83	.05	2.96	12.84	White troops.
	Year ending July 1, 1869 ³	12.66	.....	4.92	17.59	Colored troops.
	Year ending July 1, 1870 ³	7.95	.62	4.30	12.88	White troops.
	Year ending July 1, 1870 ³	14.96	.....	4.40	19.37	Colored troops.
United States Navy.....	1856 and 1857 ³.....	.....	.....	.....	11.53	
	Fiscal year 1866 ⁴	18.76	1.58	3.26	23.58	
	Fiscal year 1867 ⁴	14.92	6.00	2.61	23.53	
	Fiscal year 1868 ⁴	10.86	16.20	4.86	31.93	
	Fiscal year 1869 ⁴	9.23	.92	1.76	11.92	
English navy.....	1856 and 1860 ⁵.....	.....	.....	.....	22.65	
	1866 ⁶	7.05	.88	2.34	10.28	
	1867 ⁷	10.11	.11	1.28	11.50	
	1868 ⁸	6.30	.23	2.44	8.98	
English army.....	1837 to 1846 ⁹.....	.....	.....	.....	15.75	United Kingdom.
	1837 to 1856 ⁹.....	.....	.....	.....	17.2	Canada.
	1837 to 1856 ⁹.....	.....	.....	.....	12.9	Gibraltar.
	1838 to 1856 ⁹.....	.....	.....	.....	60.9*	Bombay.
	1837 to 1855 ⁹.....	.....	.....	.....	60.8	Jamaica, white.
	1837 to 1855 ⁹.....	.....	.....	.....	32.2	Jamaica, black.
	1860, 1861, and 1862 ¹⁰	8.43	.....	.87	9.30	United Kingdom.
	1860, 1861, and 1862 ¹⁰	6.83	.....	2.54	9.37	Canada.
	1860, 1861, and 1862 ¹⁰	8.16	.....	1.03	9.19	Gibraltar.
	1860, 1861, and 1862 ¹⁰	20.03	11.14	1.21	32.38	East Indies.
	1860, 1861, and 1862 ¹⁰	13.07	.....	1.08	14.15	Jamaica, white.
	1860, 1861, and 1862 ¹⁰	23.97	.....	2.80	26.77	Jamaica, black.
	1867 and 1868 ¹¹	9.00	.....	1.15	10.15	United Kingdom.
	1867 and 1868 ¹¹	7.99	.....	2.11	10.10	Canada.
	1867 and 1868 ¹¹	6.97	.....	1.09	8.06	Gibraltar.
	1867 and 1868 ¹¹	19.62	2.63	3.03	25.28	East Indies.
	1867 and 1868 ¹¹	11.77	12.05†	.94	24.76	West Indies, white.
	1867 and 1868 ¹¹	20.74	.....	2.91	23.65	West Indies, black.
	1846 and 1848 ¹².....	.....	.....	.....	19.4	Home service.
	1846 and 1848 ¹².....	.....	.....	.....	46.7	In Algeria.
	1863 and 1864 ¹²	8.17	.....	.95	9.11	Home service.
	1863 and 1864 ¹²	15.86	.....	1.19	17.06	In Algeria.
French army.....	1846 and 1848 ¹².....	.....	.....	.....	19.4	Home service.
	1846 and 1848 ¹².....	.....	.....	.....	46.7	In Algeria.
	1863 and 1864 ¹²	8.17	.....	.95	9.11	Home service.
	1863 and 1864 ¹²	15.86	.....	1.19	17.06	In Algeria.

¹ Surgeon General's Report for the year 1867.² Surgeon General's Reports for the years 1868, 1869, and 1870.³ 1856: Ex. Doc., 1st session, 35th Congress, volume 2, part 3, page 929; 1857: Ex. Doc., 2d session, 35th Congress, volume 2, part 4, page 673.⁴ Data furnished by Surgeon William M. Wood, Chief of the Bureau of Medicine and Surgery, United States Navy.⁵ British and Foreign Medical Chirurgical Review, volume 33, 1864, page 456.⁶ Statistical Report of English Navy, 1866, page 406.⁷ Statistical Report of English Navy, 1867, page 384.⁸ Statistical Report of English Navy, 1868, page 370.⁹ English Army Statistical, Sanitary, and Medical Report for 1860. London, 1862. Page 133.¹⁰ English Army Medical Department Report for 1860, page 142; 1861, page 137; 1862, page 135.¹¹ English Army Medical Department Report for 1867, page 450; 1868, page 386.¹² Boudin. Traité de Géographie et de Statistique Médicale. Paris, 1857. Volume 2, page 151.¹³ Statistique Médicale de l'Armée pendant l'Année, 1863, page 278; 1864, page 272.

* Exclusive of those killed in battle.

† The only epidemic noted among British troops in the West Indies during 1867-'68 occurred in Jamaica during 1867, giving a mortality of 48.22 per 1,000.

Table A, showing ratio per 1,000 of mortality in the United States Army, &c.—Continued.

Service or locality.	Years.	Deaths from diseases.	Deaths from epidemics.	Deaths from injuries.	Total.	Remarks.
French army— <i>Continued.</i>	1866 ¹	9.24	.....	1.04	10.28	Home service.
	1866 ¹	10.46	.....	1.49	11.95	In Algeria.
Prussian army.....	1857 and 1859 ².....	.....	.....	.....	8.28	
	1860 and 1862 ².....	.....	.....	.....	6.03	
Austrian army.....	1850 and 1860 ³.....	.....	.....	.....	17.5	
Russian army.....	1862 and 1863 ⁴.....	.....	.....	.....	14.2	
Italian army.....	1867 ⁵	7.25	1.14	.44	8.84	
	1868 ⁵	7.76	.004	.38	8.15	
	1869 ⁵	7.02	.....	.40	7.42	
Portland, Maine, and vicinity, including Falmouth, Pownal, and Philippi.....	Year ending May 31, 1870 ⁶	7.15	.52	1.04	8.72	} Males at soldiers ages.
Richmond, Virginia.....	.....do.....do.....do.....	14.54	.....	2.71	17.26	
Key West and Dry Tortugas, Florida.....	.....do.....do.....do.....	15.08	26.39	2.26	43.74	
Springfield City and township, Illinois.....	.....do.....do.....do.....	3.07	.....	.71	3.78	
Leavenworth City and Fort, Kansas.....	.....do.....do.....do.....	8.35	.....	1.29	9.65	
Buffalo, New York.....	.....do.....do.....do.....	8.10	.05	.78	8.94	
Baton Rouge, Louisiana.....	.....do.....do.....do.....	6.60	.....	3.67	10.27	
Galveston, Texas.....	.....do.....do.....do.....	21.86	.....	1.74	23.61	
Sacramento City and County, California.....	.....do.....do.....do.....	7.64	.....	1.32	8.97	
Portland and vicinity, Oregon.....	.....do.....do.....do.....	6.43	.....	2.23	8.67	

¹ Statistique Médicale de l'Armée pendant l'année, 1866, page 232.² Kirchner. Militär-Hygiene. Erlangen, 1869, page 430.³ Oesterlen. Handbuch der Medicinischen Statistik. Tübingen, 1865, page 239.⁴ Kirchner. Op. cit., page 443.⁵ Statistica Medica dell' Esercito Triennio, 1867-69. Firenze, 1870. Mean strength, 1867, 306,452; 1868, 216,501; 1869, 187,149.⁶ Data furnished by General F. A. Walker, Superintendent Ninth Census.

TABLE B.

Showing ratio per 1,000 of total mortality (exclusive of deaths from epidemics, accidents, and wounds) due to various classes of disease in the United States Army and Navy, the English army and navy, the French army, the Italian army, and in civil life.

Where serving.	Years.	Race.	Fevers.		Diarrhea and dysentery.	Hospital diseases.	Alcoholism.	Consumption.	Diseases of—						Drowning.	Suicide.
			Continued.	Malarial.					The nervous sys-tem.	The organs of cir-culation.	The organs of res-piration.	The organs of di-gestion.	The urinary and genital organs.			
United States Army :																
Calendar years	1840-'54	.....	55.18	108.02	324.46	5.47	59.09	104.89	49.70	8.21	78.27	55.57	4.30	.....	.....	7.43
Calendar years	1855-'59	.....	114.25	61.08	188.91	1.13	75.79	105.20	59.95	24.88	136.87	65.61	10.18	.....	.....	23.75
Fiscal year	1868	White.	126.08	94.20	181.15	5.79	34.78	89.85	85.50	23.18	104.34	104.34	23.18	.....	53.62	24.63
Fiscal year	1868	Colored	126.86	74.62	171.64	7.46	14.92	119.40	67.16	52.23	111.94	67.16	29.85	.....	44.77	.....
Fiscal year	1869	White.	137.61	140.67	177.37	18.34	48.92	134.55	134.55	42.80	107.03	70.33	33.63	.....	110.09	61.16
Fiscal year	1869	Colored	46.87	15.62	218.75	15.62	.....	203.12	78.12	46.87	31.25	62.50	46.87	.....	48.87	.....
Fiscal year	1870	White.	65.69	72.99	120.43	3.64	54.74	116.78	65.69	54.74	124.08	76.64	29.19	.....	98.54	51.09
Fiscal year	1870	Colored	115.38	38.46	250.00	.....	.....	173.07	19.42	76.92	250.00	57.69	.....	.....	.....	.....
United States Navy :																
Fiscal year	1866	.....	105.11	161.93	139.20	11.36	11.36	113.63	53.97	42.61	110.79	58.61	8.52	.....	93.75	.....
Fiscal year	1867	.....	80.18	113.20	80.18	4.71	23.58	155.66	94.33	47.16	141.50	47.16	33.01	.....	84.90	.....
Fiscal year	1868	.....	62.50	91.34	43.26	9.61	24.03	144.23	43.26	57.69	153.84	43.26	24.03	.....	206.73	.....
Fiscal year	1869	.....	50.72	623.18	79.71	.....	36.23	202.89	72.46	50.72	123.18	36.23	28.98	.....	130.43	.....
English army :																
United Kingdom.....	1860-'62	.....	57.26	2.36	9.46	6.15	15.14	320.90	67.20	79.50	162.32	47.32	12.30	.....	35.02	26.50
Canada.....	1860-'62	.....	64.00	16.00	.....	8.00	72.00	128.00	88.00	88.00	160.00	56.00	16.00	.....	200.00	32.00
Gibraltar.....	1860-'62	.....	415.84	39.60	29.70	9.90	29.70	79.20	29.70	118.81	9.90	29.70	39.60	.....	29.70	49.50
Bombay.....	1860-'62	.....	92.50	121.21	252.52	.....	23.56	55.55	102.69	25.25	50.50	188.55	1.68	.....	21.88	18.51
Jamaica.....	1860-'62	White.	272.72	181.81	45.45	.....	90.90	136.36	.....	90.90	.....	90.90	.....	.....	.....	90.90
Jamaica.....	1860-'62	Black.	.....	70.17	35.08	.....	.....	175.43	105.26	35.08	263.15	122.80	.....	.....	.....	35.08
United Kingdom.....	1867-'68	.....	68.20	1.77	13.28	6.20	18.60	323.29	76.17	175.37	118.68	69.08	24.80	.....	34.54	33.65
Canada.....	1867-'68	.....	83.76	.....	5.23	15.70	52.35	167.53	68.06	151.83	167.53	52.35	10.47	.....	104.71	57.59

REPORT ON BARRACKS AND HOSPITALS.

XXXI

[illegible]

Miasmatic fever only.

* Typhoid fever and miliary.

NOTE.—The data for Table B relative to the United States Army for the years 1868, 1869, and 1870, are furnished by Assistant Surgeon J. J. Woodward, United States Army, of this office. The remaining figures are from the several sources indicated in the foot-notes to Table A. In Table B, under the heading "hospital diseases," are included erysipelas, pyemia, and hospital gangrene. Under the heading "alcoholism" are included delirium tremens, intemperance, and chronic alcoholism.

It will be seen from these tables that, while the mortality rate of our Army for the past two years has been low, as compared with that of former periods, or of other services, it still remains higher than that of men of the same ages in civil life. The reverse of this should be the case were the sanitary condition of the soldier as good as that of the civilian; for it must be remembered that the former is selected for health and strength, and that the mortality of the Army is diminished by the discharge of men affected with consumption, &c., while the relative mortality in civil life is correspondingly increased.

The mortality from disease (excluding epidemics) in the United States Army, for the last three years, is probably 50 per cent greater than it should be; in other words, it has been increased to that extent by causes which might have been obviated.

The bad sanitary condition of barracks is one of the more important of these causes, and gives rise more especially to continued fevers, diseases of the respiratory organs, and tuberculous affections. Within the last year the result of the reduction of the Army, and the consequent diminution of overcrowding, has been to markedly decrease the mortality from these diseases among white troops.

It has been said that we have the best-fed and the worst-housed Army in the world, and the statement seems more nearly correct than such generalizations usually are. The ultimate cause of the defect is, of course, ignorance, the immediate cause being a desire for economy, praiseworthy in itself, but producing results which are the reverse of its object; for a saving in boards and bricks, at the expense of the health and life of the soldier, cannot be considered a commendable thrift. When a man enlists as a soldier it is with the understanding, expressed or implied, that, as his food, clothing, and dwelling place are to be regulated by others, they shall be selected, so far as possible, with reference to his health and comfort. It is clearly both the duty and the interest of the Government to reduce, as much as possible, the annual loss to the Army from sickness, invaliding, desertion, and death; and this can only be effected by a judicious application of the laws of sanitary science.

Many of the evils in the plan and construction of our Army buildings have long since been pointed out by medical officers, and continue to exist in spite of their remonstrances; but, as the subject of hygiene is not officially and necessarily a subject of daily consideration, as it should be, the surgeon does not have the motive to bestow that amount of study and labor upon it which must be given if good results are to be attained. The point is clearly stated by the Barrack Commission:

There being no regulation on these subjects, it naturally follows that the degree of respect shown medical opinions on matters affecting the health of the troops, whether concerning personal hygiene, such as food and clothing, or the larger and more difficult subjects of barracks, hospitals, or camps, depends solely on the good sense and capacity of the officer in command, and on the tact and ability of the medical adviser. If the commanding officer be inexperienced and not sufficiently well informed to be conscious of his ignorance in such matters, he does not ask for the opinion of the medical officer, and considers it intrusive if offered. On the other hand, the best and most experienced officers in the service, knowing the value of such advice and assistance, never failed to seek it and to be guided by it, unless, indeed, the estimate which they may have formed of the knowledge and good sense of the medical officer be such as not to inspire confidence in his opinion.

But if, in such a case as that supposed, it is for the interest of the service that an opinion should be tendered, it must not be allowed to depend on the character and disposition either of the command-

ing officer or the medical officer, whether the opinion on which the lives of men may depend should be asked or offered. The duty and the responsibility of both should be defined by regulation. The medical officer should be made to feel that, charged as he is with the care of the troops in health, as well as with their treatment in sickness, he is responsible for any act or any omission which his advice or warning would have prevented; and the commanding officer should be made to feel that he is responsible for disregarding that warning or overruling that advice, and should have sound reasons to show for the course taken.—(Report of the Commissioners for the Organization of Military Hospitals, page 19. London, 1858.)

The defects in the plan of a barrack are often so far compensated by faulty construction that evil results are not apparent; and the very cracks and crevices in roofs, walls, or floors, which are so often complained of, may explain why destructive lung affections or fevers have not attended overcrowding to a greater degree than they have done.

Hesitation in making or forwarding requests for new buildings, or for repairs involving much expense, is perfectly natural; and it is not to be wondered at that, sometimes, by reason of successive reductions in the estimates and amount recommended to be authorized for expenditure, a proposed reform is practically denied, although such may not have been the wish or intention of any one of the several officers through whose hands the request has passed.

In consideration of the great importance of proper post and barrack construction, and in order to consult the different interests involved, it would probably be expedient that this subject should be referred to a competent board of Army officers of the Engineer's, Quartermaster's and Medical Departments and of the Line, for the preparation of plans and regulations for the approval of the Honorable Secretary of War.

Very respectfully, your obedient servant,

JOHN S. BILLINGS,

Assistant Surgeon United States Army.

DESCRIPTIONS OF MILITARY POSTS.

DEPARTMENT OF THE EAST.

POSTS DESCRIBED.

Fort Sullivan, Eastport, Maine.
Fort Preble, Portland, Maine.
Fort Warren, Boston Harbor, Massachusetts.
Fort Independence, Boston Harbor, Massachusetts.
Fort Adams, Newport, Rhode Island.
Fort Trumbull, New London, Connecticut.
Fort Columbus, Governor's Island, New York Harbor.
Fort Wadsworth, Staten Island, New York.
Fort Hamilton, Long Island, New York.
Fort Wood, Bedloe's Island, New York Harbor.
Fort Schuyler, Throgg's Point, New York Harbor.
Willet's Point, Long Island, New York.

West Point, United States Military Academy, New York.
Plattsburg Barracks, Plattsburg, New York.
Fort Delaware, Delaware.
Carlisle Barracks, Carlisle, Pennsylvania.
Fort McHenry, Baltimore, Maryland.
Fort Whipple, Virginia.
Fort Foote, Maryland.
Fort Washington, Maryland.
Fortress Monroe, Virginia.
Fort Johnston, Smithville, North Carolina.
Raleigh, North Carolina.

FORT SULLIVAN, EASTPORT, MAINE.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEON H. C. FESSENDEN, UNITED STATES ARMY,
AND ASSISTANT SURGEON J. W. WILLIAMS, UNITED STATES ARMY.

Fort Sullivan, the most eastern post in the United States, and the most northern on the Atlantic coast, is located on Moose Island, Passamaquoddy Bay, in the town of Eastport, Maine, latitude $44^{\circ} 54'$ north, longitude $60^{\circ} 56'$ west from Greenwich.

The island is about four miles long by two wide; the surface is rocky and sterile.

The fort is on a rocky eminence on the southeastern side of the island, about 150 feet above tide-water, and overlooks the village, the harbor, the adjacent islands of the province of New Brunswick, and the mouth of the Saint Croix River. The amount of reservation is about nine acres.

Troops were first stationed here in the spring of 1808, and the fort was built during the same year, probably as a precautionary measure in view of the dispute then existing concerning the eastern boundary of the United States. In July, 1814, a fleet of ten armed vessels belonging to the British navy entered the harbor. The fort was surrendered, and, with the town, remained in British possession until formally surrendered to the United States, on the 30th of June, 1818.

The rock of the vicinity is a porphyritic metalliferous trap. On the mainland south and west, in the towns of Trescott and Lubec, are mines of iron and lead, and on the neighboring islands copper mining has been carried on. The lead ore is argentiferous, containing from \$10 to \$50 worth of silver to the ton.

The climate is damp, and fogs are frequent in the earlier summer months. The winters are cold, and the variations in temperature are often sudden. Average temperature, about 43° F.; extremes, 94° and 19° .

The buildings are on three sides of the parade, which slopes from west to east, and although for the most part old, are in good repair.

The barrack is a frame building of one story and an attic, 94 by 21 feet, and divided into three rooms: No. 1, 28 by 20, by 10 feet high, occupied by twelve men, giving 467 feet air space per man; No. 2, of the same dimensions, containing twenty men, giving 280 feet per man, and No. 3, 35 by 20 by 10 feet, occupied by twenty men.

Each of these rooms has two or three windows in front, and an aperture 2 by 3 feet in the ceiling communicating with a similar opening in the roof. The bunks are of wood, and double.

The mess-hall communicates with room No. 3, and a bath-room containing six tubs is at the corner of the building.

The laundresses and married soldiers occupy as quarters two one-story frame buildings, which are divided into four tenements each.

Two buildings are occupied as quarters for officers—one, an independent building, is the residence of the post commandant; the other is occupied by the remaining officers. Both are wooden framed structures, of a plain, cheap character. The commandant's residence is one story; the other building is of two stories, and is divided into four tenements. These quarters are supplied with water from a well located between the two buildings, and from a reservoir. There are no water-closets or bath-rooms.

The guard-house is southeast of the hospital, 30 by 25 by 10 feet, divided into one room for the guard and four cells. The guard-room is 29 by 16 by 10 feet; cubic capacity, 4,640 feet; has two windows, 5 by 3 feet each, one in front and one in southeast face; one door in front, 6 by 3 feet, and two communicating with cells. The large cell is 18 by 9 by 10 feet; cubic capacity, 1,620 feet; ventilated by a grated window, 2 by 2 feet, in southeast face. The small cells, three in number, are 3 by 7 by 10 feet each; cubic capacity, 210 feet; ventilated by a small grating, one foot square, in the door.

The guard-room communicates with these cells through a passage-way 10 by 2 feet; average occupancy, twenty-five for the six months commencing January 1, 1870. Not more than one man has been put into a small cell at a time, and then but for a few hours.

The hospital, erected in 1808, located at the northeast corner of the parade ground, fronting the south, is a wooden framed building, 55 feet in length by 20 feet in breadth, and two stories high. A hall 7 feet wide runs through the center. The basement is low and damp, and contains the dispensary, office, kitchen, mess-room, and two small bedrooms.

The second story contains two large rooms, the one on the eastern side occupied by the steward, and that on the western side as a ward-room. The hospital is warmed by stoves, and ventilated imperfectly through the roof.

The ward-room has a capacity of six beds, giving 624 feet air space per man. No bath-room, water-closet, or dead-house is connected with the hospital, and, owing to the very limited number of patients, no special provision is made for the storage of baggage.

The post bakery and school-house have been erected within two years, and are in good repair. The stables, located east of the parade-ground, are also recently constructed buildings, and well adapted to their purpose.

The library is kept in a well-lighted room over the officers' office, a wooden framed building of two stories, on the north side of the parade-ground. The library contains about 120 volumes of science, history, and fiction. The post is supplied with water from a well about 40 feet in depth, sunk in the ledge near the commandant's quarters, and from a reservoir on the northern side of the parade-ground. The well affords an abundant supply of very fine water, and never fails. The reservoir does not fail except in a continued summer drought, which very rarely happens. Means of extinguishing fire at the post consist of a fire-engine and buckets.

The drainage is all that could be desired. There are no stagnant waters and no cess-pools to infect the air at any season.

There are no gardens at the post. Spare land is devoted to the cultivation of turnips and potatoes by the soldiers. Rations are of good quality and ample quantity; the vicinity affords as great a variety of food as can be procured anywhere in the United States.

During the winter weekly communication is had by steamboat with Portland, Maine, and Boston, Massachusetts; during the summer there is tri-weekly communication with the same cities by boat. The nearest railroad station is Calais on the River Saint Croix, 30 miles north of Fort Sullivan. Steamboats communicate between the post and Calais during the summer months and until the Saint Croix is closed by ice, after which time daily stages take the place of boats. There is a daily mail by land transportation and one by every steamboat; ordinarily they go and come with great regularity, though occasionally in the winter time blocking snow-storms have delayed mails for several days. It usually requires from three to four days to transport a letter from this place to New York City and Washington.

The prevailing diseases have been bronchial and rheumatic affections, owing to the general coldness and humidity of the atmosphere. Pulmonary and bowel diseases are more rare than in most parts of New England; but rheumatism, particularly of a chronic character, prevails extensively.

The population in the vicinity numbers from 3,000 to 3,500. Number of guard posts, 1. Amusements of soldiers are cards, checkers, billiards, ball playing, and velocipede riding.

Statement showing mean strength, number of sick, and principal diseases, at Fort Sullivan, Maine, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Diphtheria.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.	Remarks.
1868.....	79.66	60	3	10	1	11	3	1	11	1	The death reported was a case of bronchitis.
1869.....	37.91	29	6	8	1	.....	5	.....	4	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT PREBLE, PORTLAND HARBOR, MAINE.

REPORTS OF ASSISTANT SURGEON E. COWLES, UNITED STATES ARMY, AND ACTING ASSISTANT SURGEON SIMON FITCH, UNITED STATES ARMY.

Fort Preble is situated on a small peninsula called Spring Point, on the south side of the harbor of Portland, Maine, and distant about one mile from that city. Latitude $45^{\circ} 38' 55''$; longitude $70^{\circ} 13' 18''$. The fort was first established in 1808, and then consisted of a small barbette battery, with brick scarp wall, with wooden buildings for quarters. The reservation contains about $5\frac{1}{2}$ acres. The rock upon which the fort is placed is a talcose schist slate, the highest point being about 38 feet above the sea. The natural drainage is perfect, and the supply of water, from a spring and two wells, is abundant and of good quality. Average temperature, $40^{\circ} 68' \text{ F.}$; maximum, 80° F. ; minimum, 2° F.

The barracks for troops are four two-story wooden buildings, with cellar or basement, each being 52 by $37\frac{1}{2}$ feet. The basements are used for post bakery, furnace-rooms, coal-rooms, &c. On the first floor are four rooms—mess-room, 33 by 17 feet; dormitory, 34 by 17 feet, and two office rooms. On the second floor are three dormitories, two measuring 33 by 17 feet, and the third 34 by 17 feet. The height of rooms on the first floor is 10 feet 10 inches; on the second floor, 9 feet 8 inches. Each dormitory is lighted by three windows, and is intended to contain twelve beds, which would give an average of 475 cubic feet air space per man. But one barrack is now occupied for dormitories.

The barracks are warmed by furnaces. In each of the upper dormitories an opening 8 by 12 inches and 7 feet from the floor, communicating with an air shaft in the chimney, furnishes the only special means of ventilation. The beds are low single bunks formed of boards on movable iron supports. A small room in an unoccupied barrack is used as a bath-room, having two bathtubs and a large caldron for heating water.

The sinks for the men are built over tide-water, and are arranged in stalls, each for one man, and instead of having a seat, or bar, an opening is cut in the floor 20 inches long, 5 inches wide behind and 2 inches wide in front. This form of water-closet has proved very satisfactory. The quarters for married soldiers are two frame houses in good condition.

The guard-house is a one-story wooden building, 43 by 31 feet, and contains the guard-room, 17 by 15 feet; two prison-rooms, 14 feet 10 inches by 15 feet, and 18 feet 4 inches by 7 feet 4 inches; and five cells, each 7 feet 10 inches by 3 feet 10 inches. The height of all these rooms is 12 feet 3 inches. There are two windows, 4 feet 4 inches by 2 feet 6 inches, in each of the prison rooms

and in the guard-room; none in the cells, and no special means of ventilation. Cubic air space per cell is about 370 feet.

The officers' quarters are four frame cottages of one story, with cellars and attics, and with verandas in front. They are heated by stoves, lighted by lamps or candles, and have no bath-rooms. Each building contains four rooms, with two small rooms for kitchens, &c.

The hospital is a two-story frame building, 62 by 40½ feet, with basement and attic. The kitchen and laundry are in the basement. On the first floor are two wards, each 25½ by 19 feet, and 11½ feet high. The second floor contains four wards, 25½ by 19 and 7½ feet. There is one small ventilator in each upper ward only, opening in the outer wall; it is 10 inches in diameter, and communicates by a tin flue with the outer air. The capacity of the wards is reckoned at eight beds each, giving 706½ cubic feet per man. Only one ward is usually used, containing four beds. There are wash and bath-rooms and water-closets for both first and second floors.

The post library contains about 350 volumes, and receives the principal periodicals.

The natural drainage is good, all surface water passing rapidly into the sea.

The sanitary condition of the post is good, and the general police is excellent.

There are no prevailing diseases.

Statement showing mean strength, number of sick, and principal diseases, at Fort Preble, Maine, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	Number of deaths.
1868.....	76.91	181	7	16	5	24	20	38	.....
1869.....	35.41	80	1	8	.....	9	6	26	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WARREN, BOSTON HARBOR, MASSACHUSETTS.

REPORT OF ASSISTANT SURGEON J. H. KINSMAN, UNITED STATES ARMY.

Fort Warren is situated at the mouth of Boston harbor, Massachusetts, in latitude 42° 19' 30"; longitude 70° 57' 6," on George's Island, seven and one-quarter miles east-southeast of Boston; five miles east-southeast of Fort Independence and Fort Winthrop. The height of the parade above the sea is 38 feet.

The first attempt at fortifying the island was made in the autumn of 1778, by throwing up an earthwork on its eastern extremity for the protection of vessels entering the harbor against English cruisers hovering in the neighborhood. The present fort was commenced in 1837, and was first occupied by troops in November, 1861. During the war of the rebellion, besides being garrisoned as a fort, it was used as a prison for confederates.

The island is an irregular oval, the longest axis being 1,800 feet, the shortest 1,200 feet, and contains about 28 acres. It originally consisted of two hills, which were leveled for the building of the fort, and the only land at present not thus occupied is a few acres on the northwest and southwest points of the island. This space is used as a post garden, and for the accommodation of the engineer building, laundresses' quarters, and stables.

The geological formation of the island is diluvium; of the surrounding country, argillaceous slate, conglomerate, and diluvium. The soil is moderately fertile.

The mean monthly temperature for 1869 was 47° F. The hottest day, July 4th, the thermometer indicated 77° , and the coldest day was January 22, 9° . The amount of rain-fall during the year was 34.07 inches. The amount of snow is not taken, it being drifted so much by the wind that in a circle of 100 feet the depth sometimes varies from nothing to 10 or 12 feet. The average monthly dew-point for 1869 was 44. The northwest winds prevail. These, with the west winds during the winter, are the cold, dry winds; and during the summer they are the warm, dry winds. The south-west, south, and southeast winds, during both winter and summer, are the warm, damp winds, bringing rain. The east and northeast winds bring with them violent storms of snow in winter, and rain in summer, which have a general duration of two or three days. A true north wind is comparatively rare.

The winter season is generally long and rigorous, lasting from the 1st of November till the middle of April. Spring commences and autumn ends abruptly. Summer is short, its extreme heat rarely comprising more than twelve or fifteen days in all, occurring in groups of two or three. In comparison with the temperature of the city of Boston, the heat is about 10° or 12° less in summer, and the cold the same amount less in winter.

Although the prevailing winds of summer are westerly, the heat is much mitigated by the frequent occurrence of winds from the east, which often spring up early in the afternoon, and last, unaccompanied by rain, for five or six hours. These winds are piercing and chilly, so that a linen coat at 10 o'clock may be comfortably replaced by a thin overcoat at 3 or 4 o'clock in the afternoon.

The fort is built of granite, and contains about 18 acres. The casemates are used as quarters, averaging in dimension 30 by 18 by 15 feet, with hard-finished walls and floors of concrete, covered with hard pine, accommodating nine men to each. The casemates are warmed by stoves, and lighted and ventilated by three embrasures looking outward and two windows looking upon the parade.

The beds are single iron bunks, with the usual bedding. A water-closet for winter use is within the fort—the excreta passing into the main sewer running under the ditch. It requires to be flushed with water every day, and is inadequate to the wants of the command, the arrangement being very imperfect, and it is only used when the weather is too inclement to make use of the summer water-closet, which is a wooden building outside the fort upon the sea-wall, overhanging the water.

Three of the casemates are used as kitchens and mess-rooms combined; they are well furnished and adapted for the purpose.

The quarters for laundresses and married soldiers consist of three wooden buildings outside the fort. They are one story high, 175 feet long, 25 feet broad, and divided into 5 sets of quarters, each containing about four rooms. They are mere shells of the most ordinary description.

The officers' quarters are the casemates forming the northwest side of the fort. They are hard-finished, with plain white walls, and comprise twelve sets of one story, with basements below the level of the parade, and two sets of one story without basements. The number of rooms to a set is either four or six. The average size of the rooms is 16 by 18 feet. The two sets without basements are single sets, and contain each four rooms. Two of the sets contain six rooms, including basements. All the quarters with basements, except one set, are double sets, having a common entrance, but separated by a wall running from front to back. They are heated by grates, and lighted by embrasures on one side and by windows looking upon the parade on the other, which also afford ventilation. Water is supplied from a pump in the kitchen, leading to a cistern below each set of quarters. A water-closet and bath-room is in common for each double set of quarters, and is situated at the end of the hall which separates the quarters. The two single quarters have water-closets, but no bath-rooms.

The offices and storehouses are in casemates, principally in the north bastion of the fort.

The guard-house is of stone, at the entrance of the road leading to the sally-port, between the cover-face and the wall of the fort. It is one story high, 40 by 18 feet, and contains two rooms and a hall. The building is warmed by stoves, and ventilated principally by windows. It is not any too large for the exclusive use of the guard, and it ought not to contain prisoners.

The hospital is situated in casemates on the western side of the fort, and is contained in a space of 202 by 39 feet. The walls are hard-finished, and the floor is of hard pine. The rooms are

warmed by grates and stoves, and ventilated by windows and embrasures and by tubes passing up from the ceilings. The arrangement and division of the space are shown in Fig. 1. The

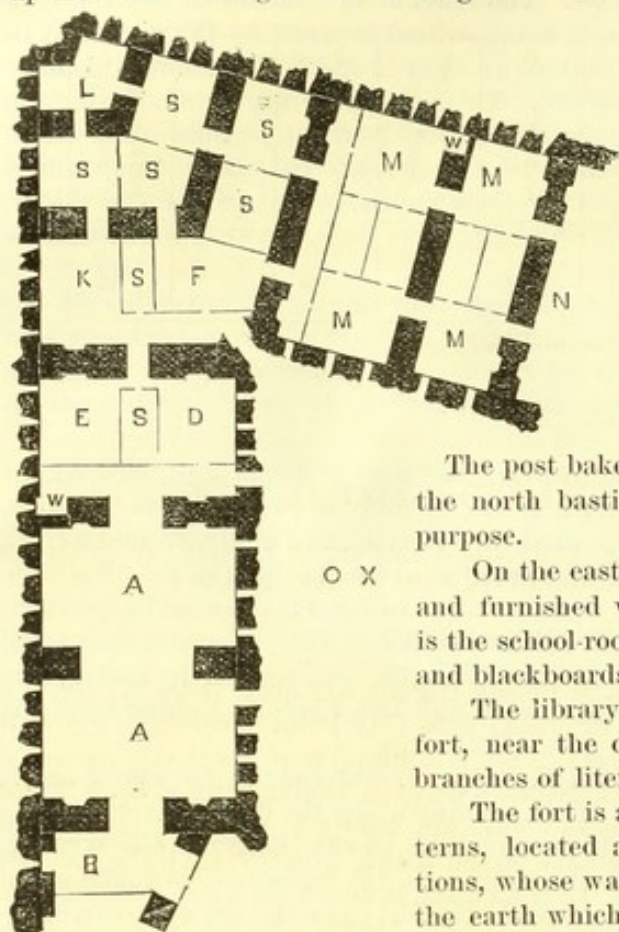


Fig. 1.

a large cistern; a well and two cisterns are situated near the middle of the parade; and in each of three of the bastions is a well and pump. There are also several wells located outside of the fort. Although the water contains a considerable amount of lime and soda salts, the quality is good. In case of fire at the post, the only available means of water supply would be the pumps.

The drainage of the fort, which is entirely artificial, is effected by drains and sewers constructed of masonry, which run in all necessary directions beneath the parade, and, extending under the ditch, discharge into the sea.

In summer the men bathe in the sea, but there are no special arrangements providing bathing accommodations for them within the fort.

The post garden contains about one and a half acres of ground, which is cultivated by a detail from the command. The following articles and quantities were produced in 1869: 80 bushels potatoes, 71 bushels beets, 75 bushels tomatoes, 14 bushels green peas, 16½ bushels green beans, 146 bushels turnips, 650 heads cabbage, 4 barrels squash, 20 bushels green corn; parsley, radishes, and lettuce enough to supply the command.

The means of communication with Boston is the steam-tug General Humphreys, belonging to the engineer department, but under orders to call at the fort three times a week. It is regular in summer, but liable to occasional interruptions in winter from ice and violent storms.

The prevailing diseases during the past year have been rheumatism, pneumonia, and general affections of the air passages, due, probably, to the peculiarly sudden changes of temperature. There are no endemic malarial diseases at the post or in the vicinity.

massive lines represent stone; the fine lines, wooden partitions. A, wards, 39 by 25 feet; B, bath and wash-room; D, dispensary; E, steward's room; F, clothing room; K, kitchen; L, cook's room; M, surgeon's quarters; N, commanding officer's quarters; O, well; S, store-rooms; W, water-closet.

The ward is intended to contain thirty beds, giving to each a cubic air space of 1,226 feet. The bath-room contains a large sink with pump, and three bath-tubs. Hot water is furnished by a small perpendicular boiler in the coal-room. The ceiling of the hospital is arched, the height from the floor to the center being 16 feet 4 inches.

The post bakery is a casemate containing two ovens, situated in the north bastion. It is commodious, and well adapted for that purpose.

On the eastern side of the fort is a casemate used as a chapel and furnished with plain wooden benches. Adjoining the chapel is the school-room—also a casemate—and furnished with benches and blackboards.

The library is contained in a casemate on the east side of the fort, near the chapel. It comprises about 1,900 volumes of all branches of literature.

The fort is abundantly supplied with water from wells and cisterns, located at convenient points in and around the fortifications, whose water is supplied by the rain which percolates through the earth which covers the parapet. Beneath the parade are four wells and two large cisterns; beneath each set of quarters is also

Statement showing mean strength, number of sick, and principal diseases at Fort Warren, Boston, Massachusetts, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	Deaths.
1868.....	192.33	54	.....	.....	.....	15	3	6	.....
1869.....	140.33	101	1	8	4	13	5	29	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT INDEPENDENCE, BOSTON HARBOR, MASSACHUSETTS.

HISTORY BY SURGEON J. P. WRIGHT, UNITED STATES ARMY.—ACCOUNT OF THE POST BY SURGEON WRIGHT AND ASSISTANT SURGEON W. H. GARDNER, UNITED STATES ARMY.

LOCALITY AND HISTORY OF THE POST.

Fort Independence is situated on Castle Island, in Boston Harbor, and from India Wharf, in a southeast direction, is distant two miles and three furlongs; from City Point (Rochester Point) it is distant about 900 yards; and from Governor's Island, (Fort Winthrop,) from which it is separated by the main channel, 1,160 yards. The surface will measure perhaps twelve acres at high water but the dimensions of the island on the north, east, and west are known to have decreased prior to the erection of the sea walls. The southern extremity of the island, a level plain but a few feet above water-mark, embraces less than one-fourth of the island, and is doubtless a gift from the sea.

Fort Independence is the oldest fortified place in the United States. In the spring of 1634, and but four years subsequent to the incorporation of the town of Boston, Governor Winthrop, with the council ministry, visited the island, where they were detained by the ice, without shelter, a day and a night. So much pleased were these gentlemen with the commanding site of the place, that they each subscribed £5 towards the erection of two platforms and a fort, and in July following made a report to the legislature which induced that body to consent to the fortifying of the place. This first fort has been described as a "castle with mud walls;" the masonry was of lime made from oyster shells.

In 1644 the arrival of a French man-of-war in the harbor so alarmed the citizens of the province of Massachusetts, that the fort, which had gone to decay, was rebuilt at the expense of six neighboring towns. The fort was now constructed of pine trees, stone, and earth; it was 50 feet square inside, with walls 10 feet thick.

In 1665 the fort was repaired and enlarged, and furnished with a small castle with brick walls three stories high. There was a dwelling-room on the first floor; a lodging-room above; a gun-room over the latter, furnished with "six very good saker guns;" upon the roof were mounted three lesser guns. On the 15th of July, 1665, Captain Richard Davenport, the commanding officer, was killed by lightning in an apartment separate from the magazine only by a wooden partition; the powder was not exploded.

March 21, 1673, the fort was burned by accident; and in the year following a new fort of stone was erected with four bastions, and armed with thirty-eight guns and sixteen culverins; there was also a small water battery of six guns. This fort was built by an able engineer and was considered a strong work.

In the year 1689 the people of Boston, favoring the revolution in England, confined Sir Edmund Andross, the governor sent by King James, and took possession of the castle. Mr. John Fairweather was appointed commander, and succeeded Captain John Pipon, who delivered up the stores on the 19th of April.

The fort was probably first known under the appellation of "the Castle." During the administration of Sir William Phipps, who was appointed by King William in 1692, it was first called "Castle William." The Crown contributed about this time toward the erection of a citadel, and the furnishing of it with ordnance; the new bastions were long known by the names of the "Crown," the "Rose," the "Royal," and the "Elizabeth" bastions; the ordnance were twenty-four 9-pounders, twelve 24-pounders, eighteen 32-pounders and 48-pounders. This augmentation of strength was the more necessary, as a French invasion of the New England colonies was apprehended in 1697.

On the 19th of October, 1716, Lieutenant Governor William Dummer assumed command of Castle William, agreeably to orders from the Crown; it is thus evident that the King asserted his prerogative in the appointment of the commandant, and the general court, it is stated, felt much injured at the assumption.

A few years afterwards a complaint was made by the governor that the pay of the soldiers here stationed was less than that of the troops at the other provincial posts. It is true that the latter were exposed in the Indian wars to more hardships, but Castle William was then considered the first fort in British America, and the garrison was commanded by the second official in the government, who officially held the rank of a field officer. A storm in 1723 did great damage to the castle, the town, and also the light-house.

Boston light-house was first illuminated September 14, 1716. It was burnt and rebuilt in 1720; dismantled to distress the enemy during the revolutionary war, 1775; destroyed by the enemy in 1776; and was finally established in 1783. It is noteworthy that, though three times struck by lightning during the first forty years of its erection, it has enjoyed immunity since the introduction of electrical conductors.

On the 11th of September John Larrabee succeeded John Gray as lieutenant of Castle William. The lieutenant was the senior resident and had the immediate command of the fortress. After this date he was styled "captain lieutenant."

A committee of the general court visited Castle Island February 1, 1734, and on their report funds were supplied, and Lieutenant Governor Phipps, John Quincy, and Benjamin Bird were appointed to superintend the necessary repairs. Ten thousand pounds, (old tenor,) or \$4,444, were appropriated toward fortifying the town. William Barnsdell, who had for thirty years been governor of the Castle, died February 9, 1734.

During the year 1740, Castle William was again repaired in anticipation of a French war; a bastion, named in honor of the governor "Shirley Bastion," was constructed, and twenty 42-pounders mounted there.

The ordnance, presented by the King, arrived in 1744. A second magazine or arsenal was built in 1747, and a third added during the latter part of Shirley's administration. On the 18th of November, 1747, a riot occurred in Boston, on account of the impressment of some of the inhabitants, and the governor retired to the castle; but upon the assurance of the legislature and the citizens that his authority would be sustained, the governor returned on the 20th of November.

In 1749 there were at Castle William, according to Douglass, 104 cannon, besides mortars.

A commodious barrack, 360 feet in length, was erected in 1753, for the accommodation of the regular and provincial troops. In 1758 it was occupied by a detachment of "loyal Americans," not being used by the permanent garrison, which, seldom exceeding fifty in number, was lodged in the citadel.

On the 15th of August, 1757, Governor Pownall arrived to assume the government of the Province. The conqueror of Lewisburg, Sir William Pepperell, who was also the senior counselor, held command of Castle William. At that time the military commissions were vacated on a change of the chief magistrate. Sir William Pepperell, on presenting to the governor the key of the fortress, observed that "the Castle was the key of the Province." Former services were called, and his excellency replied: "Sir, the interests of the Province are in your heart. I shall, therefore, always be glad to see the keys of it in your hands." Sir William Pepperell died in July, 1759. Captain Lieutenant John Larrabee died on the 15th of February, in the seventy-sixth year of his age. He had resided for fifty years on the island, and had risen from the ranks. On his death, Governor Bernard fulfilled a promise before made to Governor Pownall, and appointed to the

vacancy the chaplain, Mr. John Philips. Governor Bernard made Castle William his summer residence, and one of his daughters was buried here.

In the early part of 1764 the barracks were occupied for the purpose of inoculation for small pox, which disease at this time prevailed to a great extent in Boston, carrying with it all the horrors of the plague.

The stamps, by which a revenue was intended to be raised from the British colonies, arrived in the harbor of Boston in September, 1765, and were lodged for security at the castle. The vigorous opposition in America to this act having prevented its enforcement in any instance, it was soon repealed, and in the course of the following summer all the stamps were returned to England. In the contest between Britain and America, Boston was the center of attack, and Castle William a key to be grasped by the strongest hand.

During the year 1768, while the public was agitated by a misunderstanding between the governor of the province and the legislature, a vessel belonging to Mr. John Hancock was seized by custom-house officers, and placed under guard. The commissioners of the revenue, whose charge was very offensive to the people, with their subordinates, took shelter at the castle. They assembled all the King's vessels around the island, and caused them to be moored in situations to resist a regular attack. These officials did not return to the town until they had obtained protection from the military arm. Before the expiration of the year several men-of-war arrived from Halifax, and four or five regiments of regular troops took post in Boston. Of these, the Sixty-fifth was quartered at Castle Island. These warlike movements greatly augmented the discontent of the province, and the assumption by the Crown of the full control of the castle was no less offensive to the province of Massachusetts; it was often stated as a grievance, but found no immediate remedy. On the 10th of September Lieutenant Governor Hutchinson, in obedience to instructions, formally withdrew the company of the provincial establishment and delivered up the command to Colonel Dalrymple, to be garrisoned by regular troops. There had been an annual perquisite of £120 sterling to the lieutenant governor, as commandant of the fortress. Captain Lieutenant Philips was, in 1772, appointed to the sinecure office of fort major, with an income of £200; he soon afterward lost his office from his attachment to the American cause. Captain Sir Thomas Adams, of the Boston frigate, who died on board the Romney man-of-war, was buried on Castle Island on the 8th of October, 1772. His obsequies, as well as those of Governor Bernard's daughter, were conducted with great pomp; but there the distinction ceased. In removing the earth to Fort Independence, thirty years later, their corpses, inclosed in double coffins, highly ornamented, but upon which the inscriptions were illegible, were dug out of the arches which inclosed them, and it not being discovered at the time to whom they had belonged, the coffins were committed to the common burying place at the south point of the island, where their graves were soon not to be distinguished from those of the private soldiers which surrounded them. With these, other bodies were necessarily removed, and one was favored with a memento which displayed either British sarcasm or Yankee simplicity. The stone was inscribed: "Here lies the body of John —, aged fifty years, a faithful soldier, and a *desperate good Gardner!*"

The Fourteenth regiment remained at Castle William during the year 1771. The repeal, in 1770, of the larger part of the act authorizing a revenue from the colonies, lulled, during this and the following year, the animosity of political parties; but the duty on tea, not indeed levied but held *in terrorem*, and other causes of irritation still remained, one of which was the standing army in Massachusetts, comprised in the regiment at the island.

On the 22d of July, 1772, Lieutenant Colonel Dalrymple was relieved by the Sixty-fourth regiment and a detachment of artillery. The commanding officer at this time is unknown.

It does not appear that the force quartered on the island was engaged in the first two battles of the Revolution. The commandant of the castle had been sent in February, 1776, to seize powder and other military stores at Salem; but he was delayed at the ferry by the militia until the objects of depredation were removed beyond his reach, and he returned peaceably to the island. The same officer was ordered from Castle William at this time with five hundred men to draw, by a false attack, the Americans from their posts at Roxbury. The attack did not succeed, and the burning of five or six houses in Dorchester was the only result. In the meantime a formidable force of Americans was concentrated in the vicinity of Boston under Washington, and General Howe, the successor of General Gage, evacuated the town March 17, and the British fleet with

them dropped below the castle. The embarkation had been a scene of confusion and distress, and it was the 27th of March before the transports were able to put to sea. At their departure the British troops threw into the water the iron balls and shot, broke off the trunnions of the ordnance given to Castle William in 1740, destroyed all the military stores and battery apparatus which they could not take with them, and finally blew up the citadel and the two magazines, and left the island a mass of ruins. Part of the British fleet lay in the lower harbor until June, when they were annoyed by the American troops under General Lincoln, and raised the blockade of Boston after the exact duration of two years. With the British troops the seat of war was removed from Massachusetts, and Castle Island was thenceforth unmolested during the American contest.

Colonel John Turnbull was the officer sent by General Washington to take possession of the island after the evacuation. During the larger part of the interregnum of government in Massachusetts, this place was garrisoned by detachments from Colonel Marshall's, Colonel Whitney's, and other regiments of militia, but more particularly from Colonel Craft's artillery. The duty of garrisoning the island was, in 1777, performed by roster, and a regular succession of commanding officers cannot be traced. Lieutenant Colonel Paul Revere was stationed on the island from 1777 until 1779.

The Americans soon began to move the rubbish into a defensible state. Epaulements were thrown up on the remains of Shirley bastion; the mutilated 42-pounders were repaired by affixing to them new trunnions, clasped by strong iron hoops; and by the shipwreck of the man-of-war Somerset, at Cape Cod, in 1778, twenty-one handsome cannon of 32-pound calibre were added. A resolution was passed by the provincial assembly of Massachusetts on the 6th of October, 1779, to raise a company of artillery, whose services should not extend beyond the Castle; it consisted of a captain, captain-lieutenant, one first lieutenant, one gunner, one gunner's mate, six quarter-gunners, three sergeants, three corporals, and eighty-eight men. General John Hancock was appointed captain. The same resolution directed that one company of militia from Charlestown, two from Dorchester, and one from Weymouth should be liable to do duty six days in the year, at the fort on the island. In 1780, upon the election of the lieutenant governor, he received a commission as captain of the company at the Castle. During the year considerable labor was bestowed upon the works, and it was accomplished by a day's fatigue from each male inhabitant of Boston.

On the 4th of November, 1785, it was enacted by the legislature of Massachusetts that all criminals of the State, under sentence of confinement, should be removed to Castle Island. Lieutenant Colonel Burbeck, for a long period "captain-lieutenant" and in immediate command of the Castle, died in 1785, and was succeeded by Major William Perkins.

Soon after the appointment of Major Perkins, the convicts, pursuant to the law above mentioned, arrived at the island; although their number never exceeded ninety, their audacity exercised the vigilance of the garrison; they made several bold, but fruitless attempts to rise and effect their escape, and in their mutinies some were wounded, others killed, and others met their death while endeavoring to form subterraneous passages. Stephen Burroughs, of famous memory, whose extensive forgeries gave him a great notoriety, here learned the art of a nailer, and in his published memoirs has publicly boasted of his Castle Island exploits.

Lieutenant Governor Cushing, captain of the fortress, died during the year 1788, and General Benjamin Lincoln was chosen as lieutenant governor. Governor Hancock did not, as had been the custom, bestow upon the lieutenant governor the emolument of captain of the Castle. In "Fleet's Massachusetts Register" the governor is placed at the head of the officers of the Castle from 1788. The appendage of this post added somewhat to the dignity of the chair, and henceforth, until conceded to the general government, the office of captain of the fortress was exercised by the governor.

During the year 1789, a detachment of invalids, under Lieutenant Bartlett Hinds, did duty here. Governor John Hancock was commander of the fortress from this time continuously until his death, October 12, 1793. He was succeeded by Governor Samuel Adams.

It was with great reluctance that the legislature of Massachusetts could bring themselves to the cession of the Castle to the United States government, as it had from the first been an insignia of sovereignty; but the State was nevertheless willing to sacrifice partial advantage to the general welfare, and October, 1798, passed the following act:

AN ACT providing for the cession of Castle Island, in the Harbor of Boston, to the United States, &c.

SECTION 1. *Be it enacted by the senate and house of representatives in general court assembled, and by the authority of the same,* That an island in the harbor of Boston, called Castle Island, be, and hereby is, granted and ceded to the United States, for the purpose of erecting forts, magazines, arsenals, dock-yards, and other useful buildings thereon for the defense of the United States; reserving the ordnance and all the warlike stores now on said island, which are the property of this Commonwealth. * * * *Provided always,* (and the cession and consent aforesaid were granted upon the express condition,) That this Commonwealth shall retain a concurrent jurisdiction with the United States in and over the island. * * * So far as that all civil and criminal processes that may issue under the authority of this Commonwealth against any person or persons charged with crimes within the said island may be executed therein, in the same way and manner as though this cession had not been made and granted: *Provided also,* That the officers and soldiers stationed on Castle Island shall remain there for the purpose of guarding the convicts, and for the defense of this Commonwealth, under command of the governor thereof, until the United States shall accept the cession herein made and shall take possession thereof for the purposes expressed in this act. (Laws of Massachusetts, page 823, printed in 1801.)

Pursuant to this act the troops of the Commonwealth were discharged, and the convicts dispersed to the strongholds of the several counties.

On the 2d of October the arrangements for the transfer of the island were completed, and the following receipt was given:

CASTLE ISLAND, October 2, 1798.

Received of the Commonwealth of Massachusetts, by Amasa Davis, esquire, Quartermaster General, Castle Island, with the fortress thereon, agreeable to an act of the general court, passed at their last session; and the articles of ordnance, military stores, boats and other appendages now on said island as particularly stated in the following schedule.

Signed for and in behalf of the United States.

DANIEL JACKSON, Major.

The public buildings given with the fort were twenty in number. The military apparatus and appendages, which were charged to the account of the United States, were valued by General Davis and Major Perkins at \$35,995. But a new appraisal was taken on the 3d of September, 1803, which, by leaving out the mutilated ordnance, reduced the sum received by the Commonwealth to \$21,336. The guns saved from the man-of-war Somerset were retained. Major Jackson and the officers on duty at Castle Island, previous to April, 1802, were attached to the second regiment of artillerists and engineers. Major Jackson commanded the district, and had his headquarters at Newport, Rhode Island. Captain Lemuel Gates was in immediate command.

Dr. Thomas Welsh, of Boston, was employed as acting surgeon of the garrison. A hospital for disabled seamen of the United States Navy was established on the island, under Doctor Welsh's charge, in the spring of 1799, and remained until removed to Charlestown in 1803. The island was also made the residence of French prisoners from July, 1799, until March, 1801, when they were released. The greater number of the latter were captured with the prize brig Berceau, and embraced two hundred and forty-eight persons.

In August, 1799, the President of the United States, John Adams, visited the island and was received with due honors. The general government had at this time in contemplation the erection of a new fortress; and it was on the occasion of this visit of the President that the name of the fort was changed to Fort Independence. A large part of the necessary materials were collected during this and the following year, under the direction of Lieutenant Colonel Louis Tousard, second regiment artillerists and engineers, who had the position of inspector general of all the posts of the Eastern States. With regard to the name of Fort Independence, bestowed as above, Captain Nehemiah Freeman remarks, "as Boston was the cradle of the American Revolution this baptism was not indecorous, and the godfather is certainly unexceptionable; but Fort Independence must count some years before he can entirely divest his elder brother of his birthright; and though the pottage might have been sold in 1776, yet the title of 'the Castle' is rather endearing to the inhabitants of Massachusetts, and is still bestowed by the greater part as the only proper appellation."

A general order, dated November 12, 1800, assigned Major Jackson the special command of the harbor, and Colonel John Toncin was appointed engineer to construct the work.

The first stone was laid May 7, 1801, at the foundation of the salient angle on the north, and the whole superstructure was raised from an original design, without any advantage being derived from the remains of former skill.

On the 23d of June, 1802, the national colors were first displayed at Fort Independence. The

workmen were dismissed in January, 1803, though at this time the work had not quite been completed. The work was a barbette fortification, and its dimensions were not materially different from those of the present one. The barracks for officers and men were inside the work.

On the 5th of February, 1805, the five bastions of the new work were named as follows: First, "Winthrop," after Governor Winthrop, under whose auspices the first fort was built; second, "Shirley," after Governor Shirley, who repaired Castle William, erected other works, and made it the strongest fort in British America; third, "Hancock," after the first governor of the Commonwealth of Massachusetts, under whose administration new works were thrown up; fourth, "Adams," after John Adams, who bestowed its present name upon the fort, and collected materials for its construction; fifth, "Dearborn," after General Dearborn, Secretary of War, under whose auspices Fort Independence was actually rebuilt.

In April, 1806, Dr. James H. Sargent, garrison surgeon's mate, reported for duty at Fort Independence, and was probably the first commissioned medical officer of the United States Army on duty at the post.

After the year 1833, the garrison at Fort Independence was withdrawn, and the post given up to the Engineer Department for the construction of the present work. During the succeeding eighteen years the erection of the present fortification was prosecuted at intervals, and the aspect of the northern part of the island was greatly changed.

The earliest record of the post being regarrisoned is January 4, 1851, on which date Brevet Major George H. Thomas, captain Third Artillery, assumed command of Fort Independence, and Second Lieutenant Chauncey McKeever was appointed post adjutant.

GEOLOGY OF BOSTON HARBOR AND VICINITY.

The many islands scattered over the face of Boston Harbor are doubtless the remains of one continuous diluvial formation, and the rock and minerals of these islands, where such exist, are identical in character with those of the mainland. It has been surmised that the entire harbor, and even Massachusetts Bay, were formed by the attrition of the ocean through countless ages; the diluvial and soft conglomerate rocks of this locality giving way before the breakers, while Cape Ann and the shores of Cohasset and Scituate maintain their position. The formation of Castle Island is diluvial drift; that is, a deposit of gravel, boulders, sand, and loam mingled confusedly together by powerful currents of water; it differs from tertiary in not having the arrangement of horizontal strata superimposed. Many other islands, viz, Thompson's, Spectacle, Long Island, Gallop's, George's, Lovell's, Deer Island, Apple Island, and Great Brewster, are likewise diluvial. Moore Island is of conglomerate; Hangman's Island, syenite; Rainsford Island, Boston Light, Egg Rock, Green Island, and Governor's Island are of argillaceous slate. The predominant formation throughout the eastern portion of the State is the graywacke. It occupies generally extensive plains and undulating ground, and is abundantly covered with drift or diluvium. The peninsula of Boston has a foundation of argillaceous slate, which rock is observed both at the north and south of the city. This rock is intimately connected with the graywacke formation, and is either a variety of the latter or belongs to the inferior stratified or non-fossiliferous rocks. As we pass beyond the graywacke and argillaceous slate which encircles Boston, greenstone is the predominant rock, and this passes into syenite. Large masses of porphyry, which, from its resemblance to that used by the ancients, has been called "antique porphyry," exist in this vicinity. Two ranges of porphyry have been discovered, one north and the other south of Boston. The "Blue Hills," the most elevated land in this vicinity, rising seven hundred feet above the ocean, consist largely of porphyry and syenite.

Rocks and Minerals found in the vicinity of the Post.—Novaculite, a variety of argillaceous slate known in the arts as "hone or whetstone," is found in Charlestown, as is also argillaceous slate variegated. Argillaceous slate, curved laminae and rhomboidal, is found on Rainsford Island and in South Boston. Common greenstone in argillaceous slate, and slate traversed by veins of crystallized quartz and calcareous spar and greenstone, are found in Charlestown; greenstone passing into syenite at Blue Hills; compact feldspar, somewhat brecciated, at Dorchester and Blue Hills; compact feldspar passing into porphyry, and porphyry (dark gray) polished, at Blue Hills; porphyry, reddish brown crystals of feldspar, and quartz, polished, at Blue Hills; porphyry,

variegated feldspar, and quartz crystals, at Blue Hills; syenite, (feldspar and hornblende,) on Hangman's Island. The syenite existing in the vicinity is a granite-form mixture of feldspar, hornblende, and quartz, and is intimately associated with greenstone. Specimens of argillaceous slate have been found at Rainsford Island and South Boston which contain a double set of seams oblique to the strata seams; and thus the rock is divided with great regularity into tables with rhombic faces. On Rainsford Island the slate, though unusually fissile, is bent so as to form a semicircle within the radius of a few inches. A coarse conglomerate, or plum-pudding stone formation, exists at Roxbury and Dorchester. It consists of rounded nodules, from the size of a pea to two feet in diameter, consisting of granite, syenite, compact feldspar, porphyry, quartz, argillaceous slate, and flinty slate. The cement seems to be the same materials in a comminuted state; it is semi-crystalline and adheres firmly to the nodules. The term "graywacke," in the above, is meant in a general sense to apply to every conglomerate, sandstone, and fragmentary or arenaceous rock of transition formation anterior to red sandstone and coal formation. It varies in texture from the finest argillaceous slate to the coarsest conglomerate.

The climate is cool and moist, and the temperature is as variable as the tide, though not nearly as certain in its changes. The light westerly or southwesterly wind which frequently prevails in the morning during the summer, commonly gives place in the evening to a cold wind from the north-west, or a cold moist wind from the northeast. Easterly winds prevail exclusively at some seasons of the year, particularly in the spring and fall, and come up from the sea loaded with moisture, and often a dense fog that renders objects invisible across the parade ground.

The mean annual temperature is about 48° F.; mean summer temperature, 69°; mean winter temperature, 27°. The greatest rain-fall is during the summer and autumn—the average fall each year being about 44 inches.

DESCRIPTION OF FORT INDEPENDENCE.

The fort is a pentagonal, five-bastioned fortification, occupying the northern portion of the island. The casemates contain the squad-rooms and dormitories, the dining-room and kitchen of the men, the married soldiers' quarters, laundresses' quarters, storehouses, bakery, &c. These casemate rooms are all about the same size, averaging 21 feet long, 17 feet broad, and 11 feet high; they are finished off inside floored with jointed pine flooring, and the walls and ceilings plastered; each room looks out internally on the parade ground, and externally is separated by a wooden partition of folding doors from the general gun gallery and outer wall. Six of these casemate rooms are assigned as squad-rooms and dormitories of the men; they are each the size above given, and contain from ten to thirteen men each. Dividing the cubic contents of each room, 3,927 cubic feet, by the lowest number of men intended to sleep in each—ten—we will have 392.7 cubic air space per man—hardly one-third enough if there were any proper ventilation; but in these casemate rooms no ventilation is provided for save by a movable transom over the door, which, opening over the beds of those furthest from the stove, is diligently kept closed by them.

Each room has been heated during the winter by one cast-iron coal stove, placed in the corner furthest from the door, and during the winter was alternately heated to redness by those who slept furthest from it, or allowed to go out entirely by those whose beds were nearest to it; the air in these rooms is always foul and offensive, and is rendered still more hurtful by dampness and moisture, the walls and ceiling being constantly wet, sometimes dripping, from the water that soaks through from the terreplein above.

The married soldiers and laundresses, of which there are four, have each one of these casemates similar to the squad-rooms, and to them the same remarks will apply, save that they are not so overcrowded.

All of these casemate rooms are damp, illy ventilated, badly lighted, and worse heated; they are a constant and prolific source of catarrh, bronchitis, rheumatism, and neuralgia, and I am under the impression that they increase the sick report constantly from ten to fifteen per cent. A proper regard for the health of the men, as well as economy in the service, if the number of days each soldier loses by sickness is computed in dollars and cents, would seem to demand that some

radical change be made in these casemate quarters, regarding especially their crowding, ventilation, lighting, and heating; as they were designed, however, for purposes entirely different from dwelling rooms or dormitories, it would probably be more expensive and difficult to make them comfortable and healthy quarters than it would to erect suitable new barracks. The furniture of these squad-rooms is little beside the stove, bunks, and bedding, the clothing, arms, and accoutrements of the men. The bunks are each composed of two iron tressels, connected by slats; each bunk is intended for one man, and is furnished with a bedsack filled with hay or straw, and two or three blankets.

The kitchen department is admirably conducted, the food is good, plentiful, and well prepared, the company fund affording ample means of gratifying more epicurean palates than soldiers usually possess.

The officers' quarters are situated without the walls, on the south of the fortification, and consist of three almost similar double houses, and one isolated set of quarters immediately west of the southwest bastion; the isolated set of quarters is but one story high; it has seven rooms on the lower floor, and a basement; and is occupied by the commanding officer. The other sets of quarters are each one story and a half high; they have each three rooms on the lower floor, and two low attic rooms on the upper. All the officers' quarters are finished off nicely, and are each provided with a range in the kitchen, and grates for coal in the other lower rooms; they are all supplied with water from a tank filled by a forcing pump from the general cistern. The only drawback to these quarters is the size of the rooms, they being but fifteen feet square.

One of the casemates is used for a guard-house, which is quite damp when no fires are kept up. Ventilation is procured by two shafts; air and daylight are admitted through the embrasures; stoves are used for warming; the average occupancy of the guard-house, for two years, is three per day.

On the extreme southern point of the island is the post hospital; this is a commodious brick building, fronting the north, and consisting of a central administration building, and two wards arranged as wings, in conformity with Circular No. 4, Surgeon General's Office, series of 1867. The work was commenced July 16, 1867; the building was finished in October, and was first occupied on the 28th of that month. The expense of its construction, outside of extensive arrangements for the water supply, the portico, fence, stable, and woodshed, was \$11,400. The total expenditure on the building, with improvements, was \$13,530 82.

The central or main building is two stories high and 36 feet square; the wings or wards are each one story high, and 45 feet long by 25½ feet broad. All the roofs are of slate, and all the walls are of brick, those of the main building and wings being double, with air-chambers between the inner and outer courses; but from some cause, either from having no substance inlaid near the ground course to prevent the dampness from rising, or from the improper manner in which the inner and outer walls are bound together, the inner walls are continually wet, and the white-wash constantly discolored. The flooring is of good, well-matched, yellow pine, but the baseboards have so shrunk away from the floor that a current of air enters so forcibly in many places as to extinguish a candle. Ridge ventilation is provided for in the wards, and in all the other rooms there are ventilators connecting with the air-chamber between the walls. Ventilation proper has been unnecessary during the past winter; even the adventitious entrance of pure air has been in such great quantities as to keep the rooms uncomfortably cold. *Theoretically*, no building is a proper habitation for human beings, sick or well, unless a practically unlimited supply of pure air is provided for by ventilation. *Actually*, enlisted men prefer the unknown (to them) evils of impure warm air to the known evils of cold pure air; and so, where they are concerned, no ventilation will be of benefit unless the air admitted be warmed, for when unobserved, they will close every ventilator they have access to, more especially when, as a general thing, bad carpentry or bad material used in the construction of these hospitals frequently renders ventilation, as such, superfluous. Each ward proper is 33 by 24 feet, and 14 feet high, to the eaves; they are each calculated for twelve patients, which, if full, would allow 924 cubic feet of air space per man. The average occupancy, however, will not reach so high a proportion as even six patients in hospital at one time.

The wards and dining-room are heated by large sheet-iron coal stoves, with furnaces of fire-brick; the other rooms by cast-iron coal stoves. Each ward contains eight large windows, and is lighted at night by candles.

The bath-rooms and latrines are supplied with water from the common tank; the waste water and sewerage being carried off by a drain emptying in the bay. No room is especially used as a dead room.

In the rear of the hospital, and surrounded by a fence, is a small lot of about half an acre, containing a shed, stable, and an attempt at a hospital garden.

There is at the post hospital a library consisting of 130 well selected volumes, for the use of patients.

WATER SUPPLY.

There are six wells and an equal number of cisterns on the island. Four of the cisterns are connected with the officers' quarters in the casemates; one cistern connected with the commanding officer's quarters, and one with the hospital. Water for culinary purposes is obtained from two wells. The water from the well but a few yards from the sea-wall contains a larger quantity of saline impurities than the other wells, the principal salts being chloride of sodium, chloride and bromide of magnesium, with traces of chloride of potassium and sulphate of lime. This well is doubtless subject to tidal impregnations. It has, until recently, furnished the water required for culinary purposes by the company—its proximity to the kitchen being the recommendation. The water of the well near the soldiers' barracks, is not so strongly impregnated with earthy and alkaline salts as the former. Two quarts of water from this well gave, on evaporation, five grains of solid residue, one and a half grains of which was combustible organic matter, and the remainder earthy and alkaline salts, principally chloride of sodium and carbonate of lime. Water from the other wells does not differ materially from the latter, the prevailing impurity being in each instance chloride of sodium. In but a single instance is the water of any of the wells brackish to the taste. I am not aware of any instance in which the impurities above indicated have exercised a prejudicial influence upon the health of the command. I would rather be disposed to attribute a salutary influence to the water of the island. During the extreme heat of summer, the wells have become quite low, necessitating economy in the use of water, but at the other seasons the supply is more than sufficient for all ordinary purposes. The expediency and practicability of obtaining the water supply of the post from the city water-works, by laying pipes from South Boston to the island, has been discussed. The pipes would necessarily be exposed every twelve hours, and thus be subject to injury from the frost.

Cisterns.—The four cisterns connected with the casemate quarters are not now in use. The cistern connected with the quarters of the commanding officer supplies water for baths, laundry, &c.; that attached to the hospital, of capacity of seven thousand gallons, supplies all the water used therein. It is believed that the water of this cistern was somewhat contaminated by the collection (in the gutters and spouts of the building) of innumerable gnats. During the prevalence, in hot weather, of land breezes or high winds from the westward, vast numbers of these gnats were precipitated, in an apparently disabled condition, against the building, and some of them were doubtless carried into the cistern.

The insular position of the fort makes drainage simple and easily effected. The sink or latrine of the enlisted men is a deep pit or vault under the northeast bastion; it is connected by a covered way or large drain with the bay. This pit is now filled with excrement and is closed; either the drain is stopped up, or some other such accident prevents its proper use. In addition to this latrine, the Engineer Department last summer erected four large earth closets near the same locality. In these the earth was thrown from a hopper upon each dejection, by the weight of the body upon the seat; but as a sentinel was not stationed there constantly to see that the apparatus was not abused, the men made water-closets of the earth closets, the urine overflowing the receptacles, thus making them perfectly useless. Within the past few days a privy has been built, projecting over the eastern sea-wall, and this is probably the only correct method of abating the nuisance.

The prevailing diseases are those incident to the insular situation of the post, and the damp and unhealthy quarters; such as catarrh, pharyngitis, bronchitis, pleuritis, pneumonia, rheumatism, and neuralgia, and probably also phthisis pulmonalis. To these may be added gonorrhœa, chancre, and syphilis, always prevalent among soldiers stationed near large cities.

Fort Independence is doubtless as free from such conditions and influences as are prejudicial to health as any spot in the United States. The surface in the vicinity of the post is flooded at

stated intervals by the tide, and sewerage is thus thoroughly removed. The only source of atmospheric contamination is from an establishment on an island three miles to eastward, a receptacle for dead animals. Occasionally in summer the east wind bears from thence a very offensive odor, but not sufficiently concentrated or continued to be prejudicial to health.

Statement showing mean strength, number of sick, and principal diseases, at Fort Independence, Boston harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	Number of deaths.	Remarks.
1868.....	71	120	3	12	8	15	2	36	.....	One death from phthisis.
1869.....	70.45	187	18	26	32	4	1	52	1	

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT ADAMS, NEWPORT, RHODE ISLAND.

REPORT OF SURGEON J. F. HEAD, UNITED STATES ARMY.

Fort Adams is situated in latitude north $41^{\circ} 28'$, longitude west $71^{\circ} 22'$, about three miles from the mouth of Narraganset Bay, upon Brenton's Point, the southern boundary of the entrance to the harbor of Newport, Rhode Island. It is distant west from that city one mile across the harbor, and about three miles by land.

Goat Island,* upon which is Fort Wolcott, (now unoccupied,) lies half a mile north of the point; and Conanicut Island, between which and the fort runs the channel leading to Providence, is distant about a mile to the westward.

On the east of the point is Brenton's Cove, a narrow indentation of the south shore of the harbor near its mouth. An easy drainage is thus afforded on one side into the cove, and on the other into the outer bay, the greatest distance between the two being about half a mile.

The geological formation of the site is thus described by Professor C. T. Jackson, in his report to the legislature of Rhode Island, in 1839:

At Fort Adams, in Newport Harbor, we again see the outcroppings of the altered slate rocks, and imbedded in their strata occur several important beds of limestone. The slate within the fortress and beneath the parade-ground is distinctly stratified, and dips to the eastward 15° . Near the fort, on the shore, are the limestone beds, which are found to run N. 50° E., and S. 50° W., and dip to the S. E. 40° or 50° . One of these beds is 45 feet wide, the other is 15 feet; the easternmost bed contains the lime rocks. This limestone is of the most compact kind, and is variegated in its color, being tinged red, green, brown, or buff, by the presence of variable proportions of foreign matters, principally oxides of manganese and iron. There are evident appearances of mechanical and chemical disturbance in this rock; for the limestone is broken up and again united into a breccia, and frequently includes fragments of the slate strata. Numerous veins of quartz traverse the limestone and slate, checking it up in a curious manner, and presenting the quartz in relief where the softer rocks have been worn away by the action of the water.

Brenton's Point is believed to have been occupied by defensive works during the revolutionary war. A fort, completed in 1799, was first garrisoned and named "Fort Adams," with much ceremony, on July 4th, of that year. The present work was first garrisoned on August 9, 1841.

The area of the reserve is $138\frac{1}{2}$ acres, of which the fort proper covers $21\frac{1}{2}$. The parade-wall incloses a space of about $6\frac{1}{4}$ acres, most of which is turfed. The parade is about 30 feet above low-water mark.

The quarters for both officers and enlisted men are in casemates, arched with brick covered with sheet-lead; the valleys between the arches being filled with earth, surmounted by a thin layer of concrete, and a brick pavement over all. This arrangement has been found defective, allowing

* Now (July, 1870) occupied by the Navy Torpedo Corps.

leakage into the quarters. Some experiments have been tried with asphalt covering, which promise better protection. But quarters built in this way, practically *cellars*, are, of course, except in winter, excessively damp; more than ordinarily so in this climate, which, as will be seen below, is a peculiarly humid one. Fires are necessary during a part of almost every day, even in midsummer, to make the quarters at all habitable. Arms and instruments rust, and clothing and equipments decay rapidly. It is needless to say that such dwelling-places are unhealthy. Bad as they are in a sanitary point of view, the men's quarters are made worse by *overcrowding*. The dormitories for enlisted men measure 54 by 18 or 19 feet, with an average height of 11 feet.

The number of occupants of such a room varies from 12 to 38 at this time, giving in the last case 280 cubic feet per man. Were the estimated full garrison for this fort ever packed into it, the result would most certainly be a pestilence.

Three circular apertures, each 20 inches in diameter, in the roof of each dormitory, open into a space between the arched roof and the flat ceiling, from the outer end of which space is a communication with the external air by the smoke-hole, 5 by 1½ feet, the shaft opening on the parapet 12 feet above the ceiling.

Beside the quarters within the fort, three frame buildings, one story high, erected on the glacis a year or two since by the Quartermaster's Department, afford temporary quarters for a portion of the officers. These are less damp than the casemates, and will probably be more or less habitable for several years. They are singularly inconvenient, and, perhaps, their best feature is their temporary character.

The cells for prisoners are four in number; average dimensions 7½ by 6 feet, and 9 feet 5 inches high; ventilation by two loop-holes, 3½ by 20 inches.

In these cells, and a hall in front, giving a total cubic space of less than 5,000 cubic feet, thirty prisoners have been confined at one time, giving each man about 170 cubic feet.

On the 27th of August, 1869, the casemate which, notwithstanding the oft-repeated protests of the medical officers, had for twenty-eight years been the only hospital at Fort Adams, was abandoned to other uses, and the patients transferred to a new temporary hospital outside the work, which, though far from being perfectly adapted to its purpose, is a great improvement on the old dungeon.

The new building stands on the crest of land between Brenton's Cove and Narraganset Bay, an airy site, with dry soil. The space was selected at some distance from the main work, both for free circulation of air, and in view of the contingency, deemed not impossible, of an enlightened policy rescuing, not only the sick, but the well from imprisonment in the damp casemates. When the men are quartered outside the work, as they should be, it will be more conveniently accessible.

The building itself, erected by the Quartermaster's Department, is upon the plan given in Circular No. 4, Surgeon General's Office, April 27, 1867, for a hospital of twenty-four beds, with the addition of a porch at each end. The structure originally contracted for would have been uninhabitable, but the timely interposition of the Surgeon General prevailed so far as to have a coat of "back plastering" put upon the inside of the mere shell of weather-boards provided for the outer walls.

The finish of the whole is of an inferior character; the wall plaster soft; the floors of soft pine, ill joined, and so roughly planed that cleaning is difficult, and a bare foot would be pierced by splinters; the outer doors admitting beneath them strong draughts into the wards; in short, one sees almost at a glance that the hospital was *built by contract*, and infers that the work was not superintended by a competent architect.

The wards allow ample space for twelve beds in each, with superficial area of 94½ square feet, and air space of 1,421½ cubic feet per bed. Each ward is warmed by a large base-burner stove. The light is sufficient, and the ventilation ample and satisfactory. The water-closets, one to each ward, measuring 11 by 9 feet, contain but one seat each, (the contract not specifying any number,) and one urinal. There is no stench-trap, and no separate ventilating-shaft for the closets. Each bath-room has a good planished copper fixed tub and two basins, supplied with hot and cold water.

Both water-closets and bath-rooms are at the outer ends of the wards—those furthest from the boiler and supply tank. There being no passage with cross ventilation between them and the ward, nothing is gained by this position; by placing them at the inner end there would be a saving of many feet of lead pipe and packing, beside lessening the risk of freezing—an accident

which, in spite of special precautions, has occurred twice during this unusually mild winter. There are no "circulating pipes" for the hot water.

The bath-tubs, sinks, fixed basins, water-closets, &c., are fed by a tank in the attic, with capacity of 580 gallons, filled by a force-pump in the kitchen. The flow from the tank can be cut off, and all the pipes emptied; but there are no means of cutting off the supply from either wing independently, consequently, in winter, both wards must be kept well warmed, night and day, though but one has as yet been occupied; this is not economical.

The water is taken from a well; it is potable, though too hard for washing or bathing. The want of soft water was foreseen, and a suggestion made by the surgeon that a cistern for rain from the roof should be included in the contract for brick work. He was informed that "suitable water supply would be provided," but there is yet no cistern, while more than 35,000 gallons of rain-water have run to waste from the hospital roof.

The kitchen is hardly large enough, and there is no laundry. The only access to the second story is by one staircase, only two feet and three inches in clear width. It seems superfluous to say that this is too narrow. Ladders have recently been fixed to the front and rear as fire-escapes, and twenty-four buckets stand always filled with water in the hallways.

The chief defects of this hospital (except those attributable to the looseness of the specifications) seem to be due to the regarding of Circular No. 4, above mentioned, as a rigid, unvarying rule for all cases. It cannot be doubted that in this instance, had certain modifications, which would have suggested themselves to any medical officer on the spot, been submitted to the Surgeon-General, he would have recommended their adoption. As it stands, the hospital is a product of the contract system, applied without consulting any officer of the department most directly interested and best instructed in the means of adapting the building to its purpose.

That the intelligent officers of the Quartermaster's Department have failed to attain the most desirable results, can no more be considered evidence of incapacity than would be the inability of a medical officer to plan and superintend the building of an arsenal or a fortification.

The natural supply of water is sufficient, and the well water of reasonably good quality, though rather hard. There are in use one well within the main work, and seven outside. The best water is that of a spring near Brenton's Cove. It is soft, and is used by the laundresses. No analysis of the water has been made. In addition to the wells several large cisterns afford a supply of rain-water, to which may be added the mine-galleries, which in a moderately wet season are nearly filled.

With so abundant a supply of water, there is not a bath-room at the post for officer or soldier, except in the new hospital. The men have no lavatories. A shed in the ditch, with a simple pump and basins, would greatly add to their comfort. For sea-bathing during the warm months, the facilities are very good.

Ever since the first occupation of this fort the proper provision of sinks appears to have been a problem, to solve which many efforts have been made and great expense incurred without anything like commensurate results. The cost of ineffectual appliances during this period is estimated at not less than \$15,000.

The water-closets, occasionally without water supply, were frequently out of order—those used by the enlisted men were often maliciously or wantonly injured—and at best, the resulting filth was only stored in holes in the ground, its removal from which was a periodic nuisance. The state of things in regard to privies, both for officers and their families and for the men, is stated in my special sanitary report of December 31, 1868.

After an entirely satisfactory preliminary trial of the portable earth-closet, in some of the officers' quarters, it was determined to provide for the enlisted men a system of permanent closets on this plan. Early in August last these were completed, and have since been in constant daily use.

The closets, with a furnace for drying the earth, are in one of the casemates. The material now used in them is a sifted mixture of dry earth and ashes. The requisite earth is obtained from the immediate neighborhood of the fort; and the trifling labor of procuring, drying, and sifting it is more than repaid by the value of the product as a fertilizer.

The result is a complete success. In the closed casemate there has never (with a temporary exception) been any perceptible odor from the closets, and the removal of their contents is no

more offensive than the cartage of ordinary earth or ashes. The exception above indicated was a period of some days during which—owing to an obstruction of the neighboring urinal—the closets were used in its place, as well as for their legitimate purpose. Of course dried clay will not act as a filter for urine, though the small quantities voided with the feces are readily absorbed and deodorized. A suitable urinal should always be provided in connection with the earth-closets. The trial at this post has demonstrated the superiority of the earth-closet over any form of water-closet.

The reports of sick give cheering evidence of the extent to which picked men in the prime of life and in favorable conditions of climate can withstand the deleterious influences of their artificial surroundings. The record fully justifies the observation of the late Assistant Surgeon R. F. Simpson, United States Army, in his report of December, 1858, that “if the quarters for officers and men were any other than miserably damp casemates, Fort Adams would be more salubrious than any other permanent post in the United States.”

I can find no record of any epidemic at the fort. In the city of Newport, at long intervals, dysentery and diarrhœa have prevailed in the summer and autumn, and influenza in the colder months. It is stated on the verbal authority of M. de Montesquieu, aide-de-camp to General Chastellux, of the French auxiliary force stationed at Newport in the year 1780–81, that during the eleven months of their stay, (including a memorably mild winter,) out of the five thousand troops only about eighty were sent to hospital, most of whom were returned to duty.

The climate of the southern part of this island is in some respects an exception to that of the region in which it is classed. Its peculiarities, which, with the facilities for sea-bathing, have made Newport a favorite summer resort, are due to its insular position, its general slope toward the south, and doubtless to the nearness of the western edge of the Gulf Stream. The winter temperature is much milder than that of Providence, and the summers are remarkably cool and equable. The same cause, however, which produces these results, occasions in spring and early summer the heavy fogs for which this vicinity is famous. The influence of the dampness upon the health of the inhabitants is less unfavorable than might reasonably be expected.

The mean annual temperature of Fort Adams, deduced from observations for ten years, as given in the Army Medical Statistics of 1860, is 49.96° ; of spring, 45.55° ; summer, 69.46° ; autumn, 53.48° ; winter, 31.34 . February is usually the coldest month. The average fall of rain and snow by the above-named statistics was 52.46 inches per annum.

For the year 1868 the mean temperature has been 48.46° . The maximum on July 5, at 12 m., was registered* as 102° ; the minimum at 9 p. m. on March 3 was 2° ; average difference of thermometer and hygrometer, 1.06° ; quantity of rain and snow, 40.72 inches.

By the kindness of Mr. R. J. Taylor, of Newport, who has placed at my disposal an abstract of observations by himself and his father, the late Mr. James Taylor, for forty years, from 1817 to 1856, and by personal examination and comparison of the reports as originally published in the Newport Mercury, I am enabled to give the following results. The original reports contain many notes and comparisons with former observations, which are of great interest, but cannot be embodied here. The mean annual temperature by these tables is 49.32° .

The mean of monthly temperatures is as follows:

	<i>Degrees.</i>		<i>Degrees.</i>
January	29.98	July	70.14
February	29.84	August	69.77
March	36.14	September	63.44
April	44.51	October	53.48
May	53.88	November	43.17
June	64.11	December	33.46

The coldest month recorded is February, 1817, the mean temperature of which was 22.95° . At sunrise on the 15th of the same month the mercury stood at 13° , the lowest ever recorded.

* In Newport on the above day the temperature did not rise above 96° , which is the highest known ever to have been observed in the town. I suspect that the high temperature noted at the fort was partly due to radiation from the heated mass of masonry.

During this month every harbor from Boston to the Chesapeake, *except Newport*, was closed by ice. The warmest month in this record was July, 1825, with a mean of 75.83°.

The maximum attained during the forty years observed by the Messrs. Taylor was 94°, and in only seven of these years does it appear to have reached 90°.

Statement showing mean strength, number of sick, and principal diseases at Fort Adams, Rhode Island, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fever.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	252.91	219	.....	3	51	4	6	8	14	.....	29	2
1869	197.75	195	3	33	21	3	3	29	4	2	12	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT TRUMBULL, NEW LONDON, CONNECTICUT.

REPORT OF SURGEON JOHN CAMPBELL, UNITED STATES ARMY.

The sources of information as to the earlier history of Fort Trumbull are but few and scanty. Before the revolutionary war a small battery seems to have been erected within the limits of the city of New London; but none on the site of the present fort. Early in the year 1775 a small redoubt was commenced by order of the governor and council of Connecticut, to which the name of Fort Trumbull was given, which was not, it would seem, completed or armed until the latter part of 1777. It appears to have been a very primitive work of earth and stone, facing to the north, east, and south, and open to the westward, and to have proved of little service.

When New London was attacked by Arnold in 1781, Fort Trumbull was occupied by only twenty-three men, who, in obedience to orders, retired across the river to the stronger work, Fort Griswold, when the enemy approached to attack the fort in the rear. After the revolutionary war this work fell into decay.

In the year 1812 the old redoubt was entirely demolished, and a more powerful one erected on its site. I can find no description of this second fort. Whatever was its character, it seems to have been sufficient, with its fellow, Fort Griswold, to prevent the entrance of the British fleet into the harbor, although that fleet lay off the mouth of the river during nearly the whole continuance of the war.

This second fort remained in existence until the year 1839, when its demolition took place, in order to make way for a fortress which, though not a large work, was to possess all the latest improvements in the science of defense and gunnery. The natural ground, which had been left almost undisturbed by its two predecessors, was a rugged, irregular ledge of granite, some 25 feet above the surface of the harbor. This was carefully graded for the walls, glacis, and outworks.

To the north of the fort, however, remains a portion of the original ledge, to show the native roughness of the surface. Incorporated in one of the outworks is a block-house of stone, which is said to have formed part of the original defenses erected in 1775.

Fort Trumbull, as it now stands, is a beautiful structure. Its walls, inside and out, are of cut granite, quarried a few miles distant. Its arches are of brick. It was completed in 1849, the entire cost being \$250,000.

Fort Trumbull lies in latitude 41° 20' 33'', longitude 72° 0' 8'' west from Greenwich. It occupies the extreme southeast point of a peninsula or neck, formerly called "Mamacock," now Fort

Neck, which projects into the harbor of New London. It is half a mile below the city, and a mile and a half above the mouth of the river Thames. The government grounds are of a very limited extent, embracing but a small portion of the "Neck." The consequence is that the quarters and other buildings are crowded into very uncomfortable proximity to each other.

A few of the officers occupy very comfortable casemates in the fort. The remainder of the garrison occupy quarters outside the fort.

In parallel lines at a short distance from the sally-port, and running west therefrom, lie the officers' quarters, the men's barracks, and the hospital, a space of not more than 50 feet separating the buildings. The officers' quarters consist of a block of four two-story buildings of granite, comfortable, and in good repair. The soldiers' quarters consist of one building of granite, one story, with kitchen and offices underneath, and one frame building, continuous with the other, which has just been converted from a quartermaster's storehouse to its present purpose. One company occupies each of the buildings. To the rear of these lies the hospital. Its main building, erected many years before the present fort, is a one-story granite building, with a central hall, on one side of which is the surgery, on the other a ward; beneath are a kitchen and mess-room, the fall of the ground making two clear stories in the rear. Toward the end of the war two frame wings were affixed to the hospital, the eastern one of which is now used as a ward, while the western one has been lately converted into a quartermaster's and commissary storehouse.

The garrison is supplied with water from four wells sunk into the granite which underlies the whole tract. The water is pure, pleasant, and wholesome. It is carried by hand, by the police party, to the quarters, hospital, &c. The river Thames runs directly southward past the fort and opens upon Long Island Sound. The harbor is one of the finest on the coast, by reason of its depth of water, its easiness of access, its freedom from obstructions of all sorts, and its good anchorage. In threatening weather many vessels take refuge in it. At the lowest tides its channel carries 25 feet of water. It is very seldom closed by ice, and never troubled by floating ice. The climate is salubrious to a wonderful degree—not very cold in winter, though subject to severe storms from the eastward, and generally free from extreme heat in summer. The garrison has always enjoyed extraordinary exemption from severe disease and epidemics. A large population of the inhabitants of the neighboring country reach a great age, and the climate seems remarkably favorable to the rearing of children. It was remarked by Humboldt, that the region from the Connecticut to Narraganset Bay was remarkably free from malaria and the extremes of heat and cold, wet and drought, which has since been confirmed by meteorological observations. Wounded patients sent here during the war recovered with great rapidity.

This whole region, in its geological formation, is purely primitive, presenting no other rock than amorphous granite, composed of quartz, feldspar, and mica, generally in equal proportions, and sometimes in distinct strata, with small crystals of short and minute cubes of bright magnetic iron. The soil, composed principally of disintegrated granite, is strong, and adapted to the raising of maize, potatoes, and vegetables of all kinds. The native trees are different varieties of oak and maple, hickory, fir, cedar, &c.

Fish of every variety and excellent quality are found in the river and in the sound—shad, cod, bass, blue-fish, mackerel, eels, flat-fish, black-fish, tautog, with oysters, clams, muscles, crabs, &c. In fact, this is reputed one of the finest fish markets and harbors in the country, and is the headquarters for the sporting yachts in the blue-fish and mackerel season.

Statement showing mean strength, number of sick, and principal diseases at Fort Trumbull, Connecticut, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarhal affections.*	No. of deaths.	Remarks.
1868....	119.58	385	2	1	31	27	13	17	144	.....	The malarial diseases occurred in a company just from Fort Brown, Texas.
1869....	76.66	246	.....	30	26	24	8	17	57	2	

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT COLUMBUS, GOVERNOR'S ISLAND, NEW YORK HARBOR, NEW YORK.

REPORT OF SURGEON CHARLES PAGE, UNITED STATES ARMY.

Governor's Island, situated in New York Harbor, at the junction of the North and East Rivers, in latitude $40^{\circ} 42'$ north, and longitude $74^{\circ} 09'$ west, lies 1,066 yards southeast from the city of New York. It is separated from the city of Brooklyn, which encircles it almost one-half, lying in an easterly, southeasterly, and southerly direction, by the Buttermilk Channel, an arm of the bay, formerly narrow and very shallow, now of sufficient depth for the largest ships, and measuring about one-half of a mile in width.

The island lies in a northeasterly direction about six miles from the Narrows, the entrance to the bay. It is about 22 feet above low-water mark, and contains $62\frac{1}{4}$ acres. Pagganek, the Indian name of Governor's Island, is all that survives which could call to our minds the fact that not many centuries ago the Indians here held undisputed sway.

The first place ever occupied in New York by the Dutch was Governor's Island. (*Vide Journal of a Voyage to the American Colonies in 1679-80, by Jasper Dankers and Sluyter, of Wüward, in Frusland, page 374.*) It is thus described:

In its mouth, (East River,) before the city, between the city and Red Hook, on Long Island, lies Noten Island, (Governor's Island,) opposite the fort, the first place the Hollanders ever occupied in the bay. It is now only a farm, with a house and a place upon it where the governor keeps a parcel of sheep.

In 1637, Wouter Van Twiller, a former clerk in the company's warehouse at Amsterdam, who had been appointed director of New Netherlands in 1633, secured for his own private use the island of Pagganek, which had now become popularly known, from the abundance of excellent nuts that grew there, as Nooten or Nutten Island. During the English colonial period, Nutten Island became by common consent a perquisite attached to the office of governor, becoming, in consequence, familiarly known as Governor's Island, a name it has borne ever since. From a dreary and neglected plantation, it now became a smiling garden. At a council held at Fort William Henry, on the 26th of September, 1691, it was decreed that Nutten Island, as it continued to be officially termed, and three so-called Oyster Islands—*i. e.*, Bedloe's Island, Ellis Island, the third a smaller island, now submerged—be added to the county of New York. (*Journal of the Legislative Council of the Colony of New York, 1691-1743.*)

The first immigrants were assigned, by the council of New York, on the 13th of June, 1710, to Nutten Island, where due provision was made for them, because just fears were entertained that contagious diseases existed among them. These immigrants were Palatines, homeless and destitute, who had been driven from their country in the war between Louis XIV, on the one hand, and Austria and Holland, and subsequently Spain, Denmark, and Savoy, on the other.

In 1708, about fifty Palatines passed over to England, where they were temporarily maintained, at the instance of Queen Anne, at public expense, being allowed one shilling a day until they were transported to New York, whither, soon, ten thousand of the unfortunate exiles followed them. Thus it was that Governor's Island became the first place of quarantine for New York. (*New York Documents, vol. iii, p. 550, et passim.*) The Palatines were detained on Governor's Island until September of the same year, when, no further apprehension of contagion being entertained, they were transferred to Columbia and Greene counties.

From the revolution in 1688 to the treaty of Utrecht, in 1713, during which period of time the great warfare concerning the succession of a grandson of Louis XIV to the crown of Spain was carried on, the British colonies in North America were in constant apprehension lest a French navy should assail them. Under these impressions, the successive governors of the province (Slaughter, Fletcher, and Cornbury) urged upon the people, again and again, the defense of New York, by the erection of batteries at the Narrows, at Red Hook, and at Governor's

Island. Notwithstanding the apprehended danger and the oft-repeated importunities of the governors, no measures of defense were taken, other than the appropriation of £15,000, during the governorship of Cornbury, for fortifying the "Narrows." How much of sincerity there was in the patriotic appeals of Governor Cornbury may be estimated by the fact that the £15,000 so appropriated were applied by him to building a pleasure-house on Governor's Island for himself and succeeding governors, to which to retire when inclined to free himself from business. "There has been a mighty clamor at all times, made in general terms, of the misapplication of public money by governors; but when they were called upon to give particular instances, I never heard of any, except of £15,000," &c.—(The Colden Letters, 1759.) Though the fortifying of Governor's Island was looked upon as a most important means of defense for the city of New York, it still continued, for a long time, to be the garden of the sovereigns of the province. Governor Clark, perhaps not altogether unmindful of the fact that Governor's Island afforded him a place of quiet retirement from business, in a special message, in the year 1738, writes as follows: "There is a great cause to apprehend a speedy rupture with France. Your situation ought, therefore, to awaken you to a timely provision against that event, in fortifying this town in a better manner than it is at present, by erecting batteries at proper places, upon the wharves facing the harbor, upon the side of the Hudson River adjoining the town, and at Red Hook, upon Long Island, to prevent the enemy landing upon Nutten Island." Governor Clinton, in his speech of the 17th of April, 1744, uses language of a similar import in reference to the proper measures to be taken. From the year 1756, when the arrival of Lord Londown with a large fleet allayed all fears of foreign invasion, until the extinction of the royal authority, by the meeting of the Continental Congress on the 15th of September, 1774, nothing of greater importance concerning Governor's Island can be recorded than that it was, successively, the perquisite of Governors Hardy, Delaney, Colden, Moore, Dinsmore, and Tryon—made profitable by some of them by leasing it.

Though the probable expense of erecting fortifications had been estimated, it was not until Congress had decreed, on the 6th of October, 1775, that the provincial convention be directed immediately to render New York defensible, that works of fortification were thrown up on the island. (English MSS., *ut supra*, p. 45.) But of very little avail did these works prove; for, on the 25th of June, General Howe arrived at Sandy Hook from Halifax, and landed on the 12th of July at Staten Island, having been joined by his brother, Admiral Lord Howe, from England, making, with the forces of Clinton from the South, in all a force of twenty-four thousand of the best disciplined troops in England, besides the large re-enforcements that flocked to his standard and rendered him invaluable aid by their knowledge of their country. To oppose this formidable array Washington had gathered together a force of twenty thousand raw militia. To protect New York he was compelled to hold Kingsbridge, Governor's Island, Paulus Hook, and the heights of Brooklyn. Two regiments, one of which was Prescott's, were all that could be spared to garrison Governor's Island. (Bancroft, vol. ix, p. 82.) But, on the morning of the 22d of August, 1776, the English, protected by men-of-war, landed at Gravesend, Long Island. This movement of the English was so contrary to expectation, that it was first supposed that the enemy was making a feint upon Long Island, the real design being to fall directly upon New York. But soon the main body of the British army spread itself out upon the plain which stretches from Gravesend Bay toward the east. On the 27th of August, 1776, the battle of Long Island was fought, "a day that, though so full of sorrow for the Americans, shed little glory on British arms." The retreat from Long Island, thus necessitated, was safely effected on the 30th. On the same day Admiral Howe sailed up the bay and anchored near Governor's Island. On the approach of the fleet the little garrison on the island, in command of Colonel Prescott, withdrew to New York, with the loss of one man wounded, who lost an arm by a ball from a British ship just as he was embarking. From this time, in consequence of the necessary abandoning of New York by the American forces, Governor's Island remained in possession of the British, who fortified and garrisoned it, until the restoration of peace in 1783 and the retreat of the enemy.

The fortifications on Governor's Island were now neglected and undervalued, and continued to be so until the breaking out of the French Revolution; so much so, that Governor George

Clinton, in 1784, leased the island to a certain Dr. Price, who built on it a hotel and laid out a handsome race-course, on which races were run in 1785 and 1786, and that quarantine was located here from 1794 to 1797.

It was not until 1797, after Washington had retired from the presidency, that the irritation between the United States and France grew serious. Great apprehension was felt at New York lest it should be attacked by a French squadron. Pressing remonstrances were made to Congress, that the city be protected in its helpless condition. The State having, by the Constitution, ceded the power of providing for the common welfare and the general defense, the people became clamorous for protection. The general government contended that it had not the power to pass any law impairing the obligations of contracts; that a balance of \$2,075,846, due from the State of New York to the United States, by an award of the "Commissioner of Accounts," dated Philadelphia, December, 1793, must first be paid, that thereby Congress might be enabled to make the necessary appropriations. At length, after much altercation, Congress declared, by a law passed May 3, 1798, "that where any State, which was found indebted to the United States, by the report of the commissioners for settling accounts between the United States and the individual States, should, with the President's approbation, proceed to finish or complete any fortifications heretofore commenced by such State, for the defense of any port or harbor within the same, or shall, under the direction of the President of the United States, make and erect any additional fortifications, pursuant to the act entitled 'An act to provide for the further defense of the ports and harbors of the United States,' providing, that no expenditures exceeding the balance found and reported against the respective States, shall be allowed as aforesaid; and provided, that the fortifications, for which the whole or any part of the expenditure shall be allowed and credited as aforesaid, with their privileges and appurtenances, shall be, and shall be declared and established as the property of the United States, while maintained by them." Under the provisions of this act the State was duly credited with the several amounts of money it had expended, by authority of legislative acts, in the erection of fortifications on Governor's Island. By the authority of an act passed March 26, 1794, £30,000 had been so appropriated. This sum had been expended, under the supervision of George Clinton, Matthew Clarkson, James Watson, Richard Varick, Nicholas Fish, Ebenezer Stevens, and Elijah Hammond. A further sum of £20,000 had been granted April 6, 1795, to complete certain works on this island and on Ellis Island. The general government had given but little attention to the fortifying and improvement of the island. In a communication to the House, dated February 28, 1794, the committee directed to report on such of the ports and harbors of the United States as required to be put into a state of defense, with an estimate of the expenses thereof, made the following estimates for the fortifications of Governor's Island. The expenses of constructing batteries, embrasures, and platforms for twenty-four pieces, \$1,727 52; a redoubt with embrasures, \$810; magazine, \$200; block-house or barracks, \$500; contingencies, \$500; making a total of \$3,727 52. The committee furthermore recommended that the parapets of the batteries and redoubts should be made of earth, and that the island be garrisoned by troops in the pay of the United States.

The Secretary of War reported, December 19, 1794, that one bastion, commanding two low batteries, had been undertaken and was in considerable forwardness, but observed that the works, being only sodded, would not stand very long. On January 18, 1796, the Secretary reported to the Senate that Governor's Island had been fortified with a fort, made of earth, and two batteries, under its protection, partly lined with brick masonry; that there had been erected two air-furnaces, a large powder-magazine, and a barracks for the garrison; on February 10, 1797, that no alterations had been made since January, 1796, except in the repairs and such additions as could be made by the garrison. During this time there had been expended by the general government on the fortifications of the island as follows: in 1794, \$1,327; in 1795, \$6,866 54; in 1796, \$1,124. But now the apprehension of a French invasion caused such clamor for protection among the people that immediate attention by the general government was bestowed upon properly fortifying Governor's Island. Thirty thousand one hundred and seventeen dollars were at once appropriated to be expended on the fort, which now became known as Fort Jay. Such was the fervor of the day that the professors and students of Columbia College went in a body to Governor's Island and worked on the fortifications with shovels and wheelbarrows!

Liberal appropriations were made by Congress in the three succeeding years for completing and improving the fort. In 1799 Congress appropriated \$30,116 18; in 1800, \$20,124; in 1801, \$10,338 05. No further improvements were made until 1806, when Fort Jay, with the whole of its buildings, was demolished, except the walled counterscarp, the gate, the sally-port, the magazine, and two barracks; all the rest was removed as rubbish, to give place for a work composed of durable materials. On the site of the old fort a new one, Fort Columbus, was erected, an inclosed pentagonal work with four bastions of masonry, calculated for one hundred guns, being of the same shape on three of its sides as Fort Jay, with the addition of 14 feet on each side, and on the north side of a ravelin, with two retired casemated flanks. Such was Fort Columbus when it was completed in 1809. (Report of the Secretary of War, laid before Congress by President Jefferson on the 6th of January, 1809.) Castle William, (named after General William, of the New York militia,) situated on the extreme westerly point of the island, on a bed of rocks, which previously had much endangered navigation, as this point was totally submerged except at a very low water, was begun in 1807 and completed in 1811. No additions were made to the foregoing works, and few repairs undertaken, until 1832, when thorough repairs were instituted and prosecuted in the most efficient way, and continued without interruption until the month of August, when the work was abandoned, in consequence of the alarm created by the cholera, which was at that time raging with considerable violence among the workmen. The necessary measures having been taken to insure the health of the laborers, the interruption was of short duration, and on the 4th of September the work was progressing with the usual vigor.

The post was again evacuated, the troops in garrison being ordered to Florida, in the year 1836. From the time of its reoccupation in the following year until November 15, 1852, when by General Order No. 38 Fort Columbus became a recruiting depot, it was an artillery post, though, from time to time, detachments of recruits were sent, for want of accommodation, from Fort Wood, the principal recruiting depot, to be here temporarily quartered; indeed, it was by reason of the frequent conflicts of disputed authority between the commandants of Fort Columbus and the superintendents of the recruiting service, resulting from the assignment for quarters of such recruits, that Fort Columbus was exclusively appropriated as a recruiting depot. It was at once made the principal depot of the general recruiting service, in place of Fort Wood on Bedloe's Island, and it has continued to be such until the present time.

The post of Fort Columbus comprises all of Governor's Island, except about six acres to the north, which is reserved for the New York arsenal.

The island is irregular in form, but approaches nearly the segment of an oblate spheroid, its longest diameter being from north to south and about 800 yards in length. The transverse diameter is about 500 yards. It has an elevation above high-water mark of 20 feet. Its face is smooth and green, with a rich carpet of grass.

The basis rock of Governor's Island is gneiss, composed of quartz, feldspar, and mica, arranged in laminae, the rock being stratified and hypozoic. It is covered everywhere with alluvial and drift deposits. The general direction of the strata is from north to south, and the dip, generally to the west, averages within 10° of vertical. That the strata are almost vertical or dip at a high angle is worthy of consideration in relation to the practicability of successfully boring artesian wells. The water now in use, derived from shallow wells, is hard from calcareous and magnesian salts, and contains a great quantity of organic matter. The desirability of artesian wells is therefore apparent, but, as these are most likely to be successful where the strata are slightly inclined and gradually dip toward the place of boring from higher ground, in at least one direction, whereas the strata here dip at a high angle, and deep channels surround the island, no water, therefore, could be expected, except that flowing through the gravel beds in the depressions along the edges of the stratum, parallel to the line of bearing. (See Geological Survey of New York State, *passim*.) The alluvial deposits, consisting of loam, clay, sand, and gravel, with the drift deposit—a mixture of abraded materials (boulders, gravel, and sand)—blended confusedly together, cover everywhere the underlying primitive rock. These alluvial and diluvial deposits must be, in the northern and southern parts of the island, more than 100 feet in depth, growing thinner and thinner toward the center.

Fortifications are located on the northwest and southeast ends of the island, and one near the

northern boundary. The officers' quarters, hospital, storehouses, and other buildings are located on the east side of the island; connecting these, brick walks are laid, and on each side of the walks are trees, planted at regular intervals. In some portions of the island handsome groves of large trees are growing, where the shade is very dense in summer, and fungi grow in great profusion, encouraged by excess of moisture.

The main work, now called Fort Columbus, is situated on the highest point of the island, near the northern portion, and is an old-fashioned, four bastioned fort, with deep ditch. Within the fort are situated four buildings, extending coequal with the curtains of the fort, and surrounding the parade. These buildings are built of stone and brick, with two stories and basement, and are roofed with slate. The basements and first stories of these buildings are bisected by sally-ports. Corridors extend the whole length of these buildings on the face looking to the parade; on all the buildings, to either side of the sally-ports, a piazza is built the width of the corridors, and on three of the buildings a piazza extends the whole front of the upper story, but only half the width of the corridor. This piazza is supported by iron rafters, extending from the building to the pillars of the corridor; a stairway leads from each end of the upper piazza to the lower one. Three of these buildings, viz., those on the north, east, and south sides, are constructed for barracks, and one, that on the west side of the parade, for officers' quarters. The officers' quarters and men's barracks differ in the arrangement of rooms, officers' quarters being constructed with halls, and stairways in the halls; in the men's quarters are no halls, all stairways being built out of doors. Adjoining each end of these buildings, next to the ramp, are located small, triangular buildings, with one story over a basement resting on the level of the parade. The basements of these buildings are used, some for store-rooms and company kitchens, others for privies, and the upper stories are devoted to various uses—tailor shops, &c. One of these buildings is transformed into a bakery. Over the main sally-port is a small building divided into two rooms.

The basements of each of the men's barracks are divided into two sets of kitchens and mess halls, arranged for two companies; each set has one large room 36 by 19 feet, with one door and two windows opening on the area, and two doors opening, one at either end, to two smaller rooms, measuring 12 by 19 feet. One of the smaller rooms has a window, and is used for a kitchen; the other is the bread room of the company mess. Each of these has a door opening on the area. The pitch of the basement is 7 feet 6 inches; the doors measure 7 by 3 feet 4 inches; the windows 4 feet 2 inches by 3 feet 4 inches. The first story of the barracks is divided into two large and four smaller rooms, and is used for dormitories. The dimensions of the larger rooms are 38 by 19 feet, and of the smaller rooms 13 feet 9 inches by 19 feet. The height of this story is 9 feet 4 inches. The large rooms have one door opening on the piazza, and five windows, three looking to the ramparts and two to the parade; the smaller rooms have one door opening on the piazza, and one window opposite, looking to the ramparts. The measurement of the windows and doors of this story is as follows: Doors to the large rooms, 6 feet 8 inches by 3 feet 4 inches, with transom lights; doors to small rooms, 8 feet by 3 feet 4 inches; front windows, 6 feet by 3 feet 4 inches; back windows, 4 feet 2 inches by 3 feet 4 inches. This story is partially covered by the terre-plein of the fort. The second story is divided into three large rooms and two smaller ones at the ends of the building. The rooms have each one door, opening on the piazza. The large rooms have five windows, three opening to the ramparts and two to the parade; the small rooms have one window, opening to the ramparts. The doors in this story measure 8 feet by 3 feet 4 inches, and the windows 6 feet by 3 feet four inches. The large and small rooms are of corresponding dimensions with those in the first story. The arrangement of the fireplaces and chimneys is the same in all the buildings. At each end of the large rooms is a fireplace and chimney, and the small rooms have a fireplace and chimney in the partitions separating them from the large rooms.

The officers' quarters are divided, on either side of the sally-port, into symmetrical halves by a hall, on each side of which are two rooms, communicating with each other, but only one opening on the hall. In the upper story, over the sally-port, are two half rooms opening into the inner rooms. On the first and second stories the rooms next the hall measure 15 feet 2 inches by 19 feet 6 inches; the inner rooms measure 14 feet 2 inches by 19 feet 6 inches. The half rooms measure

10 feet 6 inches by 9 feet 5 inches. The height of these rooms is 9 feet 4 inches. In the basement the rooms measure 15 feet 2 inches by 19 feet 6 inches, by 7 feet 5 inches high. In each of the rooms in the upper stories are two windows, one looking to the ramparts, and one opposite opening toward the parade; the doors and windows in these stories are of corresponding measurement with those in the barracks. Each basement room has one door and one window opening on the area, of like corresponding dimensions with those in the barracks. Doors open to the hall from the area and from the piazza. The halls are 8 feet wide, and extend the depth of the building, from basement to rafters; in this hall are built stairways and landings. The fireplaces and chimneys are in the partitions separating the rooms. The building contains 16 rooms and 8 kitchens, and is reckoned for eight sets of quarters.

The next work of importance in point of extent is Castle William, a circular stone castle with three tiers of casemates and a barbette battery. The circle is incomplete on the face covered by Fort Columbus. It is situated on the northwest corner of the island, and distant from Fort Columbus 200 yards. The upper tier of casemates is used for quarters for recruits and transient troops, and for confinement of prisoners. The summit of the castle, and upper tiers of casemates, are reached by two winding stairways built of stone and inclosed in circular brick towers. Piazzas extend around the inner face of the castle, at the two upper tiers of casemates, and are supported by iron braces jutting out from the wall. In the upper tier the piazza furnishes the only means of communication between the casemates. In the lower tiers archways are built, connecting the casemates all around the castle. Within the circle is constructed a long wooden building, to be used as a mess hall and kitchen for recruits.

The wooden building within the area of the castle measures 59 feet 10 inches by 30 feet by 8 feet 9 inches to rafters, with a pitch to the roof of 8 feet. Three small rooms are cut off in this building for store-rooms; they measure 10 feet 4 inches by 9 feet 8 inches. There are one door and two windows at each end of this building, and four windows on one side and two on the other. On one side is a large range for cooking.

On the southeast side of the island, about 60 yards from the south battery, is located the hospital. It is composed of two buildings; one of brick, built in 1840, and the other a frame structure erected in 1862, during the late civil war, for a general hospital. Both buildings are now used as a post hospital, and the spare wards devoted to various purposes. One of the wards is used for a Catholic chapel, and two of the wards of the brick building are used for courts-martial, for examination of recruits, lectures, and balls.

The brick building contains two stories and a basement, and has a flat tin roof. The plan of the building is shown in Fig. 2, 1 being the ground plan of the basement; 2, of the first floor; and 3, of the second floor; A, wards; B, bath-room and water-closet; D, dispensary; E, steward's rooms; K, kitchen; O, office; S, store-rooms. The height of the basement is

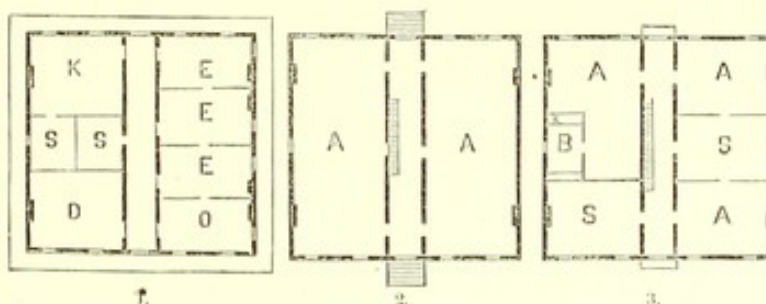


Fig. 2.

8 feet 4 inches; of the first story, 12 feet 9 inches; and of the second story, 11 feet 10 inches. The main wards on the first floor, measure 48 by 20½ feet. Two large arched doorways open near each end of these rooms. The light and ventilation are deficient, and although the rooms are spacious they are not adapted to hospital purposes. About 30 feet to the rear of the hospital is a long brick building, one story, 8 feet high, divided into four rooms; two used for quarters for matrons, one as store-room, and one for a dead-house.

The frame building forming a part of the hospital is 12 feet west of the brick building above referred to. The outline and plan of this building are shown in Fig. 3, the upper cut, marked 1, representing the basement, and the lower, marked 2, the main floor; 1 2 3 4, wards; 5, hall; 6 verandah; 7, operating-room; 8, brick walk; 9, grass; 10, wash-room; 11, dining-room; 12, laundry; 13, store-room; 14, root cellar. The roof of this building is shingled, and has a pitch of 4 feet. Wards 1 and 2 measure 57½ by 24 feet; wards 3 and 4, 78½ by 24 feet. In the ceiling

of each ward are cut two openings, each 2 by 4 feet, intended for purposes of ventilation. The height of all the rooms is 12 feet, that of the basement is 7 feet 6 inches. The laundry contains a range with water back for furnishing hot water to the bath-room.

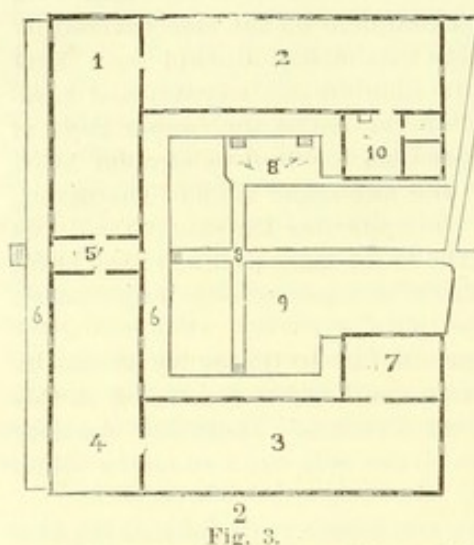
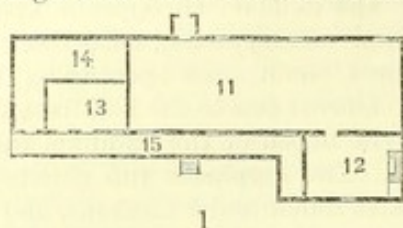


Fig. 3.

South of the commanding officer's quarters and on a line with it are two buildings, distant from each other 50 feet, in which are contained four sets of officers' quarters. The buildings are frame, of two stories, with basement and attic, and shingled roof. Each building contains eight rooms on the first and second stories; four rooms in basement and four attic rooms.

To the rear of these buildings and also that of the commanding officer's quarters are gardens, 60 feet deep, planted with fruit-trees, shrubs, &c. A portion of the garden can be devoted to vegetables.

To the east of the brick hospital about 30 feet is a quadrangular frame building, of one story and basement, cut up into six rooms on the main floor and six rooms on the basement, used for quarters for married men and laundresses. To the west of the south battery is a long one-story frame structure, divided into twenty rooms, furnishing quarters for ten married men. The sutler's store, a small frame building of one story, is a few yards west of this. To the north of the sutler's store is the carpenter and paint shop.

North of the south battery and distant about 25 yards is the chapel, a tasteful gothic frame building, with belfry. It has four wings, and is capable of seating one hundred persons.

Cemetery.—At the southwest of the island, about half an acre is appropriated for a graveyard. The graves are regularly arranged in lines, and the whole surrounded by a neat iron fence.

Bath-room.—At the northeast end of the island is built a wharf, extending 60 feet to deep water. On the wharf is a storehouse, and adjoining it, built on piles, is a boat-house. Between the boat-house and store-room the space is utilized as a bath-room.

WATER SUPPLY, ETC.

In close proximity to two large cities where an abundance of good water is supplied, Governor's Island, an important military post, depends for its supply of water on wells and cisterns. It is perfectly feasible to connect Governor's Island by submarine pipes with the mains of the water supply of Brooklyn or New York City; preferably the former, as it is conceded the water thereof is

East of Fort Columbus, about 40 yards, extending east and west, is a long one-story brick building, 100 feet by 25 feet, with shingle roof. It is divided into three compartments; one is used for a billiard-room, one for ordnance store-room, and the other for a library.

At the northeast corner of the island is located the adjutant's office or "headquarters," a two-story brick building with basement and attic, and shingled roof. It has a front and rear piazza. This building contains commanding officer's and adjutant's offices, and in the basement the guard-house for the main guard. No prisoners are, however, confined here. South of the adjutant's office 30 feet is the commissary and quartermaster's store-house, a brick building one and a half stories high, with basement; it is 50 feet by 40 feet, and divided internally by temporary partitions.

OFFICERS' QUARTERS.

On the same line, distant from the commissary building 50 feet, is the commanding officer's quarters, a large double house, two stories, basement and attic, built of brick, and roof shingled. Broad piazzas cover the front and rear of this building. In the basement are three rooms, on the first floor are four rooms, on the second floor five rooms, and there are two attic rooms.

purier, and quite as abundant. Blackwell's Island is connected with the Croton water-pipes, and the current between the shores so connected is twice as swift as the stream that flows between Governor's Island and Brooklyn, and the channel also is deeper. The wells on Governor's Island are four in number, one at Castle William, furnishing a small supply of tolerably good water; it is pumped dry in ten minutes' pumping, and requires some time to refill. Another well is in Fort Columbus, furnishing a liberal supply of water, but of so impure a character as to be unfit for drinking purposes. Another well, near the hospital, yields tolerably good water in abundance and is more used than any other supply on the island; all the animals are watered at this well. In the south battery is a well of the purest water that has been reached by digging, and it is never exhausted. All these wells are furnished with pumps. The waters of the wells in Fort Columbus, in the south battery, and the one near the hospital have been tested for organic matter by Acting Assistant Surgeon B. F. Craig, United States Army, and the result of the analysis published in Circular No. 5, Surgeon General's Office, of 1867. In addition to this miserable supply of water from wells, the rain is collected from the roofs of nearly all the buildings, in cisterns, but the cisterns are faulty in construction, being simple reservoirs for the reception of the washings of the roofs, and from them is drawn off the water unfiltered and saturated often with decomposing vegetable matter. A simple partition constructed in the cistern, with a filter near the bottom, on one side of which the water should be received and on the other side drawn off, would have given always wholesome drinking-water; as it is, cleaning these cisterns twice a year fails to keep them sweet and clean.

The privies are most of them constructed over tide-water, so that the excrementitious matter is thoroughly disposed of and so diluted by sea-water as to be rendered perfectly inoffensive. The officers' quarters are furnished with wells for privies, and sinks are dug in Fort Columbus; these, no doubt, tend to vitiate the well-water.

Statement showing mean strength, number of sick, and principal diseases at Fort Columbus, New York Harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	Number of deaths.
1868.....	581.41	1,428	1	44	369	143	65	4	171	2
1869.....	513.75	666	.....	52	113	86	34	1	85	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WADSWORTH, STATEN ISLAND, NEW YORK HARBOR.

REPORT OF SURGEON J. C. MCKEE, UNITED STATES ARMY.

The fortifications and government reserve on Staten Island west of the Narrows, commanding the entrance on that side of New York Harbor, are known by the name of Fort Wadsworth. They are in latitude 40° 30' north, longitude 74° 03' west; distant from Coney Island east 6.45 miles; from Sandy Hook 8.08 miles; from Fort Hamilton one mile; and are named in honor of General Wadsworth, a distinguished soldier who fell in the late civil war. It was formerly known by the name of Fort Richmond, being placed in the county of that name, State of New York. The fortification on the top of the hill, the commanding point on the reserve, is known by the name of Fort Tompkins, and commands the work of Fort Wadsworth, a triple casemate of granite, as well as Battery Hudson and the other continuous water batteries which defend the passage. It lies 140 feet above the level of the sea.

The reserve contains about 100 acres; surface very broken and rugged; its slopes and declivi-

ties are steep and rapid. This reserve, originally belonging to the State of New York, was, by an act of her legislature, February 10, 1818, sold to the United States, and was transferred to its jurisdiction during the administration of John Quincy Adams in 1827. The following description is taken from report of Dr. Pulling, late acting assistant surgeon United States Army:

The hills are formed of the drift deposit, composed of siliceous earth with numerous boulders of trap, serpentine and granite scattered through it. These rocks are exposed in places a few miles to the northward, occasionally though rarely. A stratum of fine clay is found at a short distance below the surface, alumina as a constituent of the soil being generally deficient. These hills have a geological connection with the range of eminences on Long Island which extends from Astoria to Fort Hamilton; and are separated from this chain of heights by the narrows or channel about a mile wide, forming the entrance to New York Harbor. The widening of this channel has been going on until recently. The shore upon which the batteries are placed continued to be slowly encroached upon by tidal and fluvial action until that point was protected by artificial means. The greater part of the material thus removed has probably been deposited along the southeastern shore of Staten Island, and has contributed to the production of the salt meadows, which border much of that coast, their origin being quite recent and their formation still in progress.

The hills on the island embosom many deep hollows or basins, some of which are in the limits of the reservation, exercising an important influence on its hygiene. The soil is very spongy and porous, and absorbs a large quantity of water. During the warm weather great atmospheric humidity is maintained from the rapid evaporation arising from the surface of the earth, which is said to be hardly ever dry, and when exposed or denuded of vegetation is never free from fungi. Having no outlets and receiving the drainage from the surrounding surface, these valleys, already mentioned and described, usually contain ponds or form into swamps, thus making large evaporating basins, which, during the summer and autumn, emit great quantities of vapor, in connection with the diffusible products of organic decomposition. I have determined by careful experiment that the humus of some swampy areas in the immediate vicinity of Fort Wadsworth is capable of evolving moisture by evaporation more rapidly than an equally extensive surface of water under the same temperature.

The men occupy for dormitories four casemates in Fort Tompkins, averaging ten men and beds in each. The casemates are comfortably warmed by a large anthracite coal stove in each, lighted by candles at night, ventilated and lighted by two windows in the rear 5 feet high and 8 inches wide, two in front 6 feet 6 inches high and 3 feet wide, and a transom over the door 3 feet by 2; air space ample; each occupant has between six and seven hundred cubic feet. Bedsteads are of iron, single, made with a hinge in the middle so as to fold up in day-time; bedsacks are filled with straw, and changed as often as required to insure cleanliness and health.

There is one large brick water-closet or sink on the slope facing the sea. Earth-closets were constructed by the engineers, but owing to their defective and faulty construction they did not fulfill the purpose required of them, and they had to be abandoned. One casemate is used for bathing and washing; basins are supplied, water is furnished in a sufficient quantity from a large hogshead on a platform. In winter, bathing once a week is required, in tubs in a compartment fitted up in casemate; in summer men bathe in the ocean. The dining-room and kitchen are adjoining casemates, and are well furnished and in good condition.

Quarters for laundresses are one-story wooden buildings, south of Fort Tompkins; are ample and well ventilated; water for washing supplied by a convenient pump.

The officers' quarters are situated at the northern end of the reservation, and are as follows: Commanding officer's quarters, one-story frame building, containing seven rooms; an adjoining building, also one-story frame, containing eleven rooms, and a one-story and attic frame building containing fourteen rooms; the latter was built in the months of October and November, 1869, and is in good condition; the former were built in 1862, were hastily constructed of poor material, and are at present much worn, (are to be torn down this summer;) they are all well lighted and ventilated.

The adjutant's office, quartermaster's and commissary's office, and the store-houses are in three casemates in the north wing of the fort. Company office in casemate in opposite wing adjoining the men's quarters.

The guard-house is placed in two casemates in the western wing; one is occupied by the guard and the other by the prisoners. The guard-house for the prisoners is divided into six cells, each 7 feet long, 4 feet broad, and 6 feet 10 inches in height. The top is secured and guarded by heavy plank lattice, so as to secure the equable ventilation of each cell with the air in the casemate. Prisoners are locked in cells at bed-time; are furnished with bedsacks and straw; have

the same diet as the company; and are supplied from company kitchen. They use the company sink, and are required to bathe once a week.

The post hospital is a frame building, constructed in September and October, 1869, in accordance with plan of "Circular No. 4, Surgeon General's Office, Washington, April 27, 1867," and consists of an administration building two stories high, back building (kitchen) one story high, and one wing (ward) one story high, and has a capacity of twelve beds; it is well built, and properly and neatly furnished.

There is no post bakery. The flour is exchanged with a village baker for bread, which is of good quality. There are four laundresses in the company; no general laundry; no chapel, and no school-house.

The library is in a casemate in the south wing adjoining the men's barracks; and has an average number of 250 bound volumes, composed of historical works and standard novels, belonging to the company. The men are allowed to keep the books for a certain number of days; and are held responsible for loss or damage. The books are always carefully handled and promptly returned.

The water supply is by means of a large cistern of about 2,000 gallons capacity, and is of good quality. Water is hauled to the officers' quarters, hospital, &c., from a well near the light-house, in a water-wagon, the quantity daily being about 200 gallons; about 40 gallons of this go to the hospital. On adding permanganate of potash, a small amount of organic matter is observed.

Dr. Pulling examined many wells in the vicinity, and remarks that most of them are mere receptacles of surface-water, which, percolating through a malarious soil, carries with it, in summer, highly noxious material, constituting a serious source of disease.

There is no effective fire apparatus at the fort. Drainage is natural and artificial, and is efficient; an outlet is made from each end of a dry ditch of Fort Tompkins, terminating in the sea. The slops are carted every morning and thrown into the sea.

For the first time at this fort, under General J. M. Brannan, First Artillery United States Army, commanding, a post garden of one and one quarter acres of ground is inclosed and cultivated. All the ordinary garden vegetables are cultivated. A potato lot of one and one half acres has also been planted, and promises an excellent yield.

Statement showing mean strength, number of sick, and principal diseases at Fort Wadsworth, New York Harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	Number of deaths.
1868.....	78.41	115	56	14	1	10	2	3	16	.....
1869.....	72.33	163	66	19	1	13	2	1	23	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT HAMILTON, NEW YORK HARBOR.

REPORTS OF SURGEONS H. R. WIRTZ AND R. H. ALEXANDER, UNITED STATES ARMY.

Fort Hamilton is situated on the southwest shore of Long Island, on the Narrows. Latitude 40° 43' north, longitude 74° 1', west; distant about six miles from New York City.

The western shore of Long Island extends in a sort of curve from opposite the southern extremity of the city of New York, with the convexity to the west, and Fort Hamilton would form one extremity of a chord running very nearly north and south, of which New York City would form

the other extremity. A similar convexity of the northeastern part of Staten Island forms with Long Island a strait called the "Narrows," by which the inner bay of New York communicates with the outer, or maritime bay. Fort Hamilton, in conjunction with Fort Wadsworth, on Staten Island, commands the Narrows, and Fort Lafayette, erected on an artificial island, lies off Fort Hamilton to the east of the main ship-channel.

From Fort Hamilton is presented a fine view, not only of the Narrows, but a portion of the inner bay, and in a southerly direction, across the outer bay, the Highlands of Jersey are visible by day and the light-houses at Sandy Hook by night. Looking to the west, the hills of Staten Island bound the horizon, covered with stately residences and patches of the primeval forest. Nothing separates Fort Hamilton on the southeast from the Atlantic but a narrow strip of sand called "Coney Island."

The name Fort Hamilton is applied not only to the military work, but also to the village that has sprung up in its neighborhood. The fort is really situated in the town of New Utrecht, Kings County, New York. The town of New Utrecht was settled during the Dutch rule, in 1654, by about twenty families from Holland, and Kings County was organized by the English in 1683. The English retained the sovereignty after this until the American Revolution, and the neighborhood of Fort Hamilton became memorable during that period as being the place where the English troops under Lord Howe landed, previous to the battle of Long Island. Such an important point as the "Narrows" could not long escape the attention of the government, and on the 25th of August, 1824, Lieutenant Talcott, of the Corps of Engineers, was ordered to the proposed site of Fort Hamilton, and had the survey made and prepared the wharves, &c., for the reception of material and the commencement of work. Ground was broken on the 26th of April, 1825, Captain George Blaney, Corps of Engineers, being superintending engineer, and Lieutenant Mansfield, Corps of Engineers, his assistant, being in immediate charge. The corner-stone was laid on the 11th of June, 1825; the fort completed, reported ready for occupation, and turned over for that purpose on the 10th of July, 1831, by Major De Russy, who was then in charge of the work.

The features of the country to the north and east of the fort are peculiar. Along the shore the banks are precipitous, and the fort itself stands on an elevation of about 47 feet above low-water. Back from the shore the land becomes rolling, and exhibits a series of elevations and depressions till we arrive at Flatlands and Flatbush, names which sufficiently express the character of the surface.

This peculiar feature is the most important element, next to its insular position, in the topography of the post, the soil being alluvial, consisting for the most part of clay on top, then sand, pebbles, &c., and frequently a second stratum of clay, and the rolling character of the surface, producing numerous depressions, some round, some oblong, varying in size from 30 feet in diameter to as many yards. The result is that the whole country is dotted over with ponds from the surface drainage. Some of these ponds are clear, with a gravelly or clayey bottom and grassy borders; others are surrounded with trees, and filled up with bushes and rank grasses, and covered in summer with a green slime. It has been calculated that within a radius of a mile about Fort Hamilton there are at least sixty of these ponds. East of the fort, near the new battery, is a marsh of considerable extent, formed by the drainage of the higher land, and imperfectly separated by a bank of sand from tide-water.

The reservation contains about 96 acres, and exhibits all the peculiar features of the surrounding country. There is scarcely a level spot on it; it is a series of ridges and round elevations, with depressions of every conceivable shape between them. Its general direction is northeast and southwest. The highest part is the northeast corner, which is 66 feet above sea level. The hospital is built on an elevation of 42 feet; back of it the land rises to 53 feet. An extensive marsh or pond occupies the ground between the hospital and other public buildings.

The parade ground of the fort is 45 or 50 feet above low water. There are six small ponds or "wet spots" on the reserve, and one large marsh or bog. There are three small ponds east and northeast of the hospital, two or three still smaller back of it, and one of considerable size back of the redoubt. The great marsh is about 200 feet in its long diameter, with a growth of long grass and stunted bushes, and having a deposit of peat on one border. It is now drained, and a

vast surface formerly under water is now exposed to the influence of the sun, and intermittent fever is as prevalent now, if not more so, as before this drainage was effected.

The soil where it is not stony consists of a clayey loam with rich muck and peat beds in places, and a substratum of sand. Boulders of all sizes are scattered over the surface, and patches of pebbles and gravel crop out here and there on the sides of declivities. The boulders and blocks are principally of granite, red sandstone, greenstone, &c. Trees of various kinds are sparsely scattered over the reserve, the principal collection being a grove of oak, poplar, maple, dogwood, &c., near the northeast extremity. There is no running water, and there are no springs. The climate at Fort Hamilton is variable, the monthly mean of temperature for 1868 being as follows: January, 25°; June, 62°; December, 36°. The prevailing winds are southwest in summer, and southeast in winter.

The quarters for the men are stone casemates, each 44 by 14 by 12 feet, badly ventilated, damp and leaky, and totally unfit for quarters. The air space per man is about 175 cubic feet. The majority of the enlisted men sleep upon bedsteads composed of board slats, an inch thick, supported by iron trestles, and better adapted for the purpose than anything in use. Bedding of sufficient quantity, but blankets of inferior quality. There are no bath-rooms or lavatories, the men performing their ordinary ablutions at the wells and cisterns near their quarters; during the summer months they bathe frequently in the bay near the fort. The water-closet is built upon the fort dock, over the water, and the excreta removed by the tide. It being the only water-closet to which the men have access, it is inconvenient for night purposes on account of its distance (about 250 yards) from the quarters. The introduction of the earth-closet in one of the unoccupied casemates on a level with the ditch was contemplated, but as yet no action has been taken in the matter. The kitchens are in casemates adjoining the quarters; they are in good condition and of sufficient capacity.

The quarters of the laundresses and married soldiers are two sets of weather-boarded frame buildings built on the northeastern portion of the reserve, near the hospital, on a slight elevation; one set, occupied by the non-commissioned staff, 75 by 26 feet, containing four rooms 12 by 18 feet, two on the ground floor and two in the attic, with doors intervening and piazzas in front and rear ventilation excellent. The other set, occupied by laundresses, is 116½ by 43 feet, constructed similar to that occupied by the non commissioned staff, with the exception that there are no doors communicating between the front and rear rooms, thereby preventing the proper amount of ventilation, and making the quarters so excessively warm during the summer season as to be almost insupportable.

The officers' quarters consist of thirteen casemates, occupied by nine officers and their families, and three sets of one-story frame buildings filled in with brick, and with Mansard roofs, the latter consisting of one set of colonel's quarters, occupied by the commanding officer, one double set captain's, and one set major's, occupied by the surgeon; they are heated by coal in grates and stoves during the winter months, and supplied with water from wells and cisterns. The casemates are dark and damp. The frame buildings were put up in the cheapest manner, without closets or other conveniences, and one of them is on the edge of a peat bog, which must always render it an unhealthy residence. It was built there in opposition to the advice of the surgeon of the post. The water-closets for the frame buildings consist of the ordinary privy vaults. Those formerly in use for officers' quarters in casemates have been abandoned and closed, and the commode or earth-closet recently introduced. The earth-closet does not appear to give general satisfaction, the objection made to it being want of capacity, non-deodorizing quality of the earth supplied, and the difficulty in having the contents of the vessels removed—objections, however, that could be overcome with proper care and attention. The principal difficulty appears to be in having the vessels emptied. It was made the duty of the prisoners confined at the post, but the majority of them positively refused to do it. They would scatter the contents over the closets. Within a few days past an extra quantity of earth and barrels have been placed in the apartments containing the closets, with a view to the better working of them. From personal observation, I believe the system to be good, and preferable to the vaults, provided all due care be taken in selecting the earth, keeping the apartments in good working order, and careful removal of the vessels containing the excreta. The old hospital building might have been erected with any conceivable object except that of a hospital.

It has not the first element of such a structure, being situated on the borders of a marsh and cut up into four little rooms on the lower floor, and into two wards on the upper, of which it is sufficient to say that the ceilings are about 7 feet from the floor, and the windows about $2\frac{1}{2}$ feet square, and nearer the floor than the ceilings.

The main building is 32 by 40 feet, with a hall 7 feet wide running through, and to this has been added a wing 25 by 30 feet. The house has lately been subdivided by board partitions into still smaller rooms, and is occupied by eight soldiers' families—sixteen adults and fourteen children.

The quartermaster's storehouse is a two-story frame building. The lower story has two rooms for offices in front, and a room back, 40 by 20 feet, for stores. The upper story, for camp and garrison equipage, is one large room, 65 by 20 feet. The commissary storehouse is a one-story shanty, 30 by 24 feet. Beside these there is a blacksmith shop, carpenter shop, and a fine large new stable, capable of containing fourteen horses, with carriage-room and granary.

The post hospital is what is called a "temporary hospital," built of frame, and partly lathed and plastered inside and weather-boarded outside, with ridge ventilation in the wards. It is situated near the upper northeast end of the reserve, on a moderate eminence about 130 yards back from the State road, fronting to the northwest, its greater length being northeast and southwest. It consists of four separate structures, the administration building, two wards, and a kitchen.

The administration building is a frame house, two stories high, shingle roof, weather-boarded outside and lathed and plastered inside. Its front length is 36 feet by 25 deep. A passage-way runs through from front to rear, and a flight of steps leads thence to the second story. There are four rooms on each floor, two on each side the entry-way, about 10 by 12 feet, each lighted by four windows. The ground floor rooms on the left of the entrance are used as surgeon's office and dispensary; these communicate, and the dispensary has a sliding window opening into the entry for the delivery of prescriptions. The two rooms on the right of the entrance are used as store-rooms, one for medical supplies and the other for bedding, furniture, &c. Three of the upper rooms are occupied by the hospital steward and his family, and the remaining room is applied to the purposes of direction and chemical and microscopical investigation. The two wards, one on each side of the administrative building, are on a line with its rear, and are 88 feet long by 25 feet wide; height of wall to the eaves, 12 feet; to the peak of roof, 18 feet. The walls are plastered inside, but not ceiled above, being open to the roof, where a ridge ventilator, with shutters, extends the whole length. The northeast ward forms one large, beautiful room, with two small apartments boarded off at the far end, one for nurses, the other for wash and bath-room.

The southwest ward is divided into two rooms by a passage-way through the building from front to rear. The farther room is used as a ward, and has two small apartments boarded off, as in the large ward; the other room has never been occupied by sick, but could be applied to that purpose if needed. It has, however, served for examining recruits, as a sort of sitting-room for convalescents, &c. The wards are well lighted by windows on all sides—two at each end, and seven front and seven rear—with space between each window for two beds. A porch 6 feet wide runs the whole length of each ward on the side facing the northwest. The superficial area of the large ward is 2,200 square feet; of the small one, 1,075 square feet; total, 3,275 square feet now applied to hospital purposes, and furnishing in cubic space 47,487 cubic feet, or about 1,180 cubic feet of air space per bed. At the end of each ward is a door opening upon a platform, leading to a small water-closet, from which a urinal and drain convey the water to a cesspool, and in which provision is made for the reception of the discharges of patients who are too sick to resort to the privy. Each little house, about the size of a sentry's box, is separated from the ward, so that a current of air passes between them.

The kitchen is a one-story structure, 40 feet to the rear of the administrative building; the walls are plastered, but the ceiling is open to the roof. It is divided into two rooms. The kitchen proper is 14 by 24 feet, and the mess-room 10 by 24 feet. A small apartment for a pantry is boarded off from one end of the kitchen, and a snug little cellar, bricked all around, with entrance from the outside, is built under it.

The above-described buildings are all connected by means of a covered corridor, 40 by 50 feet

and 4 feet wide, in the shape of a cross, which makes a convenient passage-way between the administrative building, the wards, and the kitchen.

The houses are painted outside a yellowish brown color, with red window sashes and green blinds; the doors are walnut color. The store-rooms are shelved on all sides. The large ward contains thirty iron bedsteads, with chairs and bedside tables; the small ward contains twelve iron bedsteads. The hospital is warmed by stoves, two in the large ward and one in the small one, and one in each of the other rooms when required. The water is furnished by two large excellent cisterns, 14 feet deep by 12 diameter, bricked and cemented, and arched above. One cistern supplies water to the kitchen; the other is fitted with a pump in the open air. The large and clean surface of the shingle roofs affords an unfailing supply of good water. Two cess-pools, with drains of vitrified pipe, are connected, one with the wash-room and water-closet of the northeast ward, the other with the southwest ward and kitchen; they are 8 feet deep by 7 feet in diameter, of open brick-work.

The hospital grounds embrace about two acres, and are surrounded with a good picket fence. The larger portion lies in front of the hospital, between it and the State road, and has been cultivated as a garden. The grounds in the rear of the buildings are still in grass. The privy is situated here, about 50 yards back of the kitchen; it contains eight seats, separated from each other by partitions, shoulder-high. A good root-house has been built; it is 20 feet square and 6 feet deep, covered with earth and sod, and further protected from the rains by a shingle roof; it is boarded inside, is perfectly dry, and maintains a temperature never below 40° F., even in the coldest part of winter.

It appears there never has been until lately a building suitable for a hospital; and it is somewhat strange that at a permanent post like Fort Hamilton such a state of things should have existed for over thirty-five years. In 1852, Assistant Surgeon Eaton says: "There is no hospital building at this post, and since I have been stationed here great suffering and many deaths of soldiers have taken place for want of hospital accommodations." "For want of hospital and other room, many of the sick" on one occasion "were exposed in the large horse-stable, without fire, in the month of November;" and he reports that "twenty or thirty died." How such a state of things could exist it is hard to explain. A building was finally erected to serve as a hospital. (See old hospital description of buildings.) It was built without any regard for the purpose intended, and was so uncomfortable that it was finally abandoned. In the spring of 1867 the sick occupied the upper story of an old barrack, into which the wind blew by a thousand holes and the rain dripped by a thousand leaks. A report of the condition of things was made through the commanding officer, and plans for a hospital submitted. A year passed by and no notice was taken of the matter. A report was then made direct to the Surgeon General. This met with a response, and a temporary hospital was ordered to be erected. It was the winter season, and great difficulties had to be contended with; the plans also, made by the Quartermaster's Department were open to criticism. However, after a lapse of thirty-five years, a hospital was finally built, and was occupied in the summer of 1869.

Water is supplied from wells and cisterns; it is abundant and of good quality, except that supplied from cisterns, which occasionally becomes foul from earthy deposits.

The natural drainage is bad; the ground being hilly, the water collects in the hollows, forming ponds, that have become filled with rank vegetation, the depth of water continually varying, being filled during the winter and spring by rain and snow, and in the summer and autumn becoming so nearly dry as to expose almost the entire beds to the direct solar rays. There are numerous ponds and marshes in the immediate vicinity of the reserve, for the drainage of which an appropriation was made by the civil authorities last fall; but no attempt was made to carry it into effect until last spring, when six or seven ponds and marshes lying south of and within a short distance of the reserve were effectually drained. It is the intention of the civil authorities to renew the drainage the latter part of next fall, and the three ponds remaining on the reserve could be effectually drained at the same time with little labor and but little expense to the government. The artificial drainage consists of a large sewer, built in connection with the ditch in the permanent fortification, and into which the superficial drains and water-pipes lead, discharging into the bay. Slops, offal, and excreta are thrown into the bay and removed by the tide.

About eight acres of land have been heretofore cultivated as gardens by the companies. The hospital garden embraces nearly two acres. The ordinary crops—potatoes, turnips, cabbage, &c.—flourish well; and the command is abundantly supplied with fresh vegetables.

The prevailing diseases during the past winter were catarrh, bronchitis, pneumonia, scarletina, intermittent fever, syphilis, and gonorrhœa. During the summer months intermittent fever, diarrhea, and dysentery. Owing to the numerous ponds and marshes in the district, malarial diseases are quite prevalent.

Statement showing mean strength, number of sick, and principal diseases at Fort Hamilton, New York Harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	235.58	570	295	54	25	42	39	1	15	.....
1869.....	221.08	542	311	39	14	36	18	.....	80	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WOOD, NEW YORK HARBOR.

REPORT OF ACTING ASSISTANT SURGEON H. C. YARROW, UNITED STATES ARMY.

Bedloe's Island, upon which is situated Fort Wood, is a small island of about twelve acres in extent, situated in Upper New York Bay, about twenty statute miles (according to the Coast Survey chart) from Sandy Hook, one and a half miles from Jersey City, and 2,950 yards from the Battery, New York City.

The first owner of this island of whom we have any record was Isaac Bedloe, a native of New Amsterdam, by whose name it is still known. Mr. Bedloe died in the year 1672. His representatives some years subsequently sold the island, and it afterward came into the possession of Captain Archibald Kennedy, (afterward Earl of Cassilis,) who at that time commanded the naval station, under the British government, in this harbor. Captain Kennedy occupied the island as a summer residence, and for a number of years it was distinguished as Kennedy's Island. It subsequently became the property of the State, and by act of the legislature in 1800, it was ceded to the United States government, by whom it is now occupied as a military station. Fortifications of a formidable character have been, from time to time, erected on the side facing the channel of the harbor. The authority to serve process on this island, from courts of New York, was reserved in the act of cession to the general government.

In the Gazetteer of the State of New York, by Smith, the island is mentioned as having been granted to Bedloe by Governor Nicoll; also its possession by Kennedy, and its subsequent use by the State as a quarantine station until it was ceded to the government in 1800. After giving the above facts he states: "This island is now occupied by Fort Wood, erected in 1841, at a cost of \$213,000, upon the site of a fort built about the beginning of the century." (It may be proper to mention here that the new fort spoken of by Smith is simply a continuation of the original work, as a stone tablet in the wall of one of the buildings gives the date of its commencement as 1814.) The same author further states that it is intended to mount seventy-seven guns, and have a garrison of three hundred and fifty men, and that in the year 1849 it was used as a hospital by the commissioners of emigration. In regard to one of the uses to which this island was put, probably the same mentioned by Valentine, I find, in the "History of the City of New York," by Mary L. Booth, the following:

In 1738 a sort of quarantine was established at Bedloe's Island. The small-pox was raging in South Carolina as it had raged in New York seven or eight years before, and the citizens, alarmed at the danger, entreated that all suspected

vessels should anchor at Bedloe's Island, nor be suffered to discharge their cargoes until they had first been visited and examined by physicians appointed for the purpose. This was accordingly done, and the panic soon ceased.

Under the heading of "Quarantine" of the State of New York, in Appleton's "American Cyclopaedia" for 1863, I find the following in regard to this island:

The earliest special act to prevent the spread of infectious diseases was passed about one hundred years ago, and in 1794 a regular quarantine was established on Governor's Island. A quarantine was begun on Bedloe's Island in 1797, but the severity of the yellow fever the next year induced the State to authorize the purchase of thirty acres in the town of Castleton, Staten Island, to which the Bedloe's Island building was removed.

The present hospital was commenced in the year 1851, and two years' time was required to finish it.

At the commencement of the late war Fort Wood was not garrisoned, but was left in charge of an ordnance sergeant.

DESCRIPTION OF THE POST.

Fort Wood, which is situated upon Bedloe's Island, is a star-shaped fort, built of Quincy granite. According to a stone which is inserted in one of the garrison buildings, the date of its commencement was the year 1814. The men's barracks within the quadrangle of the fort are sufficiently capacious to hold about two hundred men, allowing an air space of about 600 cubic feet to each; and there are also comfortable accommodations for eight or ten officers. The barracks are two stories, built of brick, and their dimensions are as follows: Upper room, 53 feet long by 20 feet wide; lower room, 56 feet long by 20 feet wide. In addition to the men's quarters in the brick buildings spoken of above, there are the following rooms: Men's kitchen, 54 feet long by 18 feet wide; wash-room, 19 feet long by 18 feet wide; bake-house, 19 feet long by 15 feet wide; six rooms for officers' mess-house and quarters of ordnance sergeant, besides officers' quarters, guard-house, office, &c., making in all forty-four rooms.

The garrison is supplied with water by four large cisterns, holding in all about 400,000 gallons. These cisterns are filled with Croton water, brought over in the tanks of the quartermaster's steamers. Outside the garrison there are seven small cisterns, holding about 15,707 gallons, which are supplied in the same way as those within the garrison.

During the late war of the rebellion Bedloe's Island was chosen as a general hospital, and a number of temporary barracks of wood were erected. At present there are nine of these barracks or wards occupied as men's quarters, beside others used as store-houses, offices, ordnance store-rooms, laundress's quarters, &c. These buildings were constructed substantially of boards, and careful attention was given to ventilation. The principal objection to them appears to be that the floors are almost level with the earth beneath. The average size of these buildings may be stated as 66 feet long by 20 feet wide.

DESCRIPTION OF THE POST HOSPITAL.

The post hospital at Fort Wood consists of a three-story brick building, situated at the north-west extremity of Bedloe's Island. Its dimensions are as follows: 50 feet long by 42 feet wide, and 60 feet high. Its front or principal entrance faces to the southeast. The building is placed directly upon the ground, and has no basement or cellar beneath it, which I consider unfortunate, as the ground floor has been found by experience to be very damp. The ground floor is divided into the following rooms: To the right of the passage a small room 19 feet long by 8 feet wide, used as an office; next, a small room 18 feet long by 8 feet wide, used as a furnace, lamp, and porter's room; next, a small room 7 feet long by 6 feet wide, in which the cook sleeps; and finally, the dining-room, 18½ feet long by 18 feet wide, communicating by a small passage with the kitchen, which is 17½ feet long by 8 feet wide. It will be plainly seen that space has not been economized in the arrangements of the first story, and it is a matter of regret that no better place exists for the keeping of the hospital food. The ceilings on the first floor are 8 feet high. On the second floor there are four wards, two on each side of the passage, and a bath-room and water-closet. The wards are 18 feet long by 18 feet wide, and are separated from each other by small doors. The arrangements of the third floor are even worse than that of the ground floor, as it is divided into no less than nine rooms, occupied as steward's room, bath-room, and water-closet; tank-room, knap-sack-room, linen-room, store-room, &c.

The supply of water for the hospital is arranged as follows: In the yard is a cistern containing, when filled, about 10,000 gallons of water. The water, which is from the Croton aqueduct, is brought to the island by means of water-boats, and from them distributed to the cisterns supplying the garrison. With the hospital cistern there is connected by a lead pipe a powerful force-pump, worked by hand, and placed in the kitchen. This pump throws the water into a tank placed in the third story of the building. Constant care is taken to keep the cistern and tank clean and sweet, and where it is suspected that organic matter is present, permanganate of potassa is added sufficient to render innocuous any deleterious substances.

Of the water-closets in the building (two in number) too much cannot be said of their evil arrangements. They are connected, by means of pipes, with a cistern in the yard, which, it should be stated is not more than 6 or 8 feet from the drinking-water cistern. The drain from the privy passes under the sea-wall upon the beach. The objection to this system of drainage is as follows: In case the drain between the foul-water cistern and the privy becomes choked up, it becomes necessary to remove the stone slabs which cover it and remove the cause of stoppage. If care be not taken to dig out the drain from the privy to the beach every day, the constant action of the tide fills up the passage-way. Last, though not least, the close proximity of the drinking-water cistern to the foul-water cistern must certainly be considered as dangerous to the well-being of the patients who use the water. Large quantities of various and approved disinfectants have been used to sweeten the foul-water cistern, but without effect, and the stench arising therefrom at times is intolerable. The only means by which it can be kept in any way approaching to cleanliness has been to force water from the bay into it, by means of a fire-engine, and allow it to rush through the drain, thus carrying off the accumulated filth. This plan was recommended to the commanding officer, and has been faithfully carried out under the direction of the provost sergeant.

The heating of the hospital building is accomplished by means of a large furnace and numerous grates, and the consumption of coal in winter averages 16,000 pounds monthly.

In the yard attached to the hospital are several frame sheds, used as store-houses for condemned property, and the privy already spoken of.

The ventilation of the hospital is by no means perfect, owing in part to the numerous partitions which at present exist.

The necessity of frequent bathing for the enlisted men at this post as a sanitary agent in promoting their health has been fully recognized, although no facilities other than the beach affords are at present offered for frequent baths. It was clearly proved during the cholera season of last year that those men who bathed frequently, enjoyed a perfect immunity from the cholera and diseases analogous in character.

Burials.—In the event of the death of an enlisted man at this post, the government undertaker is notified, and the body sent to New York City in charge of a guard of honor; thence it is removed to the Cypress Hill Cemetery.

Amusements and Recreations of the Men.—No billiard-room, gymnasium, or library is at present connected with the post.

Bunks.—The bunks used by enlisted men of this command are of three different varieties, viz., the ordinary well-known iron army bunk or bedstead, the wooden two-storied bunk designed for four men, and the new bunk invented by General Wallen and bearing his name. Of the three, the old-fashioned folding bunk is preferable, as taking up less room, being comfortable to the occupant, and not being liable to vermin. The Wallen bunk is composed of two iron pieces, head and foot-board, with a wooden frame, having underneath a sliding-box for containing the cleaning utensils, &c., of the soldier. This is an admirable bunk for permanent posts, but is open to the objection that it takes up considerable room, is costly, and contains numerous crevices where vermin can harbor. The most objectionable bunk is the two-story wooden one, which is opposed to all sanitary and (in the question of soldiers) all moral laws. They become infested with vermin, and cannot be cleaned without taking apart, which process involves great trouble and liability to breakage.

Disinfection.—The importance of this very essential sanitary measure has always been fully recognized at this post. All the receptacles of foul water, slops, &c., water-closets, privies, and drains, are thoroughly and carefully disinfected daily.

Statement showing mean strength, number of sick, and principal diseases at Fort Wood, New York Harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	Deaths.
1868.....	212.25	647	18	173	9	61	1	58	.....	114	1
1869.....	34.	81	2	13	.....	3	.....	7	1	17	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT SCHUYLER, NEW YORK HARBOR.

REPORT OF ASSISTANT SURGEON C. B. WHITE, UNITED STATES ARMY.

Fort Schuyler is situated upon Throgg's Point, a narrow projection of Westchester County, New York, at the junction of the East River with Long Island Sound—latitude $40^{\circ} 48' 45''$ north, longitude $73^{\circ} 42' 48''$ west from Greenwich. It is distant from the City Hall, New York City, seventeen miles; from Long Island shore about one mile; from Westchester, the post office of the fort, three miles; and from Williams' Bridge, Fordham, and Fremont, (stations on the New York and Harlem and New York and New Haven railroads,) about six miles. There is daily communication with New York City by steamer; and by rail the city can be reached at any time in about two hours.

The reservation was purchased in 1826, work was begun on the fort in 1833, and it was considered ready for armament in 1856. The neck of the peninsula was the site of the McDougall general hospital during the late war. The peninsula is a narrow strip of ground nearly half a mile in length, with an average elevation above the water of 25 feet, and including an area of fifty-two acres. The soil is sandy, with patches of yellow clay, and is only productive on the addition of fertilizers.

The climate is milder than that of the adjacent country, the average temperature for 1869 being 53° , with extremes of 94° F. and 15° F., and amount of rain-fall 43.38 inches.

The fort is on the outer end of the peninsula, and is a regular casemated structure of gneiss.

The quarters for the troops are the finished and closed casemates upon the land side of the fort. These rooms are eight in number, and in two tiers. The lower rooms measure 47 feet 6 inches by 18 feet, and the upper ones 48 feet by 18 feet 6 inches, the height of each averaging about 13 feet. Each room has two large fireplaces, but to warm them properly in severe winter weather it has been found necessary to resort to stoves. Each room has three windows in the rear, two windows and a door in front, and at the end of the room, over the windows and doors, an opening for ventilation 2 by $1\frac{1}{2}$ feet, closing with a shutter. The average air space per man is about 507 cubic feet. They are fitted up with single bunks, consisting of iron head and foot supports, with a wooden bottom.

Within 30 feet of the quarters is a shed over a well and pump, fitted up as a wash-room for the use of enlisted men. There is no bath-room connected with the quarters; in summer the men bathe in the sea. The privies for the men's use are in a flagged yard inclosed from the parade, in front of and about 35 feet from the quarters. The kitchens and mess-rooms are wooden buildings, outside the fort.

Quarters for laundresses and married soldiers are in a one-story frame building near the mainland, 150 feet long and divided into twenty-four rooms, intended for 12 sets of quarters. The

larger portion of the rooms available at this post for officers' quarters are in the land side line of casemates south of the main entrance. These casemates, similar in size to those occupied by the men, have been plastered, and divided by halls and partitions into rooms averaging $16\frac{1}{2}$ by $18\frac{1}{2}$ feet. A wide veranda, communicating with the lower floor by iron stairways, runs along the front of the second story. The lower floors are damp in summer. In front the courtyard is laid out in garden plots, with greensward and some trees. The sinks are in the front yard, like those of the enlisted men. There are also four plastered rooms available for officers' use in a one-story brick, tin-roofed building near the government wharf.

The quarters of the post surgeon are three small rooms and a kitchen, in a temporary wooden building near the hospital. There are no bath-rooms connected with the officers' quarters, and their water supply is by water-cart and barrels.

The quartermaster's and commissary storehouse is a two-story frame building, well suited to its purpose.

The guard-house is in a casemate by the sally-port. The guard-room measures 8 by 36 feet; the prison room $28\frac{1}{2}$ by $24\frac{1}{2}$ feet; the height of each being 12 feet. Each room has a ventilating tube passing through the masonry of the ceiling, and they are sufficiently lighted and dry.

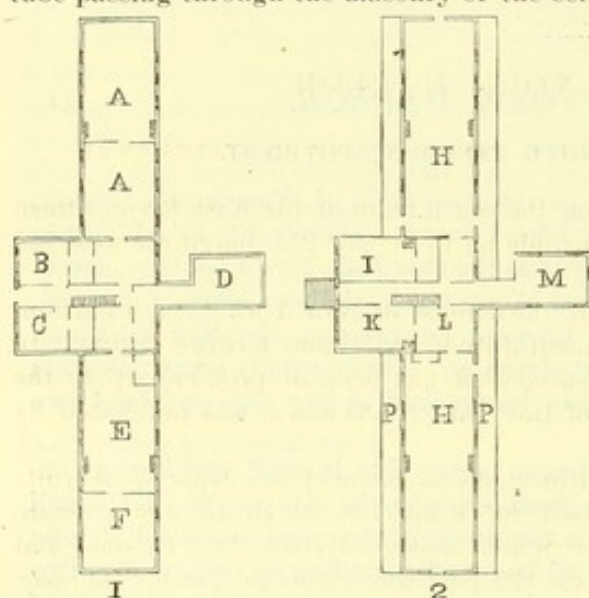


Figure 4.

The hospital is a frame building 171 feet in length, 22 feet wide in the wings, and 32 feet wide in the center buildings. It was originally a part of the general hospital above referred to, and is situated at the foot of the glacis.

The plan of the building is given in Fig. 4: 1 designating the basement, 2 the first floor, and 3 the second floor of the central part of the building; A A, store-rooms; B, laundry; C, linen-room; D, pump-room; E, kitchen; F, mess-room; H H, wards; I, dispensary; K, office; L, bath-room; M, water-closets; N, matron's room; O, steward's quarters; P, veranda.

Each ward is 63 by 21 feet and 15 feet in height, and has ridge ventilation. But one ward is used as such, and it contains but ten beds, although intended for fifteen. It is warmed by two stoves.

The laundry is fitted up with stationary tubs, with hot and cold water pipes. The kitchen contains a range with water-back, and a copper boiler of 300 gallons capacity.

A rain-water tank, 9 feet 1 inch by 2 feet 7 inches by 5 feet, intended to contain 1,000 gallons, was put up in 1869 in the rear extension of the main building, over the water-closets. It receives the drainage from the adjacent roofs. There is no dead-house.

Earth closets or commodes have been recently introduced in the hospital, and the results are very satisfactory.

The post library contains about 800 volumes, many of which are of value and interest. It is open to the soldiers at all times, and, being well warmed and lighted, is a favorite place of resort in winter evenings.

The water supply of the post is from wells; the quantity is ample, and the quality usually good. The natural drainage is excellent. A sewer underlies the fort, connected with a large reservoir, which is filled at high tide, from which the water can be let off as required to flush the sinks, &c.

Company, officers', and hospital gardens are cultivated, and produce a large quantity of vegetables.

During the warm months the men are encouraged to bathe frequently in the salt water, and a

convenient space is set apart for their use. There is no provision for their bathing in winter, except when admitted to hospital.

The sanitary condition of the post is good, and no disease can be said to prevail.

Statement showing mean strength, number of sick, and principal diseases at Fort Schuyler, New York Harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	* Catarrhal affections.	No. of deaths.
1868.....	136.66	329	18	96	25	26	12	1	7	.....
1869.....	119.58	456	36	135	28	19	48	1	23	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

WILLET'S POINT, NEW YORK HARBOR.

REPORTS OF ASSISTANT SURGEONS C. DEWITT AND J. H. JANEWAY, UNITED STATES ARMY.

Willet's Point, a part of Long Island, is situated on the south bank of the East River, fifteen miles from New York City, opposite Fort Schuyler; latitude north $40^{\circ} 47' 25''$ longitude west $73^{\circ} 46' 15''$ east from Washington $3^{\circ} 16' 33''$.

Having been selected as a site for fortifications for the defense of New York City, a portion, consisting of 110 acres, was purchased by the government July 9, 1857, from George Irving. In September, 1862, the construction of the post commenced and has been in progress up to the present, (June, 1870.) May 11, 1863, the remainder of the Point (26.35 acres) was purchased by the government.

During the first years of the rebellion a part of the ground was occupied as a depot for recruits and as a camping ground for volunteer troops. In 1864 the Grant General Hospital was established on the Point, consisting of thirty-seven wards, with a capacity of 1,410 beds. This hospital was in existence for one year. After the close of the war the post was made a depot for engineer stores and material, headquarters of battalion of engineers, and has since that time been garrisoned by three companies of the engineer battalion.

Willet's Point is an irregular, oval, undulating tract of land, the long axis running from the northwest to southeast, the highest point being the extreme northwest portion, which is 80 feet above low water. Communication with the mainland is made by a narrow strip of land on the southwest. On the north, northeast, and southeast it is bounded by Great and Little Bays; on the northwest by the East River and Little Bay, and on the south and southwest by a salt marsh and the narrow strip of land above referred to. The shores are washed by tide water, the average rise of which is 8 feet; the spring tides overflow the salt marsh.

The quarters for enlisted men consist of part of the wards of the old general hospital, four being assigned to each company. They are wooden buildings, the walls only being plastered, length 106 feet, breadth 20 feet, height $10\frac{1}{2}$ feet, provided with both ridge and eave ventilation, and have thirty-one windows and two doors each. In summer twenty-seven, and in winter forty-five, soldiers are usually quartered in each.

These barracks were intended for temporary structures only, and although still habitable in summer, are unfit for quarters during the cold season, the walls being thin and the floors warped. They are heated by stoves, but during the cold northeast storms which prevail during the winter it is almost impossible to keep them warm. They contain no lavatories or bath-rooms.

Three new barracks are now being erected, and it is expected that they will be so far completed by cold weather that they can be occupied. They are to be one story high, 180 feet long by 24 feet wide, with a rear projection 90 by 24 feet. The main floor to be divided into three rooms,

each 90 by 24 feet. The basement under the projection, to be 90 by 24 feet and 9 feet high, will contain the carpenter, tailor, and shoemaker shops, lavatories, and bath-rooms, vegetable, coal, and wood cellars. One ward is used as a hall for dramatic representations, and entertainments are given by the enlisted men semi-monthly. Another has been divided to contain barber shop, company shoe and tailor shops, and a billiard-room for the soldiers.

The wards used as laundress's quarters are in the rear of those occupied by the enlisted men, are cruciform, each being divided into four sets of quarters of three or four rooms each; are well lighted and ventilated, but have the same fault as those used for the men.

The officers' quarters are two wooden buildings lined with brick, of two stories, with basement and finished attic, containing two sets of quarters each. The basement contains kitchen and cellars, the first floor two and the second floor three rooms.

A wide covered porch surrounds each building on three sides. Each room is heated separately, all are well lighted and ventilated; but some of the modern and desirable improvements could not be introduced owing to the lack of funds. They contain no bath-rooms, nor other water conveniences. The unmarried officers occupy one-story wooden cottages, originally quarters for the assistant surgeons of the general hospital.

The quarters of the commanding officer is a two-story double house with finished attic and basement, the first floor containing four, and the second six rooms. Convenient outbuildings are attached, and in the rear there is a large garden; it is well finished and arranged, having all the modern improvements; is heated by a furnace and supplied with water.

The guard-house was erected in 1867. The basement is of granite, with thick concrete floor, divided into one large cell 30 feet by 18 feet, and 10 feet high, one light cell 8 by 9 feet, and one dark cell 5 by 9 feet, each of the latter being 10 feet high. The large cell is lighted by three long narrow iron-barred windows, and ventilated by these and two air shafts. Each of the other cells has a similar ventilating shaft. The average number of persons confined for the year past is nine; not more than one prisoner is confined in either the light or the dark cell at the same time; very little sickness has occurred among the prisoners in the guard-house, and it seems admirably adapted for the proper control of prisoners. The arrangement of the building is shown in Fig. 5.

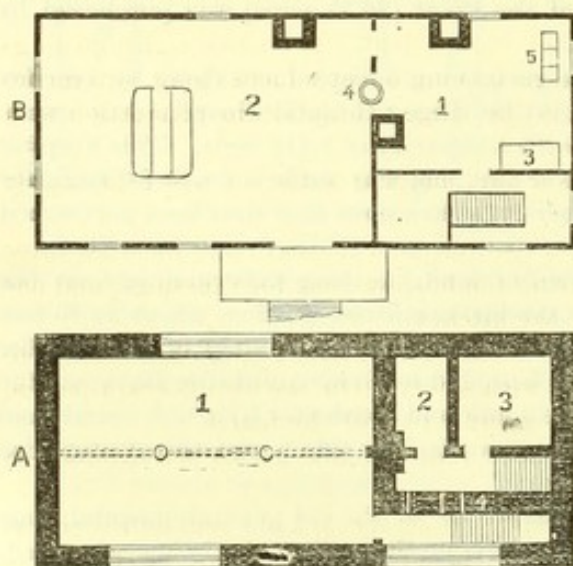


Fig. 5.

A, basement; 1, general prison; 2, dark cell; 3, light cell; 4, ventilating box.

B, first floor; 1, non-commissioned officers' room; 2, guard-room; 3, trap to dungeons; 4, stove; 5, lights to dungeon.

The erection of a hospital was commenced in 1867, and in April, 1869, although not completed, the sick were moved into it. Situated on the northeast of the point, it commands a beautiful view of Long Island Sound, the East River, and Great Neck Bay, and protected by the heights of the extreme end of the point from the strong north winds which prevail at the post.

The building is 75 feet 6 inches long by 31 feet 6 inches wide, and 50 feet high, surmounted by an oblong cupola, (arranged to increase the ventilation,) 26 feet long, 7 inches wide, and 5 feet 6 inches high from the top of the ridge. The basement has walls of concrete 2 feet 3 inches thick and 8 feet 6 inches

high, and is divided into six rooms. The kitchen is 25 feet long, 13 feet 5 inches wide, and 8 feet 6 inches high, furnished with a large range capable of cooking full and special diet for at least one hundred men, with a good though narrow closet, a sink for washing dishes, &c., and a dumb-waiter leading to the first and second floors. The mess hall is 28 feet 10 inches long by 13 feet 5 inches wide, well lighted by three large windows, and having a pantry, 13 feet 5 inches long by 2 feet 9 inches wide, attached. Two rooms are used as store-rooms, one is occupied by the cook and his assistant as a sleeping apartment, and another is to be fitted up as a library, museum, and reading-room for the convalescents and attendants of the hospital.

Outside the basement walls is an area 8 feet wide laid in concrete 6 inches thick, with a gutter of the same material, from which on two sides and a part of the third of the building the ground slopes up at an angle of forty-five degrees to the level of the garden, and is well sodded. The gutter leads to an open drain on the southeast of the building, carrying off all the water that falls. The walls of the rest of the building are of brick cased on the outside with boards; on the inside they are lathed, plastered, and hard-finished. The first floor is approached by two sets of steps—one at the main entrance, and one at the office.

The plan of the upper floors of this hospital is shown in Fig. 6.

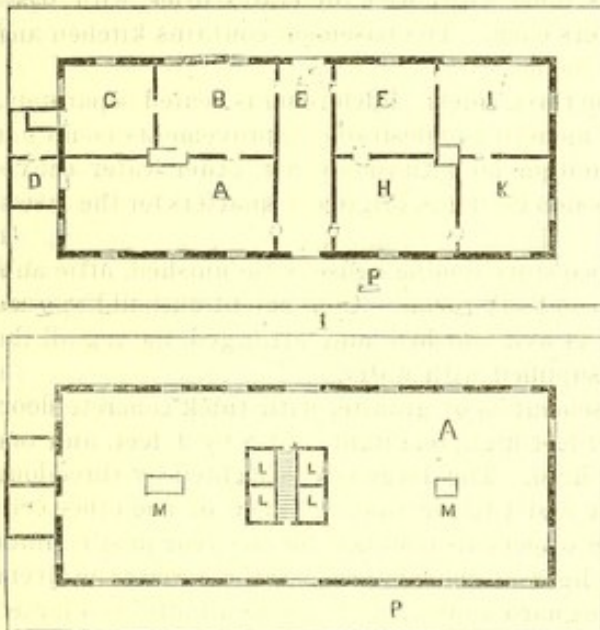


Fig. 6.

1. *First Floor*.—A, ward for isolation of contagious diseases, 74 by 30 feet; B, keeper's room, 17 feet 8 inches by 12 feet 8 inches; C, prison-room, 15 feet by 12 feet 8 inches; D, bath-room; E, hall; F, inspection-room, 14 feet 1 inch by 14 feet 2 inches; H, dispensary, 18 feet 6 inches by 14 feet 2 inches; I, steward's room, 18 feet 3 inches by 14 feet 2 inches; K, office, 14 feet 2 inches by 14 feet 3 inches; P, veranda.

2. *Second Floor*.—A, main ward, 74 feet by 30 feet; L, wardrobe; M, chimneys.

The height of the rooms on the first floor is 9 feet 8 inches; of the main ward on the second floor, 12 feet 6 inches. The ward A, on the first floor, has floor and eave ventilation.

The windows and door of the prison-room are heavily ironed. This room is used for sick prisoners undergoing sentence of court-martial, or for cases of delirium tremens. It has a water closet attached.

The ventilation of the main ward on the second floor is excellent. There are eight openings at the floor, and the same number at the top of the walls, each being 3 feet 6 inches long by 6 inches high, and fitted with doors. In addition to this there is the ridge ventilation in connection with the cupola.

In a projection at the north end of the building is a tank holding sufficient water to supply the bath-rooms and water-closets.

In the center of the ward the stairway leading from the first floor is cased, and includes three small closets; one for the clothing of the patients entering the hospital, one for dressings, and one used as a dressing-room; and also the dumb-waiter for the kitchen.

At present only sixteen beds are furnished in this ward, giving 1,734 cubic feet of air to each bed. Thirty beds could be occupied in this ward with safety. On the two floors a piazza, 8 feet wide, extends around the three sides of the building and a part of the fourth.

The ground allotted to the hospital contains a little more than two and a half acres, of which about half an acre is inclosed by a picket-fence.

The ground in front and on the south side of the hospital is neatly laid out and cultivated as a vegetable and flower garden. In the rear of the hospital the ground is not cultivated. Close to the rear fence, and 61 feet from the hospital, are placed the chicken-house, wood, coal, and cow-house, each 12 feet long by 8 feet wide, and also a sink, used by the convalescents and attendants, 13 feet 6 inches long, and divided into two apartments.

A post bakery was erected during the summer of 1867. The ovens are new and ample, and have a capacity of six hundred rations.

The building known as the old hospital is being altered; when finished it will contain the chapel, library, post school, bindery, and printing office. At present two rooms of the old mess-

hall are used for these purposes. The post school averages an attendance of eighteen children of enlisted men. The teacher is an enlisted man, acting also as librarian. All books and necessary materials for the school are purchased from the post fund.

The post library is large and miscellaneous in its character and well selected. It contains 2,350 volumes and a number of periodicals and newspapers, bound and unbound.

The water supply for the post is derived from sixteen wells, and a large cistern (oval, 50 feet by 30 feet broad and 7 feet deep) receiving its supply of rain-water from the adjacent buildings. The water used for cooking and drinking is obtained from those wells which experience has indicated as the best; all used for washing, from the other wells, and preferably from the cistern. Thus far the supply has proved to be ample, and, with but one exception, has been found to be good.

The buildings of the post, being constructed of wood, are constantly liable to catch fire, especially in winter, when, to keep the majority of them warm, it is necessary to maintain large fires in the stoves. To provide against the same there is an organized fire company, under the command of a sergeant, and provided with a large hand fire-engine. The men are well drilled in the use of it; the engine is in repair and ready for use. In addition to the engine, six force-pumps of great power have been placed at different parts of the post. They communicate with wells, and will be very valuable in case of need. With these means and the large supply of fire-buckets in the quartermaster's depot, it will be easy to subdue any fire discovered in good time.

The natural drainage of the post is very fine, as the land slopes in all directions toward the water. There is but little artificial drainage, the greater portion being superficial, and used to carry off water from the laundress quarters and barracks. One large sewer extends from the kitchen to tide-water; another from the married officers' quarters and mess-hall to the swamp on the southeast part of the post has recently been built, and is well adapted for the purpose.

Owing to the absence of baths, the men are not as clean as they should be, especially in winter, when a bath can be given to them but once in two weeks. In summer, when the water is fit for bathing, they are compelled to bathe at least twice a week.

The burial place for the soldiers is situated near the salt-marsh, southwest of the post, on ground slightly elevated, at a good distance from any building; is 180 by 100 feet, and is inclosed by a neat fence.

There are two gardens at the post, the post and hospital. The post garden is located on the northwest half of the point, contains nine acres, and is under charge of a sergeant. It is cultivated by experienced detailed men, and yields largely. The garden attached to the hospital contains about two and a half acres, and is under charge of the hospital steward. It is cultivated by the hospital attendants and convalescents. Its yield is very large, supplying an abundance of vegetables for summer and fall use.

The post stable is located on the southeastern shore, at some distance from the occupied barracks, and is entirely new; it is large, and contains at the date of this report thirty horses; is well built and ventilated, and excellently arranged for the health and comfort of its inmates; it is provided with rooms for storing harness and food; all the water that drains from or around it is led by superficial drains into the tide. In connection with the stable, but separated from it, is a carriage-shed and room for the stable orderlies.

A number of chickens and one cow are kept for the use of the post hospital, which more than repay all outlay.

The prevailing diseases at the post are intermittent fever and other malarial diseases of mild type; some diarrhoeal diseases in summer, pulmonary diseases in winter; no typhus or typhoid fever. It is regarded as a healthy post. But four deaths have occurred on the post since April, 1869—all children under one year of age, no soldier having died since July 10, 1868.

The recreations and amusements of the garrison are abundant. The post library is large and well selected. Each company receives newspapers. The men have a literary and dramatic club, a billiard-room containing two tables, a bowling alley, and are allowed to use a part of the old mess-hall for dancing purposes, having a weekly hop.

Statement showing mean strength, number of sick, and principal diseases at Willett's Point, New York Harbor, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	Deaths.
1868.....	398.08	302	31	51	9	36	26	3	30	4
1869.....	339.36	830	127	212	8	35	44	1	108	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

UNITED STATES MILITARY ACADEMY, WEST POINT, NEW YORK.

REPORTS OF SURGEON T. A. McPARLIN AND ASSISTANT SURGEON A. W. WIGGIN, UNITED STATES ARMY.

West Point is situated on the right bank of the Hudson River, fifty-one miles above New York City, in the midst of a range of the Alleghany Mountains known as the Highlands. Its latitude is $41^{\circ} 23'$ north; longitude 74° west; mean annual temperature for forty years, 50.73° ; extreme range, 116° ; greatest heat in summer, 100° ; greatest cold in winter, 16° ; average rain-fall for forty years, 46.53 inches per annum. The prevailing winds are northwest and south.

The river at this point takes two abrupt bends, and on the peninsula thus formed, containing about 100 acres, is located the National Military Academy, with its appurtenances. This is the only portion of the public lands (2,105 acres) now used for military purposes. The remainder consists of rugged cliffs and hills, rising precipitously to the west, which were occupied during the war of the Revolution by forts and redoubts. At the foot of these hills and 157 feet above the river is a level plateau, a large part of which serves as a parade ground and plain for military evolutions, and on which are situated the cadets' barrack, mess-hall and hospital, the academic buildings, administration offices, hotel, and residences of professors and officers.

The north side of the plateau, sloping quite steeply towards the river and irregularly terraced, is occupied by soldiers' barracks and hospital, cottages of married soldiers, residences of employés, ordnance laboratory, gas-works, equipment sheds and store-houses, sutler's store, schoolhouse, and workshops. The riding hall and stable are on the south side of the plain.

The geological formation is primary stratified rock—gneiss—covered with deposits of drift. The soil is gravelly, and, except on the plain, of little depth. An inexhaustible supply of excellent water can be obtained from mountain springs and brooks, as well as from numerous natural springs on the post. The slope is sufficient to allow of easy and complete drainage to the river. Access of air is unobstructed. Indeed, no unavoidable morbid agent is known to exist, unless found in stagnant marshes on the opposite side of the river; doubtless a source of malarious diseases there, but it may be considered an open question whether the health of this post is materially affected by the emanations therefrom.

A tabular statement is subjoined showing the prevalence of fevers and other miasmatic diseases during the past thirty years, as bearing on this point:

Yearly mean strength—thirty years, 560.					
	Total cases thirty years.	Average cases per year.	Total deaths for thirty years.	Average No. of deaths per year.	No. of cases per 1,000 per year.
Malarious fevers.....	1,034	$34\frac{1}{3}$	2	$\frac{1}{3}$	62
Other fevers.....	468	$15\frac{6}{10}$	6	$\frac{1}{3}$	28
Other miasmatic diseases.....	4,824	$160\frac{4}{5}$	13	$\frac{1}{30}$	287
Total miasmatic diseases.....	6,326	$210\frac{9}{10}$	21	$\frac{1}{30}$	377

This, of course, represents the whole number taken on sick report, and necessarily includes many relapses and cases reported more than once. The experience of Brevet Major E. J. Marsh, Assistant Surgeon United States Army, during quite an extended term of service at this post, leads him to believe that the greater number of cases of malarious diseases occurring here are contracted elsewhere. Cholera prevailed sporadically in 1849—the nearest approach to an epidemic that the records show the post to have ever suffered from.

A census of the post has never been taken; the present population is estimated at 1,100.

WATER SUPPLY.

Besides numerous unfailing springs and wells scattered about the post, water is supplied by three reservoirs, each having an independent source. Two of them are fed by mountain brooks, the other by springs at the bottom and by rills from the mountain side. Pipes from these three reservoirs convey the water to a common tank or water-house, whence it is distributed by a main seven inches in diameter at its exit, to nearly all parts of the post. This tank is 15 feet deep, and its bottom 62 feet above the level of the plain. The supply from this source is estimated at 60,000 gallons per diem. With a larger main or additional ones, the supply could be indefinitely increased, as only a small portion of the total yield of the reservoirs is required to keep the distributing tank constantly full. Numerous hydrants are placed at convenient distances about the post for use in case of fire.

An imperfect qualitative analysis of the water from the reservoir reveals but a small proportion of impurities, either organic or inorganic. No deposit forms after being boiled down to one-fourth its original quantity. Sulphates, chlorides, and carbonates exist to a trifling extent in combination with lime and (probably) soda. Two drops of a saturated solution of permanganate of potash give to a pint of the water a pink tinge, permanent for three hours, of as deep a hue as one drop with an equal quantity of distilled water. As much cannot be said of the purity of the spring supplying the soldiers' families in Camptown. Six drops of a saturated solution of permanganate of potash are required to give the same pink tinge that one drop will give to an equal quantity of distilled water. It also contains a larger proportion of inorganic matter. Its organic impurities are doubtless derived from the privy of the band barracks which overhang it, and from superficial drains in the vicinity.

SEWERAGE.

The cadets' barrack, mess-hall, and academic buildings are drained by a sewer of large size and sufficient fall, discharging into the river. Its dimensions are as follows: height 3 feet, width 2 feet, fall 1 foot in 40 for the first 150 feet, after which it is much greater. This sewer opens on the bank of the river nearly a hundred yards from the water's edge, and close by the carriage road leading to the ferry. The noxious gases from it are carried up the bank under certain conditions of the atmosphere, much to the disgust of the inhabitants on the crest of the hill.

There is another sewer discharging into the river at the soldiers' hospital. Except during the winter months this is constantly supplied with water from the overflow of a spring in front of the hospital. This also has the defect of opening on the river bank, and of being unprovided with traps. With the exception of these two sewers, the means of getting rid of excrementitious and refuse matter are as follows:

1. *Close cesspits*, at some distance from the houses, into which excreta are conveyed through a pipe by water from the water-closets, and whence the soluble portions sink into the soil, while the gaseous either find their way back into the houses, or are disseminated into the atmosphere. The sides and top of these cesspits are of masonry, the top being about three feet from the surface of the ground; the bottom of the chamber is simply the loose, gravelly soil. The pipe, in its passage is bent so as to contain water, forming a valve to prevent the reflux of gases. But one of these cesspits has been opened for years; its condition is said to have been by no means offensive, only a few inches deep of soil remaining in the bottom of the vault. This arrangement prevails at the cadets' hospital and at the residences of some of the professors and officers.

2. *Open cesspits or vaults*.—The hotel, band barracks, most of the quarters of officers and professors, and all the cottages of soldiers, are provided with these. There is one also at the encamp-

ment ground of cadets. The pits are of varying size, and, when of sufficient depth and frequented by but few persons, seem not to be offensive. Excepting the ones at the hotel and camp-grounds, they are seldom or never cleaned. In some cases old ones have been filled up and new ones constructed. As the area over which they are scattered is very large, they are far from being the nuisance that they would be in a densely-populated village. At the same time, it must be remembered that the soil is thin and underlaid by ledges, which serve to a great extent either as an impervious receptacle for this filth, or as a shed to convey it to the surface at a lower level. It is proper to add, that whatever improvements are necessary in the drainage and sewerage of the post will be dependent upon appropriations to be made for such purposes.

ACADEMIC BUILDINGS.

The observatory and library on the southeast corner of the plain was erected in 1841. It is a stone structure 160 feet front and 78 feet in depth, castellated and corniced with red sandstone in the Elizabethan style. The east wing contains the library, 46 feet square and 31 feet high; it contains 25,000 volumes. The offices of the superintendent, adjutant, quartermaster, and treasurer of the academy temporarily occupy the first floor of the west wing, while above them are the lecture hall and apparatus of the philosophical department.

A new building is now in process of erection for the administrative offices. It will be fire-proof, with rooms for records, archives, and for offices of the superintendent, adjutant, quartermaster, and the treasurer of the Academy. When completed, these officers will vacate rooms which are used by them now in the philosophical department, and which are needed by that department of instruction. The structure is being built of hewn gneiss rock (obtained in the vicinity) trimmed with Kingston blue-stone, having arched floors and iron beams, with the (interior) party walls of brick. The windows of the first floor (above the basement) are of the pointed Gothic style, and appear in pairs; on the second floor the windows are squared. The roof is in the French style. The situation selected is on the south side of the chapel and eastward of the academic building, upon ground that has been raised and leveled during the time of the Academy, and near where it is said a graveyard existed for the garrison during the revolutionary war.

The chapel, a stone structure west of the library, 83 by 54 feet, was built in 1836.

The academy fronting east and situated directly west of the chapel was erected in 1838. It is a stone edifice, with red sandstone pilasters, 275 by 75 feet, and three stories high. This building is occupied by laboratories, lecture and recitation rooms, model rooms, and cabinets.

The ordnance and artillery laboratory, on the north side of the plain, was erected in 1840, and consists of three two-story stone buildings used for fabrication of ammunition, repairing, &c., all within a stone-inclosed yard, containing, besides, shelter for field batteries. Near the cavalry stables, on the east slope of the plain, stands the riding hall, 218 by 78 feet, built of stone in 1855.

RESIDENCES OF PROFESSORS AND OFFICERS.

These are substantial and commodious structures, built, with few exceptions, of stone or brick, and provided, for the most part, with bathing-rooms and water-closets. Some of the officers occupy quarters in the west angle of the cadet barrack.

The hotel, built in 1829, is a stone building, stuccoed, 50 by 60 feet, and contains sixty-four rooms. A wing three stories, 62 by 29 feet, of brick, has since been added.

CADETS' BARRACK.

The cadets' barrack, on the south side of the plain, fronting north, was built in 1851. It is of stone, four stories high, with fire-proof rooms, castellated and corniced in the Elizabethan style of architecture. It is 360 by 60 feet, with a wing extending in rear of the west tower, 100 by 60 feet. It contains one hundred and seventy-six rooms, of which one hundred and thirty-six are cadets' quarters, arranged in eight divisions without interior communications. The basement contains bathing-rooms and quarters of employés.

The arrangement of the rooms is shown in Fig. 7: K, cadets' rooms; O, officers' rooms; A, partition between beds.

Each room is occupied by two cadets—is 22 by 14 by $9\frac{1}{2}$ feet. It has a window $6\frac{1}{2}$ by $3\frac{1}{2}$ feet; a door $7\frac{1}{2}$ by 3 feet, a glazed transom over the door; a transom 12 by 18 inches, provided with

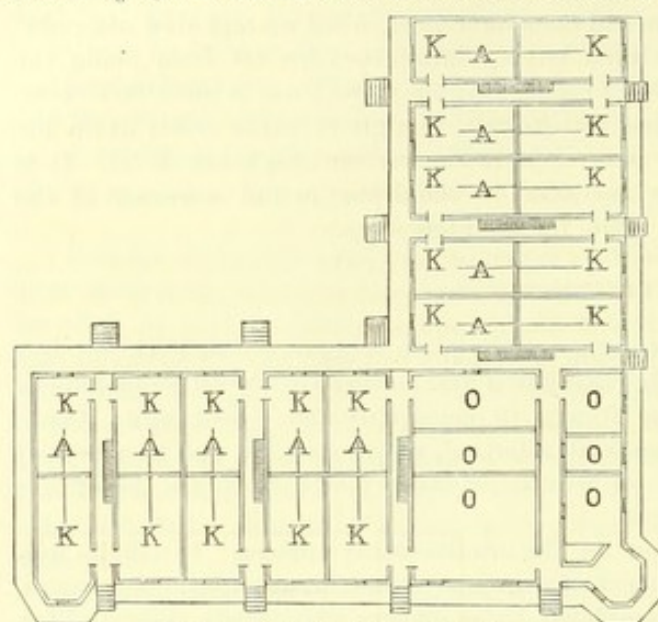


Fig. 7.—Scale, 60 feet to the inch.

lattice and shutter, opening into the hall near the inner end of the room; a fire-place flue 9 by 30 inches, and a ventilating flue near the ceiling, with a circular aperture 7 inches in diameter. Two alcoves are formed by a wall projecting from the center of the rear end of the room.

The dimensions of the room, 22 by 14 by $9\frac{1}{2}$, give 2,926 cubic feet. Deduct chimney, furniture, occupants, &c., 186 cubic feet, and there remain 2,740 cubic feet, or 1,370 cubic feet of air to each occupant—an ample supply, provided its renewal is sufficiently accomplished. The means of ventilation mentioned above are seen to be adequate to effect this result.

With a view to ascertain approximately the sufficiency of the renovation of air in these rooms, and to infer to what extent any of the ventilators can be safely closed, though by no

means presuming to solve definitely the difficult and uncertain problem of ventilation, some deductions have been drawn from acknowledged facts which, so far as they go, may be considered reliable.

The rooms being heated by steam, ventilation must depend almost entirely on the difference between the external and internal temperatures. With transoms and chimney-flues open, it is obvious that ventilation is sufficient. But in winter time only the chimney flues are kept open, and in the coldest weather, as has been stated above, even these are closed. Let us consider the condition of one of these rooms with both chimney-flues open, other apertures being closed. This gives $9 \times 30 = 270$ square inches, and by $7 \times 7 \times .7854 = 38.5$ square inches—a total of 308.5 square inches of opening to the external air, or 154.25 square inches for each occupant. I have ascertained that the flue near the ceiling is an outlet, and the fire-place flue mainly, but not entirely, an inlet. To determine the amount of discharge by the former on the several floors and on various assumptions of temperature, I have made use of the table on page 135, Parke's Hygiene, with the following results:

Area of opening in square inches, ($7 \times 7 \times .7854$).....	38.5	38.5	38.5	38.5	38.5
Number of floor.....	First.	First.	Second.	Third.	Fourth.
Height of column of warm air in feet.....	40	40	30	20	10
Supposed difference between external and internal temperatures..	10°	30°	15°	20°	10°
Amount of discharge per hour in cubic feet.....	5,110	8,928	5,456	5,110	2,584
Amount of discharge per hour in cubic feet per person.....	2,555	4,464	2,728	2,555	1,292

I think we may safely assume, moreover, that an equal amount of vitiated air finds an egress by cracks about the doors and windows, as well as by the wide fire-place flue, and that fresh air is admitted by the same apertures. This assumption doubles the above results, and leaves no question of a due replenishment during the day-time in any of the rooms. At night 3,000 cubic feet (Parke, page 78) per hour will be required for the single gas-burner with which the room is lighted, leaving an insufficient supply for the occupants on the upper stories when the difference is slight between the external and internal temperatures. If the rooms were properly heated, however, this very condition of temperature would, of itself, induce the inmates to open a door, window, or transom.

The above facts lead to the conclusion that abundant, though not the best, means of ventilation have been provided for the cadets' barrack; that the chimney-flues alone are generally sufficient of themselves to renovate the air; but that it would be unsafe to close them even partially, unless at the same time means are provided for the escape of products of combustion independently of the general ventilation of the room.

Bathing facilities are extensive. The privies and urinals, though at present slightly out of repair, are commodious and well arranged; they discharge by a sewer into the river.

The engineer barrack, built in 1858, is a brick building of two stories and a basement, 103 by 43 feet. It fronts north, having an eligible site, with free access of air, on an open terrace about 300 yards from the river. The basement contains the kitchen, dining-room, and store-rooms. The first floor has two sergeants' rooms, each 14 by 14 feet, and three squad-rooms, each 30 by 18 feet, and 12 feet high. Each squad-room is fitted up with double bunks in two tiers for twelve men, giving 530 cubic feet air space to each. The ventilation is by doors and windows. For the general arrangement of the engineer barrack see Fig. 8.

1. *Basement*.—B, bath-room; H, hall; K, kitchen; M, dining-room; S, store-rooms.

2. *First floor*.—A, squad-rooms; C, sergeants' room; S, store-room; H, hall; O, officers' quarters.

The cavalry barrack, 57 by 41 feet, two stories high, of brick, with a stone basement, was erected in 1857. The artillery barrack, 46 by 30 feet, was built soon after, on a similar plan. The kitchens, mess-rooms, and store-rooms of both barracks are large and convenient.

The squad-rooms of the cavalry barrack have single bunks for 84 men, giving to each 371 cubic feet and 35½ superficial feet of space.

The artillery barrack has single bunks for 58 men, giving to each 434 cubic feet and 39 superficial feet. The means of ventilation in both are doors and windows.

CADETS' HOSPITAL.

The hospital for cadets, built in 1830, 131 by 40 feet, is a stone building, fronting east and overlooking the river, of two stories and a basement. The two wings are used as quarters of medical officers. The central portion contains twelve rooms, two being used as quarters for the steward, two for dispensary, one as an office, and the remaining seven as wards for the sick. Two of the latter are 32 by 14½ by 10 feet, one 28½ by 14½ by 10 feet, and the other five 16 by 14½ by 10 feet. The two largest wards are partially divided by partition walls. For general arrangement of the hospital see Fig. 9.

1 represents the first floor, 2 the second floor of the building; A, wards; B, bath-rooms; D, dispensary; E, steward's quarters; P, veranda; O, medical officers' quarters; M, dining-room.

Allowance is made for 20 patients—about 8 per cent. of the corps—thus giving to each 1,160 cubic feet, and 116 superficial feet of space. The means of ventilation are doors, windows, transoms, and chimney-flues; of heating, open grates. The bathing-rooms are supplied with hot and cold water, and there are three water closets, the latter discharging into covered cesspits in the rear; two privies in the yard likewise discharge into cesspits. The basement of the building contains store-rooms, quarters of attendants, and two kitchens, each of the latter being furnished with a cooking range. Food is conveyed from the kitchens to the dining-room by means of a dumb-waiter. While this is far from being a model hospital, either in internal arrangement, access of air and sunshine, ventilation, or drainage, the records do not show that any exceptions have ever been made to its sanitary condition—due, no doubt, to the fact that the number of sick in hospital is usually small and the ailments slight.

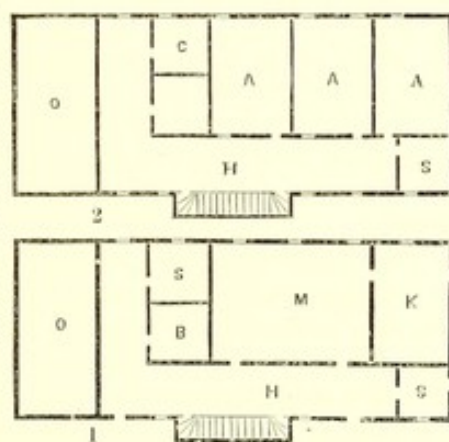


Fig. 8.—Scale, 50 feet to 1 inch.

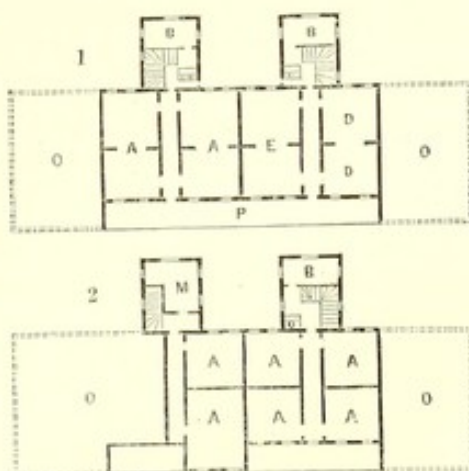


Fig. 9.—Scale, 60 feet to 1 inch.

GUARD-HOUSE.

This is a one-story brick building with stone basement. It has a guard-room and six cells for prisoners. Four of the six cells are in the basement, and have no facilities for heating, two of them being dark and badly ventilated. One end of the building is occupied by soldiers' families. There is another guard-house on the east side of the post, but it is not now in use.

STABLES.

A new building has been erected as quartermaster's stables on a commanding bluff looking north from the cavalry and artillery barracks, and fronting them, on the Hudson River, opposite Constitution Island. Its dimensions are 146½ by 39 feet, and three stories high. The basement is of stone, containing stalls for 50 animals. The second floor is of frame, for storage of wagons, &c., having, also, a grain bin capable of holding 7,000 bushels of oats. On the third floor there is storage room for 250 tons of hay.

SOLDIERS' HOSPITAL.

This hospital, built in 1851, is of brick, 50 by 28 feet, having two stories and a basement. The height of the first story is 12 feet; of the second, 10½ feet; and of the basement, 9 feet. The latter is entirely beneath the level of the surface in front, the ground sloping so as to expose it behind. It is situated near the foot of a wooded hill, with a steep northern slope, the ground being as high as the eaves of the hospital at a distance of 100 feet, horizontally, in front. Air and sunshine have, consequently, an imperfect access to the southern or front windows, and the only other windows opening into the wards are on the north. These defects give it the twofold disadvantage of being very hot in summer and very cold in winter. There are accommodations for twelve patients—a trifle over 4 per cent. of the average strength of enlisted men during the past three years. This allowance, with two additional beds in the wards for attendants, gives to each bed 982 cubic feet and 94 superficial feet of space. The steward's quarters are in an adjacent building. Doors, windows, and transoms (one over each door) furnish the only means of ventilation. Only one ward has a privy attached. The bathing-room is inconvenient, opening, as it does, from the dispensary.

The mode of heating is by coal stoves. An abundance of water is supplied from the reservoir, except during the coldest weather, when, owing to freezing of the pipes, it has to be obtained from a spring in front of the hospital.

Statement showing mean strength, number of sick, and principal diseases at West Point, New York, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	Number of deaths.
1868	582.58	1,574	2	42	214	.....	18	48	4	279	2
1869	595.08	1,679	1	53	250	75	16	51	6	311	4

Statement showing the mean strength, number of sick, and principal diseases of Cadets at U. S. Academy, West Point, New York.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Headache.	Catarrhal affections.*	Excoriations, chafes, &c.	Number of deaths.
1868	260	1,470	1	22	124	64	75	8	29	481	213	159	....
1869	260	1,251	2	29	155	79	.....	3	24	408	229	88	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

PLATTSBURG BARRACKS, NEW YORK.

INFORMATION FURNISHED BY ASSISTANT SURGEON S. M. HORTON, UNITED STATES ARMY, AND ACTING ASSISTANT SURGEON J. P. FOOTE, UNITED STATES ARMY.

This post is situated on the west side of Lake Champlain, about one mile from the village of Plattsburg, New York, latitude $44^{\circ} 41'$ north, longitude $73^{\circ} 25'$ west, and 186 feet above the sea. The Saranac, a small river rising in a range of lakes forty miles southwest, enters the lake at this point. This vicinity was first occupied by United States troops in 1812. In July, 1813, a descent was made upon this point by a British force from Canada, and the block-house, arsenal, and armory were destroyed. On the 11th of September, 1814, the battle of Plattsburg and the naval engagement on Lake Champlain were fought. Troops were stationed here from 1814 to 1825, from 1840 to 1846, from 1848 to 1852, from 1859 to 1861, and from 1865 to the present. The post was established in June, 1838.

The geology of the vicinity may be briefly presented as follows, the strata being given from above downwards:

1. Drift of sand and gravel, depth 25 to 30 feet.
2. Trenton limestone, 400 feet. This is the surface rock of Plattsburg and Lumberland Head, and includes two varieties—one, black and close-grained, taking a fine polish; the other, gray and crystalline.
3. Birdseye limestone, 50 feet.
4. Chazy limestone, 130 feet.
5. Calcareous sandstone, from 250 to 300 feet.

The soil of the vicinity is sandy, and not productive unless fertilizers are used extensively.

The winters are often severe, but agreeable; the heat of summer is modified by cool and exhilarating breezes from the lake and the Green and Adirondack Mountains. Grazing can usually be relied on by the 20th of April. Mean temperature for 1869, $43^{\circ}.04$ F.; extremes, 87° F. and 18° F. Average monthly rain-fall, 1.98 inch. The prevailing winds of spring and summer are from the south; of the autumn and winter, from the northwest. The winters are long, snow falling in 1869 on the 2d of May and 29th of October.

The post is situated on a sandy plain 25 rods from the lake and 90 feet above its level, the buildings being arranged around a square parade of 200 feet each side. The principal buildings are substantially constructed of uncut limestone.

The barracks for the enlisted men were erected in 1838-'40, and consist of a building two and a half stories high, 200 feet long by 26 feet wide, containing 18 rooms. On the second floor are three large and commodious sleeping-rooms for each company. They are warmed by stoves, well lighted and ventilated by windows, and contain 420 cubic feet of air space per man. Each bunk is arranged for two occupants. A camp privy for each company, and one for the hospital, are located 100 feet distant from the barracks. A capacious company kitchen adjoins each mess-room and occupies a portion of the first floor of the building. In the eastern end of this building, four rooms on the lower floor are set apart for the use of the hospital department, and are occupied as office, dispensary, ward-room, and kitchen. The arrangement of the barracks and hospital is shown in Fig. 10.

The quarters of the non-commissioned staff and also the quarters of the company laundresses, located outside of the inclosure of the post, are three old wooden buildings, each one and a half stories high. The first of these buildings is divided into three rooms, one 20 by 12 feet and two 12 by 12 feet, and occupied by the non-commissioned staff, hospital steward, and matron. The other buildings toward the north, containing two rooms and two attics each, are occupied by laundresses. A new wooden building, 80 by 28 feet, has been erected on the south side of the barracks, and 20 feet distant from the inclosure. This is occupied by four families, affording to each two rooms 16 by 14 feet, with air space of 1,568 cubic feet.

1, first story; 2, second story; A, hospital kitchen; B, ward; C, office; D, dispensary; E, company kitchen; F, mess-room; H, sergeants' rooms; I, company office; M, hospital bath-room;

K, storm shed; P, piazza; L L, dormitories. Height of rooms on first floor, 10 feet; on second floor, 10 feet 6 inches.

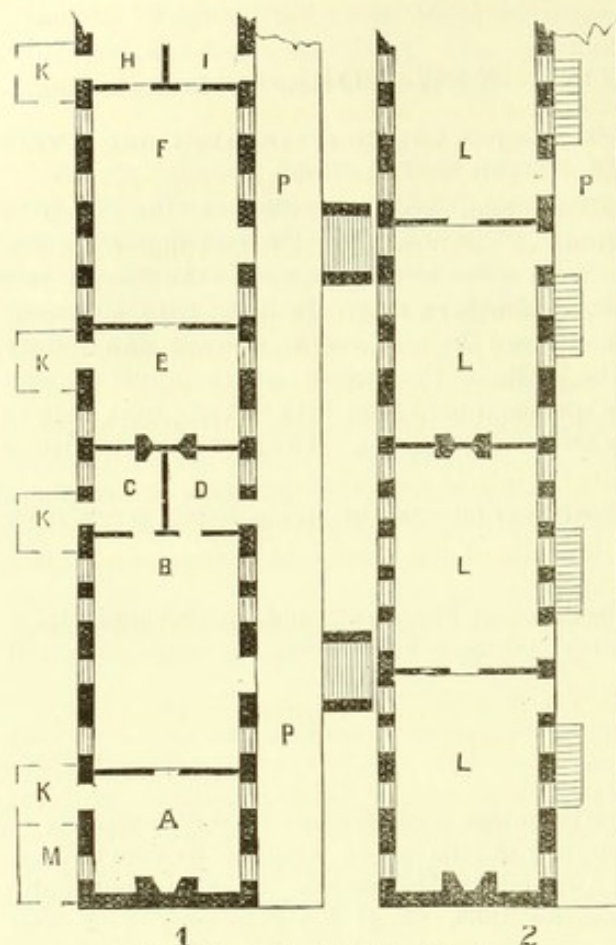


Fig. 10.—Scale, 32 feet to 1 inch.

of the principal entrance to the post; it is 50 feet long by 15 feet wide, and divided into three rooms and two cells. The front room, 13 by 12 feet, is used as a guard-room; adjoining are the cells designated for prisoners sentenced to solitary confinement. The cells are $4\frac{1}{2}$ feet wide and 10 feet long, with a grated window 1 foot square near the top of the wall, and a similar grating in the door for ventilation; a small opening from the top of the cell serves to allow a part of the foul air to escape. These cells are found to be unsuitable for the purpose by reason of defective ventilation and bad arrangement for warming the rooms in cold weather. Adjoining the guard-room is a room 27 by 14 feet, used as a "lock-up" for prisoners. This apartment could be improved by more ample ventilation.

The hospital, as before mentioned, is located in a portion of the building occupied as soldiers' barracks, the men's quarters being immediately over the sick-ward, as shown in Figure 10. Though rather inconvenient, this arrangement will answer the purpose for a command of two companies. The hospital is warmed by coal stoves and well ventilated. Two rooms, each 10 by 10 feet, are used for office and dispensary.

The ward contains eight beds; superficial area, 792 feet; air space per bed, 990 cubic feet. A room for bathing and lavatory purposes has been erected in rear of the building and adjoining the ward. The hospital sink is 100 feet distant, and kept in good condition; this privy is constructed on the system of earth-closets, the result proving quite satisfactory. The substance used as an absorbent is dry coal ashes, (sifted,) which is regularly applied to each deposit in a sufficient quantity, and is found to be a good deodorizer.

The school-house is an old one-story building situated at the northeast corner of the post; it is well provided with books, and has a competent person selected from the command as an instructor.

The building assigned to the use of commissioned officers is composed of the same material as the main building, and is 70 feet long, 25 feet wide, two and a half stories high, and contains 16 rooms. The building is erected at right angles with the main building, and 20 feet distant, and commands a fine view of the post. In its rear an open veranda is in course of erection, which will materially add to the appearance of the building, and render it more convenient for the occupants. It is intended for eight sets of quarters.

The headquarters of the post is situated at the northwestern part of the inclosure, in a small one-story building 24 by 18 feet, a portion of which is set apart for the purpose of a library and reading-room for the use of the command.

In the northwest corner of the post is located the commissary store house, a two-and-a-half story wooden building, 40 feet long and 18 feet wide; it is divided into two store-rooms and an office.

On the east side is a one-story building, 60 by 16 feet, used for a carpenter's shop, with the exception of a small portion on the western end, which is set apart for a sutler's store.

The guard-house is a wooden building situated on the western side of the inclosure and north

The ice-house is located near the banks of the lake, and consists of a wooden building 10 by 12 feet, with a stone wall 10 feet deep below ground, and frame building 8 feet high above the surface. An ample supply of ice is obtained from Lake Champlain during the months of January and February, and is found to be of an excellent quality.

The library contains a good supply of the most desirable of the daily and weekly journals; stationery and materials for writing are supplied gratis to members of the command.

The supply of water is obtained from two deep wells in close vicinity to the buildings; the quality of this water is excellent for drinking and cooking, and it is perfectly free from impurities. Rain-water is chiefly used for cleansing clothes and habitations.

The post is well drained by reason of being located on elevated ground and the alluvial nature of the soil.

The close proximity of Lake Champlain affords good facilities for bathing purposes.

Fronting the western entrance to the post is a square plot of ground inclosed with fence, containing about two acres; this ground is supposed to have been originally designed for a park or parade-ground, but has recently been converted into a vegetable garden, and cultivated for the benefit of the officers of the post.

The company gardens are located about half a mile northwest from the barracks, and consist of about five acres of fertile soil, under a good state of cultivation. The hospital garden is located about the same distance east of the post and near the bank of the river. It is about a half an acre in extent, and is cultivated by the hospital attendants.

Acute diarrhœa and dysentery prevail in the summer season; catarrh and bronchial affections in the winter.

Statement showing mean strength, number of sick, and principal diseases, at Plattsburg barracks, New York, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	119.	212	3	40	3	14	20	3
1869.....	91.33	119	16	16	7	11	26	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT DELAWARE, DELAWARE.

REPORT OF SURGEON W. C. SPENCER, UNITED STATES ARMY.

Fort Delaware is situated on Pea-Patch Island, in the Delaware River, one and one-eighth miles distant from the Delaware shore; one mile from the New Jersey shore; and forty-two miles below the city of Philadelphia. Latitude 39° 35' 18" north; longitude 75° 34' 31" west from Greenwich.

The island is a flat mud bank, irregularly oval in form, and has an area of eighty acres; its average level is 3 feet 4 inches, and its highest point 9 feet 8 inches above mean low water. It is surrounded by an embankment faced with broken stone, 10 feet 10 inches above mean low water, and is drained by means of a network of ditches through which the tide, which has an average of 6½ feet, is permitted to flood and ebb under the control of two sluice-gates. These ditches vary in width from three to thirty feet, and in depth from 8 inches below to 1 foot above mean low water.

The following history is condensed from a general record book, dated April 1, 1851, belonging to the engineer office at Fort Delaware, Delaware:

The island now known as the Pea-Patch first began to attract attention about the year 1770. From 1770 to 1813 but little notice was taken of it, as it was seldom visited except by fishermen and persons wishing to destroy crows, of which there then were great numbers roosting every night.

In 1813 the State of Delaware, thinking the Pea-Patch a good site for fortifications, and that the Delaware River and adjacent country required certain defensive works, ceded the island to the United States on condition that fortifications should be erected and maintained thereon at the expense of the general government. Accordingly, in 1814, Captain Clark, with one hundred soldiers and thirty laborers, took possession on the part of the United States, and at once began building dykes, wharves, and fortifications, which were carried on until 1823 and 1824, when the fort was nearly completed under Major Babcock.

In February, 1831, the roof and other wood-work were burned. In 1833 many repairs were made, and in June the demolition of the old fort was commenced. In 1834 the principal work accomplished was the removing the rubbish of the old fort. In this year there was an attempt made to find water by boring, the particulars of which are as follows:

The boring was commenced with 6 or 7 inch pipes and carried to the depth of 46 feet through mud to sand, then continued 20 feet through sand (in all 66 feet) to a very coarse sand and shells, through the coarse sand to the depth of 96 feet, when a large boulder was struck, the working through which consumed two weeks. After the boulder, dark clay was found; after the clay, a very fine white sand at the depth of 143 feet. At this point water was found, but of such a sweetish taste that it was entirely unfit for use.*

In December of the last-named year, borings were also made in the corners of the old star fort, for the purpose of ascertaining the nature of the soil. These borings were continued to the average depth of 47 feet, at which point sand was found.

In the year 1834, materials began to be received for the new work, and in 1836 the driving of piles for the new foundation was commenced, which work was completed in 1838. The number of piles driven was between ten and eleven thousand. In this year Captain Delafield left the island for West Point, and was succeeded by Colonel De Russey, under whom a portion of the grillage was laid, but in December, before the foundations were entirely completed, possession was taken of the island by one Hudson, under a title purporting to be given by the State of New Jersey to Gale, who it appears had some time occupied the island for fishing purposes. On this account the works were suspended until the question as to whom the island belonged should be settled.

In 1839, there was an uncommonly high tide which overflowed the island. There was also another in October, 1846, which also overflowed the island, carrying the timber about it, and some away. This last is said to have been the highest tide in the memory of the oldest inhabitants. The wind at the time was strong from the southeast, which was probably the cause of the remarkably high water.

In 1848, by the decision of the Hon. John Sergeant, (to whom was referred the question as to the title of the island,) the United States again came in possession and once more the works were resumed under Brevet Major John Sanders.

The works which had been commenced under Captain Delafield were abandoned, and a new plan for the fort substituted. The principal work done in this year (1848) was the repairing of quarters, general policing the island, and excavating the foundations for the new fort.

In May, 1849, the driving of the piling for the new foundation was commenced. The whole piling of the foundation, (amounting in number to between six and seven thousand piles,) was then subjected to a certain test by means of the ringing pile-engine. This work was commenced on the 11th of April, and finished on the 17th of June following. Those piles not standing the required test, amounting in all to about 1,700, were again spliced and redriven, so that now there can be no doubt that the foundation of the fort about to be built, is as near perfection as it can be brought.

Fort Delaware is placed midway between the center and the southern extremity of the island and is a bastioned work of granite, lined with concrete brick. Within the fortification are three brick buildings, each placed against a separate curtain, which are three stories in height, and provided with painted iron roofs. Their third floors are nearly on a level with the terre-plein, and communicate directly with it.

The largest of these buildings, which constitutes the barracks proper, is 279 feet long, 66 feet 6 inches wide, and 51 feet 6 inches high, from the parade to the crest of the roof. The sally-port is in the center of this building. The ground floor is divided into fifteen rooms, which are severally occupied as subsistence store-rooms, mess-rooms, prison-rooms, kitchen and laundresses' quarters. The third floor has sixteen rooms, used as quartermaster store-rooms, company offices, and laundresses' quarters. Several rooms on this floor are unoccupied. The height of the first floor in the clear is 12 feet 6 inches; of the second, 12 feet 9 inches, and of the third, 13 feet 9 inches. The kitchens, two in number, measure, respectively, 20 feet 6 inches, by 19 feet 6 inches. Each kitchen is provided with a large range, and with suitable wash-sinks, pumps, pantries, &c. The mess-rooms are also two in number. They are 39 feet long, by 30 feet broad, and are immediately adjacent to the kitchens. The floors of all the rooms on the first story are flagged. There are four squad,

* I have been told recently by Mr. Timothy Collins, who was employed in boring this well, that the water obtained had no "sweetish" or brackish taste, and was excellent in every respect. It was used by the residents of the island for nearly two years, when, through neglect, the well became filled up.

rooms or dormitories, each 57 feet 6 inches long, and 30 feet broad. They are all furnished with ventilators, wash-sinks, pumps, &c.

One guard-room and three prison-rooms are situated in the second story of the barracks, above the sally-port. The former measures 19 feet 9 inches by 13 feet; the latter, respectively, 13 feet by 8 feet 6 inches, 19 feet 9 inches by 10 feet, and 29 feet by 17 feet 9 inches. In addition to these, there are two cells on the ground floor, one on each side of the main gate, each 6 feet 6 inches long, 5 feet 11 inches broad, and 10 feet high, and a prison room 24 feet 6 inches by 14 feet 9 inches. A bastion-room on the lower tier is set apart for the post bakery.

The two remaining buildings are used for officers' quarters and for offices. They are each 95 feet in length, 70 feet in depth, and 53 feet 6 inches in height, from the parade to the crest of the roof. The height of the first-floors in the clear is 13 feet; of the second, 13 feet; and of the third, 14 feet. The ground floor of each building is divided into eight rooms, which are occupied as offices and as kitchens. The latter are furnished with ranges, ovens, wash-sinks, pumps, pantries, &c. The second floor contains nine rooms, and the third eight, all set apart for officers and their families, except one room in the second story, which contains the post library. These quarters are excellent in every essential particular. They are well lighted, well ventilated, and provided with handsome mantel-pieces and grates. The post library contains 1,400 volumes of scientific, historical, and miscellaneous works.

The water supply of the fort is principally derived from the fall of rain on the terre-plein. The water from this source passes successively through six inches of sand, two feet of earth, nine inches of gravel, and several layers of brick, the vertical joints of which are open to an arched brick gutter, whose bottom is covered with asphaltum. From this gutter it runs through conduits made in part of iron, and in part of earthenware crocks, to filters placed with the cistern to which each is attached, under the floor of the first tier of casemates. Every filter contains a layer of broken brick, 1 foot 3 inches thick; one of gravel, 2 feet thick; one of coarsely pulverized charcoal, 9 inches thick; and one of sand, 2 feet thick. Below these are several layers of brick, uncemented, but closely laid, through which the water passes directly to the adjacent cistern. Each cistern has a trap in the floor above, and each filter is provided with a door.

The cisterns, twenty-two in number, are of various sizes. Their aggregate capacity is 543,710 $\frac{2}{3}$ gallons; and it has been estimated that the water-shed is sufficient to fill them three times annually. They are built wholly of brick, lined throughout with hydraulic cement. Every cistern has a self-acting waste-pipe fixed at the height of 7 feet 7 inches above mean low water.

During the war, when many thousand prisoners were confined on the island, water was brought from Brandywine Creek, Delaware, and emptied into the cisterns, without having previously passed through the filters. A sandy sediment several inches in thickness, which has not yet been removed, was the result of this procedure.

The rain that falls on the buildings inside the fort is conveyed to iron tanks placed a short distance under every roof. The dimensions of these tanks are 12 feet by 8 feet by 4 feet. There are six in the barracks, and three in each of the other buildings. The water derived from those in the officers' quarters is used in the privies. The water from those in the barracks is conveyed to wash sinks situated in the second and in the third stories, and is chiefly used by the laundresses. The number of privies in the barracks is sixteen, equally divided between the first and the second floors. They communicate with the moat by means of a perpendicular well 4 feet by 3 feet in size, which extends from the second story to the grillage of the foundation. In each of the other buildings there are three privies on the first and three on the second story, constructed on the same plan, but in addition having a supply of water from the tanks. The excrement from these privies passes into the moat through sixteen openings, each 4 feet long, and 3 feet 8 inches high, and placed 2 feet above the bottom of the well. The drainage of the interior of the fort is secured by a large brick culvert, which discharges into the moat, and by tributary side-drains. They are all provided with traps.

There are five neat frame cottages with gardens, outside the work, four of which belong to the engineer, and one to the quartermaster's department. Three of these are occupied by officers and their families, and by two engineer employés. There are also three wooden houses, not in good repair, in which married soldiers and their families reside, besides nine cottages and shanties tenanted

by laborers hired by the engineer in charge. All these houses are furnished with covered cisterns, built entirely above the surface of the ground. Their privies have been erected upon the outer face of the adjacent embankment. They are cleansed by the tide. In addition to the edifices already mentioned, the island contains carpenters', shoemakers', and blacksmiths' shops, a school-house, post trader's store, a stable, and two ice-houses. It has also a dock and three wharves. Near the fort stands a very neat frame chapel, built during the war from the prison fund.

The hospital is situated 350 yards from the sally-port. It was begun on the 12th of August, 1868, and first occupied on the 26th of the ensuing November. It is a wooden structure, placed upon brick piers 3 feet 4 inches high. The ground underneath the building has been covered with a layer of sand one foot in thickness, and the spaces between the piers latticed. The hospital consists of a central building, having a front of 33 feet, and two wings, each 72 feet long, and containing eighteen beds. A veranda, one story high and 12 feet broad, extends around the whole building, with the exception of the kitchen. The plan promulgated in Circular No. 4, Surgeon General's Office, 1867, has been strictly followed in its erection, excepting that the central building has a hip roof; that the wards are ceiled in hard finish; that a door with a dead-light has been placed between the administration building and the right ward, and that a door has been inserted between each

ward and the passage leading to the bath-room and water-closet. The water-closets have been supplied with close-stools, and an excellent privy has been built on the outer face of the embankment, 78 yards distant from each ward. Rain water is conveyed directly to covered wooden tanks, two in number, situated respectively in the rear of the kitchen and of the right ward. The hospital grounds have a front of 263 feet and a depth of 310 feet, extending to the embankment in the rear, exclusive of the adjacent hospital garden, which is 231 feet long and 141 feet deep. They will be inclosed with a neat fence in the spring, and properly laid out.

For the general arrangement of the hospital, see Figure 11.

1. *Main floor.*—A, ward, 60 by 24 feet; B, bath-room, 11 by 9 feet; D, dispensary, 14 by 14 feet; K, kitchen, 14 by 12 feet; M, dining-room, 19 by 14 feet; O, office, 14 by 14 feet; P, veranda; S, store-room, 14 by 14 feet; W, water-closet, 11 by 9 feet.

2. *Second floor.*—A, B, C, E, F, G, store-rooms, attendants' quarters, and dead-room; D, hall.

The building recently in use for hospital purposes was a remnant of the prison hospital. It has lately been demolished. During the last three years of the rebellion the island was converted into a depot for prisoners of war, who were confined in wooden barracks erected outside the fort. I am informed that the greatest number imprisoned here at one time was about 12,000. All records of value relative to them were sent to the commissary general of prisoners in August, 1865.

There are two burial lots on the island, at its northern extremity, and one on a farm of about 80 acres, owned by the United States, situated directly opposite on the New Jersey shore. The latter has an area of about 9,000 square yards, and contains 10 graves of United States soldiers and 1,434 of confederates. It is protected by a wooden picket-fence, and provided with headboards.

One of the cemeteries on the island contains the remains of prisoners of war exclusively. Interments were permitted here in the winter only when access to the principal cemetery was rendered impracticable by floating ice. The remaining burial lot which was laid out at the

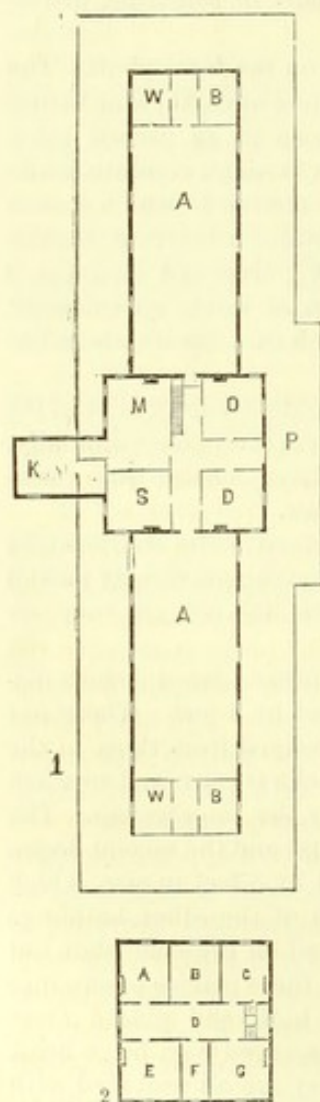


Figure 11.

establishment of the post is appropriated to the use of the garrison. They each have an area of 930 square yards, and together contain 142 graves. Both cemeteries are provided with headboards and good fences.

The graves, which were originally very shallow, have been covered with a layer of quicklime and of earth four feet in thickness.

Statement showing mean strength, number of sick, and principal diseases of troops at Fort Delaware, Delaware, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	Deaths.
1868.....	154.41	208	.....	19	39	13	9	3	27	.....
1869.....	113.	211	1	17	40	5	8	5	16	.....

Statement showing mean strength, number of sick, and principal diseases of white prisoners at Fort Delaware, Delaware, for the year 1869

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	Deaths.
1869.....	19.58	120	14	33	1	3	5	9	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CARLISLE BARRACKS, PENNSYLVANIA.

REPORT OF SURGEON J. J. B. WRIGHT, UNITED STATES ARMY.

Carlisle Barracks is situated near the center of the beautiful Cumberland Valley, about midway between the north and south mountain spurs of the Alleghany range, which are at this point ten miles apart. Latitude, 40° 12' north; longitude, 77° 10' west from Greenwich; height above the sea, 500 feet. The post is exposed to the northwest wind, coming from the mountains about five miles distant; but its other aspects are in some degree protected by woods, and by the town of Carlisle, situated on a slight eminence half a mile off. Le Tort's Creek, averaging ten feet in width, and having its origin in a spring two and a half miles south of the town, flows past the garrison on the northwest—distant about 200 yards. A large marshy tract of land, the only one in the vicinity, lies north and northwest of the barracks, in the immediate vicinity of the present hospital. The creek is not confined by well-defined banks, but at intervals spreads over considerable tracts of land.

The underlying rock of the vicinity is carboniferous limestone, which crops out at short and irregular intervals all over the eastern portion of the valley. All the cellars of the garrison are dug out of this solid rock.

The soil is argillaceous, with rich alluvium superimposed. Cumberland County is regarded as one of the richest agricultural districts in the State. Indications of coal are present at several points on the northwest of the valley, but no mines are worked. Iron ore is found, and supplies several furnaces in the vicinity. The mean temperature is 51.09° F.; extremes, 105° F. and 10° F. Total rain and snow fall for 1869, 49.29 inches. No special effect on the health of the troops has been noticed from prevailing winds or other climatic influences.

The town of Carlisle was laid out in 1750. It had previously been the site of an old fort or stockade, faint traces of which are still apparent. The first weekly mail from Philadelphia was established in 1757.

During the revolutionary war Carlisle, owing to its distance from the scene of hostilities,

was frequently selected for the confinement of British prisoners. In 1794 General Washington had his headquarters at this point while organizing the forces sent out to crush the whisky insurrection.

The barracks were built in 1777, chiefly by Hessian prisoners captured at Trenton. They were occupied by troops during the Revolution and in the war of 1812. The post was a recruiting depot, several regiments being here organized, among others the Twenty-second Infantry, commanded by General Brady. It is now occupied as a cavalry school of practice and as a depot for cavalry recruits. Carlisle is on the Cumberland Valley railroad leading from Harrisburg to Hagerstown, 18 miles west of Harrisburg. The barracks having been burned by the rebels in July, 1863, were substantially rebuilt, and are now in very good condition.

The general arrangement of the post is shown in Plate I. Over the parade and around the garrison are distributed a large number of beautiful shade trees of different species.

The quarters for enlisted men consist of three brick buildings. Two of these are, respectively, 271 by 24 feet, and 251 by 24 feet, and two stories high, and principally occupied by the permanent troops; the third is a three-story building, including the basement; its first and second floors occupied by married soldiers with their families; the remaining portion of the building serves for an armory, with shops, &c. The rooms occupied as dormitories are 25 by 40 by 10 feet each, accommodating forty men. At times, when the garrison is crowded, the air space per man is only 250 cubic feet. Five windows in each room admit plenty of light. Coal-oil is used at night. The dormitories are warmed by stoves. The squad-rooms are provided with efficient ridge ventilators of elegant pattern.

Double wooden bunks, two stories high, accommodating two men each, are furnished with the usual bedsack and blankets. At each end of these quarters is a wash-house, containing six iron wash-bowls and a hydrant to each. There are no bathing arrangements in connection with the post, the men performing their ablutions in a small creek running by the post. The sinks are all well located and kept in good condition. "Commodes" (earth-closets) are in use at this post, and upon thorough trial are found to be worthy of great praise.

Each troop has its own kitchen, about 10 by 25 feet, which is supplied with a large cooking stove and plenty of cooking utensils. The mess-rooms are separated from the kitchens by a partition, and are about 25 by 30 feet.

The married soldiers' quarters very comfortably accommodate from twelve to sixteen families, giving each from two to six rooms, with a commodious yard.

The officers' quarters consist of two-story brick buildings, in good condition, with kitchens and quarters for servants; also convenient yards in the rear. A commodious veranda for both stories extends along the whole front of the buildings. Ten sets of quarters consist each of parlor, dining room, two bed-rooms, kitchen, servants' room, and a bath-room. These quarters are liberally supplied with hydrants.

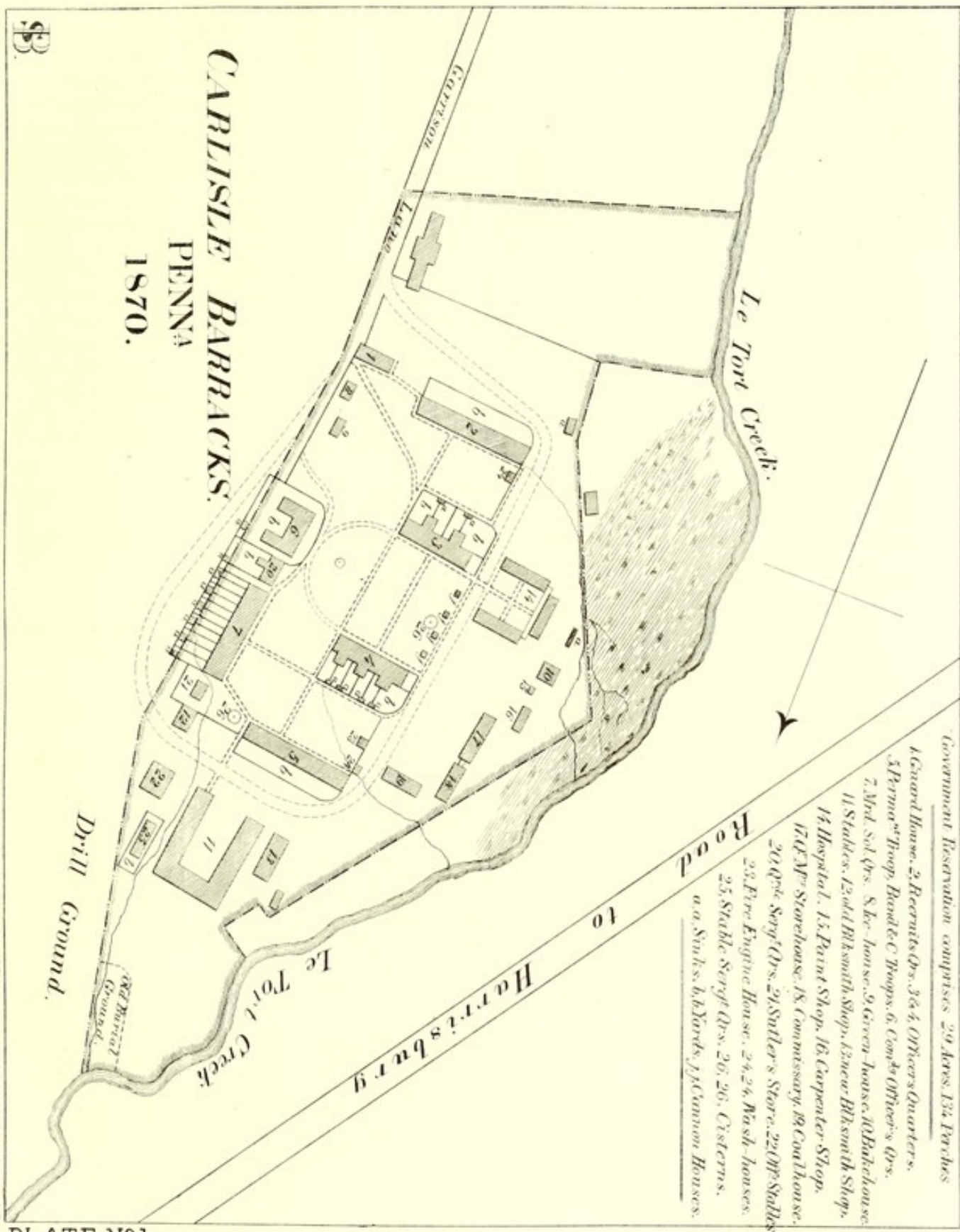
The commandant's residence, a two-story brick building with wings attached, is appropriately located, and, with the exception of gas, contains all modern improvements and appurtenances.

The commissary store-room, 25 by 55 feet, occupies the basement of the recruit quarters, while the quartermaster's department uses for storage purposes a frame building 25 by 65 feet, and one story high, and the large cellar beneath the quarters of the permanent troops.

The ice-house, of about 120 tons capacity, is 20 feet square and built of brick. Ice is furnished the post by contract in the winter.

The guard-house, about 70 by 30 feet, was originally built for a powder magazine; it is a brick vault, 6 feet thick; the summit of the arch is about 20 feet high in the clear. The guard-house is divided into four apartments; two of which are used for prison-rooms, one as a guard-room, and the remaining one as a magazine for powder and ammunition; the latter is separated from the other rooms by a very substantial brick wall from the apex to the base of the vault. This structure is considered bomb and fire-proof. The rebels, in 1863 did not succeed in injuring the vault by fire, although the roof which covered it was totally consumed, as well as the wood-work entering into the construction of the building.

The guard-house is principally defective in point of capacity. At the last muster for payment I counted 46 prisoners paraded in front of the guard-house. Taking the dimensions of the prison, rooms into account, it will be perceived that on that day only 165 cubic feet were allowed for each man, while the ventilation of the light prison is furnished by one grated window $2\frac{1}{2}$ by 5 feet, and



that of the cell by an aperture at the apex of the arch and a narrow slit in the side walls 2 by $\frac{1}{2}$ feet. The small cell in the powder magazine room, 6 feet square, which is used only for the confinement of refractory prisoners, has no means of ventilation or admission of light. A coal-stove warms the guard-house in winter.

It is doubtful whether the guard-house or the hospital at Carlisle barracks can best claim the bad eminence of being a public nuisance; the latter more particularly, perhaps, on account of its location than of its construction, though it is not built after any approved model. It is placed near the western limit of the slope of the military tract of ground, which extends in the direction of the low marshy bottom of a basin, through which runs a deep creek which overflows its banks several times a year, leaving the surface of the ground, comprising many acres, submerged for weeks. The sewer—which drains the southern portion of the garrison—empties itself immediately below, and in fearful proximity to, the hospital; all that it bears of slops and dirt from the company kitchens and washhouses, remaining exposed to the sun during the whole summer.

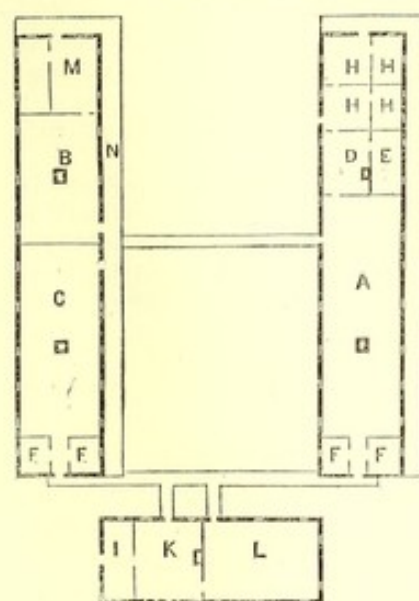


Figure 12.—Scale 62½ feet to 1 inch.

The building consists of two frame pavilions, and a miserable shell for a kitchen, for the general arrangement of which see Figure 12. A, ward, 77 by 25 feet; B, chapel, 42 by 25 feet; C, theater, 61 by 25 feet; D, dispensary, 20 by 14.6 feet; E, store-room, 20 by 10.6 feet; F, F, F, F, bath-rooms, 9 by 10 feet; H, steward's quarters; I, cook's room, 10 by 25 feet; K, kitchen, 22 by 25 feet; L, mess-room, 38 by 25 feet; M, rooms not in use; N, veranda.

The two wards contain 50 beds, allowing to each about 800 cubic feet of air, and about 90 square feet of surface area. Usually only one ward is occupied, although as many as 75 patients have been crowded into the hospital. Two cast-iron bath-tubs and two wash-bowls, connected by one-inch pipes with the hydrant, are located in the small rooms on the further end of the ward. There are no water-closets connected with the hospital.

The following extracts from letters of Surgeon J. J. B. Wright, United States Army, will give an idea of the history and condition of the hospital:

Extract from letter dated September 22, 1864.

Carlisle barracks dates its origin to a period anterior to the American Revolution, and has been occupied, with the exception of short intervals, ever since. Yet there has never been a separate hospital for the post until last winter, when, the barracks having been destroyed by the rebels, a temporary building, consisting of a mere shell, was constructed for the emergency.

The barracks having been rebuilt in a most substantial way, it seems proper that a hospital corresponding in appearance and durability should render the post complete. I have the honor, very respectfully, to submit for the consideration of the proper authority the accompanying plan, specification, and estimates.

Extract from letter dated March 4, 1866.

GENERAL: I have the honor again to invite your attention to the subject of the post hospital at these barracks. By reference to the report of Acting Inspector General Colonel George D. Ruggles, dated about September 20, 1864, (a copy of the part of which, relating to the medical department of the post, is, I presume, on file in your office,) you will see that in the estimation of that officer urgent necessity existed for better accommodations for the sick at the post. I beg leave also to refer you to my communication of the 22d of September, 1864, on the same subject, and to one of subsequent date, about September, 1865, of which I failed to keep a copy.

The objections of the Inspector General, as well as myself, to the hospital then and now in use at the post, related more perhaps to the position or location than to the construction of the building. It is built near the western limit of the slope of the military tract of ground, which extends in the direction of the low marshy bottom of a basin, through which runs a deep creek which overflows its banks several times a year, leaving the surface of the ground, comprising many acres, submerged for weeks; even now it is a miniature sea, with its islands of swamp grass dotting its surface, almost in the immediate vicinity of the hospital. Besides, the sewer, which drains the southern portion of the garrison, empties itself immediately below and in fearful proximity to the hospital, all that it bears of slops and dirt from the

company kitchens and washhouses remaining exposed to the sun during the whole summer. The termination of this drain being the lowest ground in the vicinity, its contents, of course, cannot be carried off. But you will very naturally inquire why was the hospital erected upon this very objectionable site, and I will explain. When the barracks were burned by the rebels, it was deemed (very reasonably, I think) that a permanent hospital would be erected corresponding in durability and convenience with the rest of the garrison; and nature seemed to point out a particular spot for its erection; but when the War Department ordered that a *temporary* hospital should be built, it was concluded not to erect it on this eligible site, for the reason that it would interfere with the construction of the new hospital. In justice to myself, however, I have to disclaim any agency in the location of the present miserable hospital. I had advised, when it was proposed to erect a temporary hospital, that it should occupy a position on high ground on the east side of the barracks, remote from the swampy tract alluded to, and not in the way of the new hospital. I left the post just at that time, under an order detailing me on a medical board in New York, with the impression that the site recommended would be occupied. On my return from New York I found that the commanding officer (Major Hastings) had ordered it to be erected where it now stands.

When the work on the new hospital was abandoned at an advanced stage of its completion, by direction of the Quartermaster General, it was ordered that the temporary building should be repaired and converted into a comfortable hospital, which, of course, involved an utter impossibility. Much expense was incurred on the frail structure, it is true, (enough, I should think, to have finished the new hospital;) but however much it was *improved* it was far from being a good and comfortable and healthy place for the sick. The objections to its surroundings remained; besides, an important part of the hospital, the kitchen, has never undergone any repair or improvement. It is almost in a state of dilapidation, a mere shell, scarcely inhabitable in winter.

From the foregoing statement it will be perceived that it is utterly impossible to police in a proper way the environs of the present hospital.

The several grave cases of fever which have recently occurred at the post have all, without exception, originated in the hospital; at least all its victims have lived and slept in the rooms and wards of the hospital. The late Assistant Surgeon Petherbridge occupied quarters in the hospital, and died in the belief that the cause of his disease originated in the faulty surroundings and construction of the hospital. The rooms he occupied are but very slightly elevated, (in fact almost rest upon the ground.) I can readily conceive that some telluric emanations assuming miasmatic form and character were operative in the production of the fever of which he died.

The post bakery is a brick building one and a half stories high, containing two rooms with brick floors; in the larger of which is an oven of capacity for 240 loaves.

The stable, a substantial brick structure, consists of a centre building 150 by 35 feet, containing a farrier's room, saddle-room, granary, two boilers for heating water, &c., and two wings joined at right angles; each divided into fifty commodious stalls for horses. The stables are well ventilated by ridge ventilators, and by numerous windows and air-holes, besides being provided with six large double doors, facilitating greatly the removal of horses in case of fire. Between the wings are stretched two picket lines, allowing ample space for over one hundred horses. Close to the stables are a water plug and hydrant supplying the watering troughs. If a brick or some other substantial floor was substituted for the present miserable clay floor, these stables would be perfect in every respect. There are generally between eighty and ninety horses in these stables for the instruction of cavalry recruits, and a few horses for teams, &c.

A post library, consisting of 876 volumes of miscellaneous books, for the benefit of officers and men, was begun in 1865. The men of the permanent troop have a reading-room, which is also occupied for several hours a day for a school-room. The school is supported by the post fund, from which are supplied books and other necessities. A literary society has been organized by the men, and most of the more important daily and weekly papers, pictorials, and periodicals, are taken.

The post is supplied with water from hydrants, to which it is conveyed in pipes from the Canadequinte Creek. The water is of good quality; it is slightly impregnated with lime, but not to an exceptionable extent.

Between the officers' and permanent troop quarters is the fire-engine house. The engine is supplied by the hydrants and two large cisterns, one between the rows of officers' quarters, the other near the permanent troop quarters, and has sufficient hose for throwing water over the whole garrison, excepting the hospital building.

The drainage of the garrison is generally good, being carried off by Le Tort's Creek. The sewer, before referred to, emptying near the hospital, its termination the lowest ground in the vicinity, drains the southern portion of the post. All offal, &c., is buried in the swamps situated north from the garrison.

The post garden consists of about two acres, partially supplying the men's mess with vege-

tables in their season. Most of the potatoes used are purchased by the commissary department. The hospital garden is very small, occupying the space between the wings of the hospital, and is more ornamental than useful.

No local causes of disease exist in or about the post, unless such as are possibly found in connection with a tract of low ground, sometimes partially submerged, extending along the whole length of the government line of fence on the southwest. Some cases of cholera occurred at the post in 1864 and 1866, but the disease did not assume epidemic proportions. In the latter year, the cases were limited to recruits lately arrived at the post. The majority of cases of intermittent fever occurring during the year may be traced to foreign origin. The prevailing diseases are pneumonia, rheumatism, diarrhœa, intermittent fever, &c.

Except as relates to the permanent party of the post, the men are constantly changed from time to time, those partially instructed being sent in detachments to the several cavalry regiments, and their places supplied by new recruits.

Statement showing mean strength, number of sick, and principal diseases at Carlisle Barracks, Pennsylvania, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarhal affections.*	No. of deaths.
1868.....	335. 16	1,286	135	258	70	140	31	240	1
1869.....	335. 25	1,021	98	201	55	100	20	191	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT McHENRY, BALTIMORE, MARYLAND.

REPORTS OF SURGEON JOSIAH SIMPSON, UNITED STATES ARMY, AND ACTING ASSISTANT SURGEON H. C. YARROW, UNITED STATES ARMY.

Fort McHenry is situated on Whetstone Point, a peninsula formed by the junction of the northwest branch of the Patapsco with the main river, latitude 39° 15' 44" north, longitude 76° 34' 28" west. It is about three miles southeast from the center of the city of Baltimore.

This site was first occupied for military purposes in 1775, at which time a water battery was constructed here in connection with obstructions in the river, consisting of three massive wrought-iron chains and some sunken vessels. In 1794 the fort was repaired, the star fort of brick-work added, and the whole was ceded to the United States and received its present name. It was named after James McHenry, a secretary to General Washington during the revolutionary war, and Secretary of War in 1798.

Fort McHenry was bombarded on the 12th of September, 1814, by a British squadron under the command of Admiral Cockburn, but was not materially injured, and the enemy was successfully repulsed.

During the late war the fort was used as a rendezvous and as a military prison.

The military reservation covers an area of about 49½ acres, of which about 4¼ is occupied by the fort and water battery. The surrounding country is comparatively low and level, and subject to occasional inundations.

The geological formation of the land upon which the fort is located, as shown by the borings of the artesian well at the post, consists of yellow sand, clay, with boulders, iron ore, &c., in layers varying from one to thirty-three feet in thickness, until, at a depth of 140 feet, water of an excellent quality is found in abundance.

The mean temperature of the post during the year was 56.18° F. The greatest heat was July

15, 1869, 95° in the shade; the extreme of cold was on February 21, 1870, 12° F. The amount of annual rain-fall was 29.11 inches. During the summer the prevailing winds vary from south to east; those of winter are mostly northwest. In summer the winds pass over the low lands on the opposite side of the Patapsco, over one mile distant from the fort. The fort occupies the whole of the extremity of the peninsula; the parade ground is $31\frac{1}{2}$ feet above low-water mark.

The men's barracks inside the fort, as originally built and intended to accommodate two companies, are two substantial brick buildings occupying two adjacent sides of a pentagon. They are each $97\frac{1}{2}$ feet by $21\frac{2}{3}$ feet, and two stories high, with a covered porch 10 feet wide to each floor, extending the entire length of the west or front side. These barracks are insufficient to accommodate properly the number of men occupying them. Each story contains three rooms of equal size; in the lower are the kitchen, mess-room, orderly and store rooms; in the upper are three squad-rooms as quarters, each $30\frac{1}{2}$ by $21\frac{2}{3}$ by 10 feet, plastered and ceiled, giving to each man about 330 cubic feet of air space. In these rooms the men live almost entirely, there being no separate provision for lounging, smoking, reading, &c. At present wooden, two-storied bunks are furnished these quarters, and are alike detrimental to morality, cleanliness, and comfort; four men sleep in each of these bunks, the number of soldiers in each dormitory is seldom less than 20, and the ventilation is very insufficient, especially in winter.

The barracks situated outside of the fort are on the northeastern part of the sea-wall, built of brick, and, unlike those described above, are large and commodious. They consist of two stories, the lower used for mess hall, office, kitchen, &c.; the upper as dormitories. In these rooms iron bedsteads are used, which contribute greatly to the comfort of the men and neatness of the barracks. Upon the roofs of these buildings are placed two large ventilators, and there being a sufficient number of windows, the air is kept tolerably sweet and pure. The principal objection to these rooms is the lowness of ceiling, the air space for each man being 520 cubic feet; at night the air in all the sleeping rooms is very impure. Another objection to the sea-wall barracks is the location near the water. It has been found by observation that in the spring, summer, and fall, the sick list of the companies occupying these quarters is twice as large as that of the companies garrisoned within the fort. All the barrack buildings are heated by stoves, and the windows are ranged on opposite sides.

The men's sinks, two in number, are decidedly objectionable. One is situated in the moat facing the sally-port; the other, distant some 400 yards from the fort, is located on the sea-wall. It has been found impossible to keep the former sweet, and in warm weather it is extremely offensive. The contents of this sink have to be removed from time to time, which of itself is a great nuisance. The other sink is objectionable on account of its distance from the fort. A kitchen and mess-room are attached to each company quarters. The laundresses' quarters, situated on the northeast side of the main entrance to the fort, are three one story frame battened buildings, originally put up for confederate prisoners, but used for quarters by troops, and subsequently divided into rooms and occupied by laundresses. In these buildings too many persons are crowded, being occupied by families with a total proportion of 87 souls.

The quarters for officers are necessarily much scattered and not uniform. Some of the buildings are good, others decidedly objectionable, being very damp, swarming with vermin, and exposed to miasmatic exhalations from a swampy piece of ground, which is frequently covered by water after high tide.

That occupied by the commanding officer is situated near the chapel between the two roads leading to the wharf. It is an old brick building, two and one-half stories high, formerly used as a hospital. Opposite to this building are two frame houses used as officers' quarters; the one nearest the fort is one and one-half stories high; the other, consisting of two separate buildings joined at right angles, is partly one and partly two stories high. In addition to these quarters, one single, and two double cottages are built facing the road leading to the fort. The double cottages contain four rooms, two kitchens, and four attic rooms each; the single one, three rooms, one kitchen, and four attic rooms. These buildings are convenient and comfortable, with the exception of being damp; but having been constructed of green timber the joints of the doors and windows have opened.

The ordnance, quartermaster, and commissary storehouses, are in three large frame buildings without the fort.

The guard-house is situated at the entrance of the fort, and occupies the fifth side of a pentagon. It is a substantial brick building, the arch-way or sally-port passing through it, on one side of which are two rooms, one 21 feet 5 inches by 14 feet 2 inches; the other 12 feet 10 inches by 12 feet 2 inches, used for the confinement of prisoners. These rooms are deemed too small for the strength of the garrison. The guard-room, 21 feet 5 inches by 14 feet 2 inches, is on the other side of the arch-way, and communicates by means of a door of iron bars, with three cells, each about 10 by 4 feet, intended for solitary confinement. The guard-house is warmed by stoves, ventilation is rather imperfect, and the building is believed to be decidedly unhealthy. Its average occupancy is about 18 prisoners, giving to each about 238 cubic feet of air space.

The hospital building proper is a substantial brick structure located within the fort limits, upon elevated ground, and fronts to the southeast. It was erected about thirty-five years ago. Its dimensions are 53½ by 27 feet, and two stories high. Covered porches, 10 feet wide, extend around the building on its lower and upper floor. The first floor being raised from the ground about four feet, is reached by stairs at the front and rear porch. The building is warmed by means of stoves; kerosene oil is used for artificial illumination at night; large windows secure natural lighting and ventilation.

The plan of this building is shown in Figure 13. 1, lower floor; 2, upper floor; A, A, wards; B, bath and wash-room; D, dispensary; H, H, halls; O, office; W, water-closets.

The wards on the upper floor measure 23 feet 10 inches by 19 feet 4 inches, and are 12 feet 10 inches high. These wards contain six beds, giving to each 979 cubic feet of air space. Each room has a water-closet attached, which, on account of their improper construction, rendering disinfection imperfect, are no longer used. (The earth-closet has been sent to this hospital.) The bath-room is on the first floor, adjoining the office. The basement story extends only under one-half of the building, and contains the kitchen, which is low and dark, and at present not in use. Water is supplied from the main tank inside the fort, and conveyed in pipes to the first floor of the hospital. A fine spring is located near the building, but cannot be used on account of the proximity of the hospital privy.

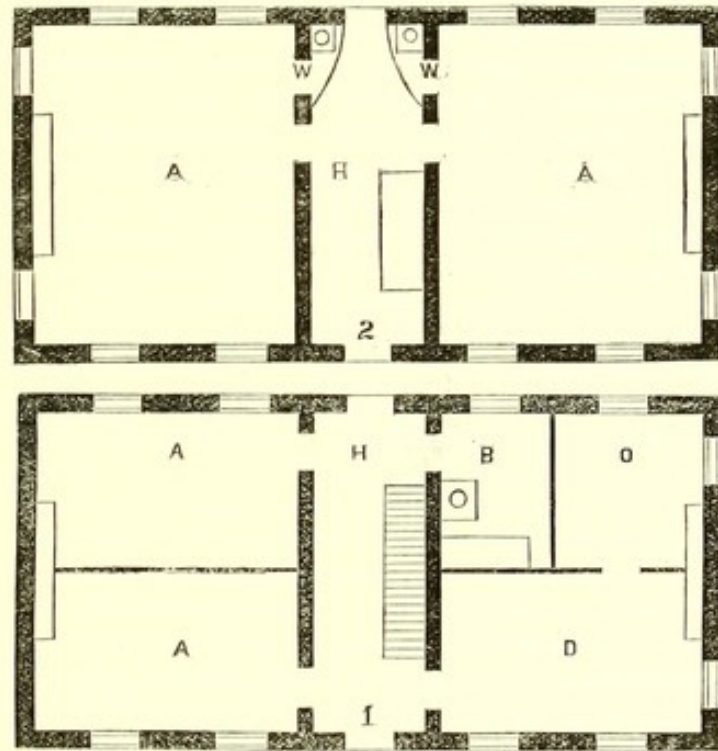


Fig. 13.—Scale 16 feet to 1 inch.

During the recent war it became necessary to provide additional hospital accommodations, and a frame building 150 feet by 30½ feet was erected, adjoining the hospital on the southwest side, by an addition 60½ by 25½ feet, extending from the center of each; the connecting building contains the mess-room, store-room, and linen-room. The frame building was originally one large ward, but latterly a portion of it has been partitioned off, sufficient to contain twenty beds, with an air space of 1,200 cubic feet to each. The principal objection to this ward is its defective ventilation; the windows are sufficient in number, but too high from the floor. The upper part of the ward is thoroughly purified by the windows and ridge vents, while on the floor and five feet above, the air is never fresh.

The post bakery, located near the wharf, is a very old frame building one story high, and contains two large ovens with a respective capacity for 200 and 300 loaves per day.

The chapel, situated west of the commanding officer's residence, is a two-storied building, the first floor being used as a library and school-room. On the second floor is the auditory, which will comfortably seat 200 persons. This building was erected some twenty years ago by the Methodists of Baltimore.

The stable is a two-story brick building, 121 by 22½ feet, with gable roof. The lower story contains stalls for public animals, while the forage, &c., is stored in the story above. The building accommodates 35 animals; is well lighted and ventilated by windows and loop-holes in the sides and sky-lights in the roof. The stalls are large and comfortable, and, in case of fire, the animals can be easily liberated. A small stable, built of brick, is located near the commanding officer's quarters, for his horses.

The post and regimental libraries contain over 1,000 volumes of standard literature, and are being constantly increased.

The principal supply of water is furnished by an artesian well sunk in the center of the parade ground. The well is 142 feet in depth; 12 inches in diameter 92 feet down; 88 feet of 8-inch pipe extending to 138 feet; double pipe 46 feet. The water is forced by means of a force-pump from a depth of 30 feet into an iron tank of a capacity of 3,322 gallons, and from thence distributed through iron pipes to the following hydrants, viz: one in the center of the fort; one in the center of the road leading from the sally-port to the wharf, located between the commanding officer's and officers' quarters; one to each cook-house of the barracks; one near the southwest corner of the laundresses' quarters; one in the hospital yard; one in the dispensary; one in the hospital kitchen; one in the second story of the brick hospital, and one in every kitchen of the officers' quarters.

The post is also supplied by means of pumps from wells located as follows, viz: one in the southeast corner of the fort; one in the southwest corner of the yard, in rear of the commanding officers' quarters; one between the stable and bakery, and one in the hospital grounds. Means of subduing fire are water-buckets, a force-pump, and ladders; in addition to which there should be a steam fire-engine.

The drainage is naturally good, the whole of the reservation having a gradual slope to the water. The ground outside of the fort is drained by stone and brick gutters, following the natural slope and emptying into the river. The fort is drained by a sewer extending from the southeast side. The marshy piece of ground, spoken of in reference to a portion of the officers' quarters, and which fronts northeast on the Patapsco, should be filled in, or some means devised to prevent the overflow it is subject to, as it is a fruitful source of disease.

The hospital garden consists of three patches of ground within the hospital reservation proper, and is cultivated by convalescents; it is not only ornamental but useful, a sufficiency of vegetables having been raised to supply all the wants of the hospital.

It can hardly be stated that any disease is particularly prevalent at this post, as may be expected from the position of the fort reservation, surrounded as it is on all sides by mud flats. The miasmatic fevers prevail to a certain extent, not so much so, however, as at posts similarly situated. A number of cases of neuralgia and rheumatism have occurred this spring, principally in officers' families, owing to the continued bad weather and the dampness of the quarters.

Statement showing mean strength, number of sick, and principal diseases at Fort McHenry, Maryland, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	332.16	742	216	152	17	48	28	6	79	1
1869.....	298.00	588	116	121	35	30	36	1	56	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WHIPPLE, VIRGINIA.

INFORMATION FURNISHED BY ASSISTANT SURGEON CHARLES SMART, UNITED STATES ARMY, AND
ACTING ASSISTANT SURGEON L. W. RITCHIE, UNITED STATES ARMY.

Fort Whipple, Virginia, is situated on the south bank of the Potomac, about half a mile from the Aqueduct bridge, which crosses the river at Georgetown, District of Columbia. From the river the ground rises rapidly until it attains a height of 200 feet at the point where the post is built. It is wooded in part and cut into ravines by numerous small water-courses tending toward the river. Beyond the post the country is undulating and grassy. The fort commands this rolling ground, and, in the opposite direction, overlooks the basin of the Potomac, the cities of Washington and Georgetown, and the lands beyond them on the east. Its position is so elevated that it has been considered free from malaria, but during the past summer and autumn intermittents have prevailed.

The water supply is from a spring which furnishes pure, cool water. The natural drainage is excellent. Fort Whipple is one of the chain of earth-works erected for the defense of Washington during the late war. For the past year a small detachment of the signal corps has been stationed here, but during the summer and fall the number was greatly increased, and a new barrack has been constructed. This is composed of a two-story central building, 29 feet 2 inches by 23 feet 6 inches, and two wings, each 38 feet by 23 feet 2 inches. It is built of wood, and raised 18 inches from the ground on brick piers. The height of all the rooms is 9 feet 8 inches.

The building is heated by four stoves, one in each dormitory; the only means of ventilation are the doors and windows. The central room on the ground floor has two windows and a door in front; the same in the back, and a door in each side wall, opening into the wing rooms. It is occupied by 14 men, each man having 427 cubic feet of air space. The wings have each four windows and a door in front; the same on the rear wall, one in the free ends, and opposite them doors communicating with the center room; but from the free end of the right wing ten feet has been partitioned off as quartermaster's office, thus depriving the soldiers' quarters of one of the end windows. The wing rooms are occupied respectively by 16 and 21 men, giving an air space of 370 and 405 cubic feet. The second-story room corresponds to the central barrack room, and is occupied by 16 men, giving to each 374 cubic feet air space.

The officers' quarters are two one-story frame buildings, old and unfit for their purpose. They are at present occupied for the most part as offices and store-rooms, and as quarters for the sergeants receiving instructions with regard to meteorological observations.

The guard-house is a frame building within the fort, divided into a guard-room, 13 by 14 feet, and a prison-room, 14 by 18 feet. The average number of occupants of each room is three.

The hospital is a frame building erected during the summer of 1870. It contains two rooms—a ward 15 feet by 15 feet 6 inches, by 9 feet high, containing six beds, giving 351 cubic feet air space to each, and an office and dispensary, 15 feet by 11 feet 6 inches. There are no arrangements for ventilation. The kitchen is a frame building, 15 by 12 feet, placed 24 feet in rear of the hospital. There is no store-room, mess-room, bath-room, or privy connected with the hospital. The two attendants sleep in the wards.

There are no facilities for bathing, and no sinks or privies at the post, and the sanitary condition is decidedly bad. There have been two cases of typhoid fever during the past summer, one of which proved fatal. Malarial fevers have also prevailed.

FORT FOOTE, MARYLAND.

REPORT OF ACTING ASSISTANT SURGEON, JOHN. H. BAYNE, UNITED STATES ARMY.

Fort Foote is situated immediately upon the Potomac River, on the Maryland side, about eight miles below Washington City, on an elevation of land known as Rozer's Bluff, at an altitude of about 100 feet above tide-water. In the rear of the fort is an extensive gorge, varying in depth from 10 to 100 feet, running the full extent of the reservation, and continuing thence to the Potomac River. A marsh about 400 yards wide, and covered with a thick growth of coarse grass and small trees, extends along the margin of the Potomac, in a northerly direction, to the distance of a mile. About a mile and a quarter below the post, in a southeasterly direction, is located a marshy tract of land of at least 200 acres, called "Broad Creek;" one-half of its area is clothed with a luxuriant growth of tall coarse grasses, interspersed with scrubby trees and bushes; the other half is composed of mud banks, the accumulation of years, brought down by floods from the hills and valleys above.

This post was established in 1862, as an adjunct to Fort Washington, four miles distant, and was first occupied by the Ninth New York volunteers, under command of Colonel Stewart.

The fortification is constructed of earth and green timber. The quarters of the garrison, the hospital, and other buildings in process of erection, are eligibly located upon the height back of the fort.

The barrack is a new two-story wooden building, 160 feet in length, affording a sufficient capacity for two companies. The walls of the building are lined with brick, and a veranda extends its whole length in front, with a roof formed by a continuation of the roof of the building. The barrack is warmed by stoves, artificially lighted by candles, and ventilated through the roof. The dormitories, 78 by 23 feet, and 9 feet high to the eaves, would each accommodate 33 men were each man allowed an air space of 600 cubic feet, but double that number have been placed in them. They are two in number, and occupy the second floor of the building. Iron bedsteads, similar to those used in the hospital department, are furnished, and over each is a shelf for the knapsack of the soldier. The lower floor of the building contains a wash-room, mess-room, kitchen, library, office, &c.

The kitchen is large, and has two store-rooms adjoining. The mess-room occupies about one-third of the area of the first floor, and contains two rows of tables.

Married soldiers' quarters are five new rooms, 16 by 12 feet, one room to each family, with a porch in front, and kitchen attached to the rear of the building.

Officers' quarters are two frame houses, lined with brick; each house is a double set of quarters, each set containing four rooms.

A bomb-proof within the fort is occupied as a guard-house and prison-room; being an earth-work, and the timbers somewhat decayed, it is illy adapted for the purposes for which it is used. It is sufficiently heated by a wood-stove, but the ceilings, which are of decayed logs, admit water in rainy weather. The floor is damp, making it very uncomfortable for the occupants. The guard-house and prison-room are doubtless causes of much sickness at this post, as nearly every private soldier in the garrison has to occupy one of these rooms underground every alternate night on guard duty.

The post bake-house is a commodious wooden building, with brick oven attached sufficiently large to turn out 350 rations of bread in a batch.

The water supply is obtained from a well, a spring, and several small cisterns. There are no underdrains or sewers at the post. A system of leveling, grading, paving, and draining has been so thoroughly and unremittingly pursued that the grounds have been rendered comparatively firm and dry.

Endemic dysentery and diarrhœa have prevailed at Fort Foote with great severity during the last six months, (ending December 31, 1869,) which, superadded to the autumnal disease incident to this locality, rendered the percentage of sick very large in proportion to the command, and

as the first two named diseases have been exclusively confined to its limits, it is difficult to account for their origin and prolongation.

Situated in a malarial district, intermittents, remittents, malarial dysentery and diarrhœa prevail at this post during the autumnal months; but for the period above mentioned the proportion of sickness has been far greater than that of previous seasons, while Fort Washington, a few miles below, on the Potomac River, with malarial surroundings very similar, has enjoyed the most perfect immunity from disease. The morbid agent would thus appear to have a local origin, even within the limits of the post; but after the most careful investigation it is impossible to arrive at any satisfactory solution of the difficulty. The cases have nearly all been very protracted, varying in duration from one to four months, and presenting nearly the same series of morbid phenomena.

The post and hospital gardens contain about three acres. Potatoes, onions, and cabbages are raised in abundance for the supply of the small company at present forming the garrison.

Statement showing mean strength, number of sick, and principal diseases at Fort Foote, Maryland, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarhal affections.*	No. of deaths.
1868	115.58	574	1	135	100	7	23	71	47	.....
1869	78.16	364	.....	99	66	9	12	24	32	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WASHINGTON, MARYLAND.

REPORT OF ASSISTANT SURGEON J. C. G. HAPPERSETT, UNITED STATES ARMY.

Fort Washington, in latitude $38^{\circ} 41'$ north, longitude $76^{\circ} 58'$ west, stands on a high ridge, at the confluence of the Piscataway Creek with the Potomac River, 14 miles below Washington City. This ridge extends from Swan Creek, (a short, wide arm of the river, half a mile north of the post,) nearly parallel with the river, and terminates in a narrow promontory below the fort. Behind is a deep ravine, 300 feet wide at the top, with sides sloping precipitously about 80 feet, terminating in a narrow plain about 100 feet wide; this ravine opens on Piscataway Creek, a small portion of which, near the creek, is marshy and covered with swamp willow. The ridge is composed of layers of clay, sand, and marl, and many fossils are found in the vicinity of the marl beds which open on the river bank. The sides of the ravine were formerly heavily timbered, but this was cut away during the late war, and they are now covered by a thick undergrowth, principally chestnut and locust. The river at this point is about 1,300 yards wide; the channel, however, is not more than 500, and entirely on the fort or Maryland side of the river. The shore is gradually sloping, sandy, and hard; the Virginia side being flat and muddy, both sides covered in summer by the ordinary river grass, which is exposed at low tide, the rise and fall of which is between five and six feet. The shores of the creeks are muddy.

This site was early occupied as a military post, and the small work which formerly stood here, near where the water battery now is, known as Fort Warburton, was blown up in 1814, by order of the officer in command, to prevent its probable capture by the English fleet. The present structure, laid out in 1815, is an irregular bastioned fortification of stone and brick. The parade of the main work is 115 feet above high-water mark. The entire government reservation contains between 40 and 50 acres.

The buildings originally constructed are one brick building designed as quarters for four officers; one brick building for barracks for one company, (both inside the fort,) and one brick building outside the fort, intended as quarters for the commanding officer. All these are covered with slate, and though deficient in most of the conveniences and appliances of modern architecture, are substantial buildings. In the winter of 1867-'68, three small double cottages, intended as officers' quarters, and one large building for barracks, all frame buildings, were erected outside the fort, and in the winter of 1868-'69, one long frame building for laundresses, and a small house for the hospital steward. The old, or brick barracks is intended to accommodate 60 men. It has been recently repaired, but is without means for proper ventilation, is two stories high, with piazza facing the west. The upper story is divided into two rooms for dormitories, the lower story has three rooms, kitchen, mess-room, and one sleeping room. The sleeping rooms are fitted with iron bedsteads, double lockers, and gun-racks. This building stands close to the eastern parapet, and the lower story is badly ventilated and always damp; the air space per man is 360 cubic feet.

The new or frame barracks is a two-story building, standing near the edge of the ravine on the eastern side of the reservation. The upper story, originally a single room, is now divided by a temporary partition, near the middle, which, though deemed necessary in cold weather, materially interferes with its free ventilation. A wide stairway, entering near the middle from the outside, and a ridge ventilator surmounting the building, render this the best ventilated room in the garrison. It is intended to accommodate 100 men with an allowance of 460 cubic feet of air per man. The lower story is divided into kitchen, mess-room, wash-room, store-room, and company offices, all badly ventilated. The walls and ceilings of this story are all plastered; of the upper story, only the sides. From its position this building has every facility for thorough drainage. Two wide piazzas extend the entire length of the building, front and rear, and being raised from the ground on brick piers it could be easily made a model in point of drainage and ventilation, but it is badly constructed, the south end being propped up to keep it from falling in. It is also fitted with iron bedsteads, lockers, and gun-racks. The kitchens in both barracks are well furnished, have large and very fine cooking stoves, and well selected mess furniture; they are now artificially lighted by candles, and heated by coal stoves, burning anthracite coal; there is no provision for bath-room or reading-room in either.

The officers' quarters consist of one brick building inside the fort, intended for four officers, the set at each end of the building consisting of two rooms and a basement kitchen; the others of similar rooms, but without the kitchen. One brick building outside the fort, for the commanding officer, has four rooms with a basement and attic. These buildings, as before stated, were constructed at the same time as the main work. To accommodate the necessary officers, three small frame cottages, each for two sets of quarters, have been erected. Two of these cottages (four sets of quarters) have two rooms and a small kitchen on the ground floor, with low attic above; the other cottage is smaller and without the kitchen, (though rude basement kitchens have since been added by the officers.)

The division to each cottage is a thin, plastered partition on the ground floor, and an open frame one on the attic floor, that on the ground floor having a door leading from one set of quarters to the other. They are all badly constructed, of but partially seasoned lumber, and all leak. The privy to the brick quarters is a vault, that to the frame or new quarters, a shallow pit. These are a constant source of annoyance. With unsurpassed natural facilities for thorough drainage, but a very moderate outlay would be required to fit bath-rooms and water-closets to all the buildings, and add greatly to the health of the post. No attention whatever has been paid to this matter, although drain-tile of good quality has been at the post for nearly a year.

The only arrangement for a guard-house was at the main sally-port, where there was one room, with two cells attached, but this had to be abandoned on account of its want of ventilation. A casemate is now used for this purpose, but it is poorly ventilated and very damp; the old building on the wharf, which was for a time used for this purpose, was abandoned. A guard-house is much needed.

The present hospital building, erected in 1863, and intended for temporary use, is a frame building 192 by 24 feet, and 16 feet high, with a small kitchen connected with the main building by a covered porch. It has two wards, separated by sliding doors, intended for eighteen beds, and allowing an air space of 950 cubic feet per man. This building is badly arranged, and has never

been entirely finished; the rooms intended for a dispensary and office are entirely too small, and there is no place suitable for a store-room. There is a good cistern, with a force pump in the kitchen. The bath-room has never been completed. The whole building being lined with boards, tongued and grooved, it is found impossible to keep it free from the annoyance of bed-bugs. An effort was made to have it plastered, but this was unsuccessful. From its exposed position and poor construction, it is impossible to keep it comfortably warm in cold weather. It is 118 feet above high water, and the highest point on the reservation. The privy is some distance from the hospital, and similar to those previously described. The hospital is well supplied with furniture and appliances, obtained from the purveying depot in New York. Another site for the hospital must soon be selected, as the bank on which it now stands is rapidly crumbling away.

The post bakery is in good order; it has a well-constructed oven of the best pressed fire brick. The water used is hauled from the river.

There is a small chapel on the east side of the reservation, intended also as a school-room, but it is not used now, there being neither chaplain or teacher.

The stables are all in the water battery, and are well constructed of brick. The offal, as well as the slops from the entire post, are daily removed by carts, and deposited on the bank of the river, from whence they are removed by boats across the river. Each company has a small library, and there is also a post library accessible at all times, but no furnished reading-room, the post library being in the adjutant's office, and that of each company in its respective company office.

The water supply is entirely from cisterns, and, when these fail from dry weather, by hauling from the river. The old cisterns (those inside the fort and at the commanding officer's quarters) are large, and have filters, while those attached to the new buildings are poor and have no filter. The buildings occupied by the hospital steward and laundresses have no cistern.

In case of fire the limited supply of water in dry weather would result in much loss of property, there being no means at the post to extinguish fire, except the small leather buckets issued for that purpose.

The drainage inside the fort is by large brick sewers, one from each building, running towards the river, and opening near it; but outside the fort the drainage is entirely superficial.

The ground formerly occupied as a burying ground is near the river, at the foot of the hill; is low and wet, and utterly unfit for the purpose, and steps should be taken with the least practicable delay to secure some proper place to be used for this purpose. A small piece of ground near the chapel was intended to be so used, but this is separated only by a narrow road from the officers' quarters, the barracks at one side and the laundresses' quarters on the other. There is no suitable place within the reservation.

The National Cemetery at Alexandria, Virginia, is accessible by boat twice a day, and it is believed would be better than any place near the fort which could be purchased for the purpose. Two burials have occurred here in two years, both in the old ground, and both graves, though not over three feet deep, contained at least half a foot of water.

There is no ground suitable for a post garden; a small piece attached to each set of officers' quarters outside the fort is used as a garden by officers.

During the summer the men are required to bathe in the river three times a week, under the supervision of the officer of the day, but no arrangement exists for this purpose during the winter.

Milk, butter, eggs, poultry, and vegetables are procurable from the surrounding country.

Fort Washington has generally been considered an unhealthy post, owing to the prevalence of malarial fevers, and several times the garrison has been removed to some point on the opposite side of the river during the sickly season, but for several years preceding the present, comparatively few cases occurred here. During the present month, however, (August, 1870,) nearly every man, woman, and child remaining here has been attacked with either intermittent or remittent fever.

Fort Washington is easy of access, by both water and land, but the beauty as well as health of the place has been sadly marred by the destruction of the shade trees. The entire place needs thorough police and attention given to the proper ventilation of all the buildings. Where the natural facilities for thorough police and drainage are unsurpassed, both from position and the nature of the soil, it is but poor economy to construct buildings or to keep men in conditions by which all hygienic laws are set at defiance.

Statement showing mean strength, number of sick, and principal diseases at Fort Washington, Maryland, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarhal affections.*	No. of deaths.
1868.....	158.91	242	49	32	8	10	22	27	1
1869.....	122.33	324	52	44	.....	31	19	56	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT MONROE, VIRGINIA.

REPORT OF SURGEON GEORGE E. COOPER, UNITED STATES ARMY.

The military post of Fort Monroe, Virginia, is situated at the extremity of a level, sandy beach which forms the southern end of the western shore of Chesapeake Bay, and is known to geographers as Old Point Comfort. The geographical position of Old Point Comfort is $37^{\circ} 2''$ north, and $76^{\circ} 12'$ west of the meridian of Greenwich. The peninsula, on the extremity of which the fort is erected, is surrounded almost entirely by water. The exception to this is a strip of beach some 400 yards wide, which runs to the north and looks eastward. Over this strip of beach, during heavy easterly storms, with a full spring tide, the sea washes, rendering, at such times, the peninsula an island. On the east, northeast, and southeast, are the waters of the Chesapeake Bay; on the south and southwest are those of Hampton Roads, and on the north and northwest are those of Mill Creek, which empties itself into and is fed from Hampton Roads. The connections with the mainland are by the narrow strip of beach above referred to, and by a bridge over Mill Creek, approached by an artificial causeway some half mile in length. The fort is built at the extremity of the peninsula, and commands the entrance to Hampton Roads, into which empty the waters of the James, Elizabeth, and Nansemond Rivers. The waters on all sides of the fort are salt, augmented or diminished in intensity by the fresh water floods coming down the James River; though, at all times and in all tides, they are highly saline. The country between the point of the peninsula and York River, distant some twenty miles north, and thence across to the James, is cut up by numerous small streams, which are more or less brackish, as the rains are profuse or scanty. These small streams all communicate with the Chesapeake, Hampton Roads, or the James. The land upon which the fort is built is some four feet above mean high-water mark. Salt marshes are on the north and northwest of the fort, but these seem to have but little if any effect upon its sanitary condition.

The geological formation of the peninsula upon which the fort is built is ocean sand resting upon marl-impregnated clay. Boring to the depth of 850 feet, within the inclosure of the fort, has shown nothing but sand, lying upon marl-impregnated clay, with here and there small veins of sharp bluish sand of fine grain, admirably adapted for polishing and grinding metals. The country on the mainland is flat, and there are no hills within a radius of eight or ten miles. The soil to the north of Mill Creek, which bounds the reservation in that direction, is aluminous and quite productive, giving, under favorable circumstances, abundant yields of wheat, corn, oats, and potatoes, as well as of all the market vegetables. There are few portions of the country more suitable than the vicinity of Fort Monroe for trucking farms. There are no rocks of any description in the neighborhood.

The whole country to the north and northwest of the fort is underlaid by extensive beds of marl, at depths varying from 20 to 50 feet. The water procurable on the mainland, from wells, is, in consequence, quite unpalatable, and, to many persons, acts as a strong cathartic, while to others it has the effect of causing discharges of bloody urine. All, previous to the war of secession, who had the means, erected cisterns to collect the rain water for drinking purposes.

The soil inside the fort, which incloses over 80 acres, is artificial, and has been brought from the mainland. By careful cultivation and an artificial supply of water during the dry seasons, vegetables for kitchen use and flowers for ornament can be raised. But few natural products can be seen. The dandelion, worm seed, and wild garlic are met with on the slopes and ramparts, on which all the soil is artificial. The live oak is found within the inclosure of the work, having been undisturbed when the clearing was made to build the fort.

On the Chesapeake Bay beach, distant some 2,000 yards to the north, are heavy sand hills, and on and around these are found numerous live oaks, as well as the southern pine. This is said to be the most northern position in the United States at which the live oak is to be met with.

In the gardens of the fort are to be found numerous fig trees, which flourish exceedingly well, though the fruit crop of them cannot be relied upon, as the late frosts of spring oftentimes destroy them. The forests and woodlands in the neighborhood, on the mainland, furnish the varieties of forest trees, bushes, and shrubs usually met with in the middle region of the United States, viz, the several varieties of pine, white oak, red oak, black oak, Spanish oak, white and red hickory, white and black gum, white and red ash, wild cherry, white maple, hackberry, red cedar, red and black haw, white and black walnut, holly, chinquapin, white and yellow poplar, beech, chestnut, chestnut oak, locust, dogwood, white and red elm, tulip, poplar, papaw, red and paper mulberry, slippery elm, sugar nut, sassafras, sycamore, persimmon, Lombardy poplar, bayberry, common willow, butternut, crab apple, wild plum, linden, and birch. Among the shrubs may be noted the following: Laurel, pokeberry, stramonium, alder, sarsaparilla, serpentaria, black snake root, plantain, sheep mint, horse and garden mint, peppermint, Indian turnip, dog fennel, peppergrass, May apple, partridge berry, liverwort, wild spice, nettle, dewberry, blackberry, gooseberry, hoarhound, life-everlasting, pennyroyal, horseradish, garlic, calamus, wormwood, boneset, wild cress, blood-root, swamp lily, prickly ash, ivy, boxwood, mullein, burdock, belladonna, yarrow, sage, balm, sumac. Wild flowers of all kinds fill the woods; the most prevalent are the wild rose, yellow jasmine, and honeysuckle.

The waters surrounding the fort are well stocked with fish, principally rock, sheephead, bay mackerel, trout, white perch, sun, spot, hog, chub, green, flounders, moss-bunkers, and toad. Porpoises are quite numerous, and white shark not scarce. Crabs, both hard and soft, are in great quantities. Oysters cover the banks where the tide runs not too fast and the bottom is not sand; they are the quality highest prized in all the markets. Those growing in Lynnhaven Bay are by many considered to be the most delicious procurable in any part of the country. The birds are those common to the water as well as to the land; but with neither these nor the animals am I sufficiently well acquainted to attempt the enumeration. In the immediate vicinity of the fort only the tame kinds are to be met with. Gulls, apparently of many varieties, are constantly flying over the water, but it is not in my power to distinguish, ornithologically, one from the other.

The climate of Old Point Comfort is comparatively mild. The winters are open, and the thermometer, except in extremely rare instances, does not fall below 12° F. The duration of the cold periods seldom passes seventy-two hours, when the cold snaps give way and the mercury indicates an increase of temperature. The cold is, however, felt more perceptibly than in those regions where it is continuous, and the system is far more susceptible to the influence of a decrease of temperature than it is in the more northern latitudes. There is but little snow here, and that which falls remains upon the ground but a few hours.

The summers are long and hot. The summer heat commences in the early part of May, and continues until the latter part of September. During the months of June, July, and August the heat is oppressive, and, were it not for the sea breeze, which commences to blow about 9 o'clock in the morning, would be almost unendurable. Within the walls of the fort the heat is much more oppressive than without them, as they serve to obstruct, in a great measure, the free range of the breeze which may be blowing. When on the beach or anywhere outside the temperature may be quite pleasant, within the inclosure the temperature will be most oppressive. At night, however, the reverse holds, as a damp, murky atmosphere arises from the ground, imparting a chilly sensation, with a feeling of moisture. There is, at night, a difference of two or three degrees in the temperature inside and outside the fort.

During the winter season, too, the temperature is lower within the walls, and the ground is much damper than when it is exposed to the unrestrained influence of the winds and sun. The mean annual temperature of 1867 was 58.19° F. The warmest day of the year was July 6, when the mercury indicated 90° F. The coldest day was January 19, when the mercury, at 7 o'clock, a. m., indicated 14° F. The mean annual temperature of 1868 was 58.30° F. The warmest day was July 15, when the mercury indicated 92° F. The coldest day was December 25, when the mercury, at 7 o'clock, a. m., indicated 19° F. The amount of rain which fell in 1867 was 64.26 inches. The greatest monthly amount of rain during the year was in August, when 11.40 inches fell. The amount of rain which fell in 1868 was 44.41 inches. The greatest monthly amount of rain in 1868 was in July, when 6.94 inches fell. The barometer ranges from 29.25 inches to 30.60 inches, which are the extremes reached here, as indicated by the record of four years.

For the last three years the opening of spring has been much later than it was wont to be in previous years, and vegetation has not fairly commenced till late in April, though prior to April there were warm periods sufficiently long to cause a budding and incipient blossoming of the fruit trees, which were subsequently blighted by severe frosts.

The prevailing winds of spring and summer are southeast and southwest; those of fall and winter, east, northeast, and northwest. The easterly winds are the most severe in February and March, and with them come diseases of the throat and lungs to both adults and infants. With the latter croup is most common in February and early March, when the winds, chilled by the icebergs on the banks, continue blowing from the northeast for several successive days.

The fort is a massive work built of granite, surrounded by a moat filled with water, which is fed by a tide-gate opening into Mill Creek. The depth of water in the moat is 8 feet. Bridges, five in number, crossing the moat, furnish the means of entrance into the fort. The officers and men composing the garrison are quartered within the walls of the work.

The quarters for officers are, respectively, brick buildings, frame buildings, and casemates. The brick buildings are large, roomy, and well ventilated, though badly arranged for household conveniences. They all have basement stories, which are really untenable, in consequence of their excessive humidity, caused, principally, by large fresh-water cisterns being built in contact with one of the walls, one side of which they form. In the winter time this excessive dampness is overcome by the large fires kept in the basements. During the summer time all articles kept in the basement stories are soon covered with a greenish-white mold. The same objection, as far as humidity is concerned, is applicable to the casemates. They are very damp and poorly ventilated. Even in the warmest days of summer it is necessary to have large fires in them to overcome the humidity and render them tenable. The use of them as dwellings is very conducive to rheumatic affections, as well as to diseases of the pulmonary organs. Persons suffering from intermittent fevers find that it is almost impossible to have them broken up as long as they reside in the casemates, without having them dried by constant fires.

The quarters for the enlisted men are temporary frame structures erected on the northern side of the parade ground. The buildings are seven in number, each 120 feet long by 25 feet wide. The houses are built some 40 feet distant from each other. Fifteen feet of the length of the buildings is made use of for the rooms of the first sergeants, and of that in which the company records are kept. These buildings are not as well adapted for the purpose they are intended as they might be; they are not sufficiently roomy, nor are they built of the proper material, being made of green, unseasoned lumber. Kitchens of the same materials are built to the rear of each set of company quarters, and are separated from them by a street some 25 feet in width.

The company quarters are one-story structures, raised from the ground 5 feet, and rest on piles. The ventilation is by means of windows and doors, as well as by ventilating orifices in the ceiling, which can be opened or closed as are shutters. These orifices connect with roof ventilators. The air space for each man is 251 cubic feet. In consequence of the shrinking of the green lumber and the opening of the joints, there is more than a sufficiency of fresh air admitted.

In the winter time there is great difficulty experienced in keeping the quarters sufficiently warm, notwithstanding that two large 18-inch cylinder stoves are kept burning, night and day, to their utmost capacity, being attended, as they are, by the room orderlies. There is no equability of temperature in the different parts of the room. Near to the stoves the heat is too oppressive, and distant from them the cold is much too perceptible. There is all the light that could be

required. It is admitted through the glass windows, of which there are even more than are necessary for that purpose. The men sleep in the main room of the company quarters, the same which is occupied by them during the day, and in which, too, are kept their boxes, extra clothing, apparatus for cleaning arms, accoutrements, &c. The bunks used in the company quarters are similar to those which were made for the hospital department during the war, being iron frames with wooden slats. The bunks are furnished two to three men, and are covered with bed-sacks filled with straw, which is replaced by fresh at least once in each month, or oftener, if required. The troops have a sufficiency of blankets and covering. The accommodations furnished the soldiery to assist them in the way of personal cleanliness are very scarce and of the most limited character. The company wash-rooms are, by far, too contracted, being but 12 by 5 feet in dimensions, and are built to the outside of the company kitchens.

There is not a sufficiency of fresh water for general use, and there are no means of washing the whole person afforded the men, save during the summer time, when salt-water bathing can be indulged in. The greater part of the command do not wash their whole persons from November till June. During the cold weather the troops have no means of cleansing their persons except by small wash-basins. A bath-house attached to each company quarters, with the means of heating water during the winter, would be a great desideratum in a sanitary point of view. With the exception of small shelves at the head of the bunks, a few benches, and two or three large tables, there is no furniture in the company quarters. The company kitchens are rather contracted in size, but answer the purpose quite well. The cooking apparatus is all that could be desired. To each company kitchen a large-sized range has been furnished, and by means of it cooking of the finest kind can be done for even a greater number of men than a full company. The police of the company quarters is very good, as, too, is that of the kitchens and all the buildings attached. The company mess-rooms, which are 24 by 24 feet, are all too contracted for the accommodation of a full company.

The quarters of the married soldiery and laundresses are badly built and worse arranged. They are two-story buildings of battened frame, with porches on the south sides, by means of which porches access to the second story is gained by stairs running from the lower to the upper porch, and by no other way. Each family has a set of two rooms, one opening on to the porch, and connecting by a door with each other. They are miserably ventilated; indeed, no provision for this seems to have been made or considered in the construction.

The buildings for married soldiery and laundresses are two in number, and in each of these are fourteen sets of quarters, seven on the lower and seven on the upper floor. The quarters on the upper floor are, in the summer time, rendered almost uninhabitable, in consequence of the pipes from the cooking stoves on the lower floor coming up through the ceiling and floor of the second stories. There are fourteen stoves, doing the cooking of the same number of families, in a frame building 87 feet long by 30 feet deep. These quarters were constructed partly of green lumber and partly of old lumber taken from the laundresses' quarters, which were torn down in 1867. The green, yellow-pine, lumber, in drying and shrinking, has, to all intents, opened the rooms adjoining to each other; for the joints of the ceilings and partition walls have so much opened as to allow what occurs in one room to be seen in the next set of quarters. The quarters are built most disadvantageously in case of fire; for, should it occur in the lower story, there would be but little chance of escape for those occupying the upper one, the only stairs being those joining the porches, and there is no fire-escape. The use of the lumber taken from the buildings torn down in the erection of the new ones has served to fill them with vermin. Roaches, chinchies, and bugs are endless and most annoying.

To partially isolate a case of contagious disease, or an infectious one, in these quarters, is a matter of impossibility, and to have even a moderate share of quiet is impracticable. Should any disease, contagious or infectious in its nature, make its appearance in these buildings, it will go through the whole of them as if it were a single room.

There are no regular storehouses in the fort. Unoccupied casemates are made use of to store supplies, as they are to store the immense supply of powder and fixed ammunition collected here at the close of the war, and which the regularly built magazines will not accommodate.

The stables for public horses are some quarter of a mile distant from the fort, on the road

leading to the Mill Creek bridge. They are kept in excellent order, and are as cleanly as care and labor can make them. Near to the stables are the storehouses of the quartermaster's depot, large frame buildings, containing supplies collected at the closing of the war.

Inside of the fort there are no sinks, in the general acceptation of the term. Officers residing in the casemates make use of the officers' commode in the flagstaff bastion, which is now a series of six earth-closets, which are admirably adapted for the purpose, and fulfill every indication required of them. They are a great improvement on the copper tank on wheels. The families in the casemates who have not furnished themselves with earth commodes are necessitated to make use of chamber utensils, and to throw their contents into the waters of the moat. The water-closets of officers not residing in casemates are furnished with small boxes, which are removed at different periods, longer or shorter, according to the heat of the weather, and are sprinkled with crude lime, or its chloride, at the option of the men who have charge of them. The same arrangement exists in the hospital yard, with the exception of the use of the disinfectant, which is regulated by order of the surgeon on duty.

The sinks for the men are large copper tanks, mounted on wheels, which are run under the closets, and changed every twenty-four hours, summer and winter. They are used only during the night by the men, whose main sink is at the north side of the fort, outside of the work, and covers a portion of Mill Creek below low-water mark. The night-soil tanks are drawn out of the fort and emptied into the Roads to the northwest of the work, and the filth is carried off by the tide, sooner or later. At times, during midsummer, the excrement is not carried off sufficiently promptly to prevent it from giving off unpleasant smells, perceptible to persons passing in the vicinity; but I know of no injurious effect having been produced by it.

There is no drainage or sewerage. The rains, when heavy, collect on the parade ground, and there remain till soaked up by the soil or evaporated by the sun.

The fuel furnished for use is coal and wood—anthracite, oak and pine. The component parts of the ration furnished the troops are, with the exception of the fresh beef, excellent. The beef is not of good quality, but seems to be that of the poorer class of cattle. I cannot see why all the rations of the soldier except the beef should be of the best quality in the market, and it not. It is of as great importance as any other component part, and oftentimes the most important. The contracts, as a general thing, do not call for a first-class article, or, if they do, it is taken at so low a rate as to be patent to every one that it cannot be filled without considerable loss to the furnishers. The truth is, that the best quality of beef is not issued to the troops, and no complaint is made, because all feel confident that as good an article is being furnished as the price paid by the terms of the contract will justify. When circumstances are such as to prevent the furnishing of a first-class article of beef it can be endured in silence, but at Fort Monroe there is really no difficulty. A living price will procure as good an article here as it will in any part of the country.

The markets of Baltimore are but twelve hours' distant, with daily water communication, and from them all the vessels of war in the Roads are supplied, as are the marines in the Norfolk navy yard.

The troops are supplied with vegetables and other articles needed by means of their company fund. As a general thing, the troops are well fed, and with, too, a sufficient variety of food to keep them healthy and in good condition.

There are neither company nor post gardens belonging to the fort, consequently everything not issued by the subsistence department must be procured by purchase. Fish and oysters are abundant in season, and are to be purchased at reasonable rates. Did the companies own seines, the men could catch more fish than they could possibly make use of; as it is, they, by means of hooks and lines, procure quite a number, and thus are enabled to change their diet at will.

The general police of the garrison is excellent, and is all that could be wished for. Each morning the police party is sent in every part of the fort to clean up all that may be found out of order and admirably well they do it. The only exception to this fine condition of police is met within that part of the garrison known as Carroll Hall, a large building in which are the quarters of many of the younger officers, as well as the library and museum of the artillery school. This building, interiorly, is not kept in as cleanly a condition as it should be. It being the business of each and every person therein quartered to see the place kept in good police, it becomes, in conse-

quence, the business of no one in particular. The result is that nothing in the way of keeping it clean is done, and the staircases and halls grow day by day more dirty, till the general police party are compelled to clean up that which should be done by the officers' servants. Were it not for the general police party going now and then to Carroll Hall, it would, by its accumulated dirt in the halls and on the staircases, become a disgrace to the garrison.

The guard-houses of the fort are situated to the right and left of the main entrance, and are casemates appropriated for that purpose. The prison-rooms are badly ventilated, if the name of ventilation can be applied to air entering and scarcely issuing from an apartment. The prison-rooms are two, and to one of these is attached a cell-room for solitary confinement. The main prison-room includes both the casemated room and the gun-room, is 44 feet long, and 17 feet wide; has a large door and two large windows in front, and an embrasure in the rear. Both the windows and the embrasure are shielded by immovable blinds, which prevent the ingress of sunlight and interfere greatly with the wind, which otherwise would more freely enter the prison-room. The only ventilation to this room, which oftentimes has from twenty to forty men confined in it, is furnished through the small embrasure, not more than 3 by 4 feet wide, and which, too, is greatly interfered with by the crossed bars built into it, and by the screen outside. Into this prison-room sunlight scarcely ever enters, and never warms. During the winter the room is heated by stoves, which keep it comparatively dry and comfortably warm. In the summer time, however, it is always damp, and the water condenses in large drops on the walls and trickles thence to the floor. The prison-rooms are well floored, and they are made as tenable as circumstances will permit of, but at night, when the doors are closed, it is unendurable in consequence of the very imperfect ventilation. The smaller of the prison-rooms is worse, in point of ventilation, than the larger, as it has not even the embrasure to allow a current of air to pass through. The cells are much worse, in a sanitary point of view, than either of the prison-rooms. They are contracted, ill ventilated, never warmed, and the light of the sun never enters them. They are always cold, damp, most disagreeable, and really unfit to confine men in.

The hospital building is near to the main entrance of the fort and faces the parade ground. It is a structure of three stories with garrets, which are used as store-rooms for bedding, and as a small ward for isolating contagious diseases. On the front of the building, on the first and second stories, there is a large porch much used by the convalescents. There seems to have been no particular regard paid in its construction to either ventilation or convenience. The wards, four in number, are large airy rooms in the second and third stories of the building, measuring $23\frac{1}{2}$ feet by $24\frac{1}{2}$ feet, and accommodating in each ten beds. The ventilation of the wards is afforded by a door opening into a spacious hall and by four windows, the sash of which raise and lower from above and below. The wards are heated by stoves burning anthracite coal, and are kept most comfortably warm by them during the coldest days of winter. The first floor of the building is occupied as a dispensary, steward's room, and two small store-rooms, which are much too contracted to accommodate the supplies requiring storage.

The hospital kitchen and mess-room are in a small brick building in the hospital yard, immediately to the west of the main building. This is sufficiently large, and is well adapted to the purpose. It has a second story which is used as a dormitory for the cook, and as a store-room for kitchen utensils. Attached to the hospital, in the yard, is a frame building, which was erected during the war of secession, and is now used as quarters for the hospital matron.

The hospital building answers its purpose quite well, and is objectionable most on account of the difficulty experienced in carrying severely injured persons to the wards, which are in the upper stories, and approachable only by means of the staircase, which has a middle landing, interfering much with their being carried from the ground-floor up.

There are no grounds proper belonging to the hospital; but being built as it is, facing the parade, there would really be no benefit to be derived from having it other than it is in this respect. The hospital is deficient in most of the modern conveniences. There is no operating room, no *post-mortem* room, no wash-room, no bath-room. There is, it is true, a tub in an old frame building in the yard, but it is but a makeshift for want of a more suitable and convenient arrangement. The water-closets attached to the hospital are in the yard. They are open boxes, which are removed every day or every second day, according to the heated condition of the atmosphere. They answer

the purpose as well as anything, save earth-closets, could. By the free use of commercial carbolic acid as a disinfectant they are kept entirely free from all disagreeable smell, and a person can stand within a yard's distance from the boxes, and were it not for the smell of carbolic acid, be unconscious of it, nor would he be aware of his proximity to the water-closets were the fact not pointed out to him. The close stools used in the wards are earth commodes, and they are infinitely superior to anything of the kind ever before furnished for the purpose. It is impossible to discover the slightest disagreeable smell arising from them, no matter how freely they may be used.

The water used for drinking purposes, as well as for cooking in the hospital, is procured from the large cistern attached to it. The roofing of the building being of slate furnishes perfectly pure water, and it is as good as can be procured anywhere. The taste is unexceptionable, but it does not quench thirst as does good spring water running through sandstone rocks. In the warmer season of the year, more of the rain-water is required for drinking purposes than would be, were it slightly impregnated with some of the earthy salts. It is generally believed by persons residing in this country that those who use rain-water for drinking are not as subject to malarial fevers as are those who are in the habit of having the water they drink furnished by wells or springs. How much of truth there may be in this I cannot tell, but as it is the general accepted credence, there must be some foundation for it. The water used in the garrison is either rain-water or that produced by condensation from sea-water. There is in the fort a large condensing apparatus, and much of the water used by the troops for drinking and culinary purposes is thus procured. Water, too, is collected from the roofs of the barracks and carried to cisterns, which is used for drinking. This is somewhat unpalatable in consequence of having run over the shingles, and when warm it is somewhat nauseating. The condensed water is very disagreeable to most palates, and produces, when first used, considerable irritation of the intestinal canal, which, however, passes away in the course of a few days. There is an attempt being made to procure suitable water for supplying the fort by boring. So far this has not been successful.

Unfortunately, there is no garden attached to the hospital, and all vegetables which could with a garden be cultivated free of expense must now be purchased by the hospital fund, which depending as it does on the severe cases under treatment in hospital, is here seldom more than is, absolutely needed for necessities, leaving but little margin for the purchase of luxuries.

The disease of the post is fever, generally of a malarial type, though typhoid, and even pure typhus, present themselves for treatment. Eruptive fevers are by no means common, and rarely, when brought here, do they show a tendency to spread or become epidemic. Twice in four years has scarlatina been brought into the garrison, but at neither time did it extend beyond the house in which the patients were being treated. The only exception to this being the daughter of the physician in attendance, who was attacked by a sharp fever, followed by a rash similar in all respects to that of scarlatina, but of so mild a type as to cause considerable doubts as to the certainty of the diagnosis. Measles of a malignant type, brought from Norfolk, and destroying the life of the person introducing it, changed to an apparently modified disease, which, in some cases, did not infect an unprotected child sleeping in the same bed. So mild is the disease here that, in many cases, the surgeon is not informed of, or called upon to treat, it. This shows that the parents have but little fear of it, or look upon it as of little consequence. Erysipelas has shown itself several times since 1865, at one time of a very severe type, and most contagious, but always yielding more or less readily to treatment; but in each and every case requiring the administration of the salts of quinine ere any effect could be made upon the disease by the adjuvant remedies, which are regarded by practitioners as appropriate to the treatment of it. There was an evident tendency to periodicity in the fever attending all the cases of erysipelas. At certain similar times in the twenty-four hours the pulse indicated an increased number of beats, the color of the eruption became more intense, and there was a well-marked increase in the temperature of the body. This same condition of things had by the writer been observed in the sporadic erysipelas occurring in the southern part of the Territory of New Mexico, which, if not met by prompt medication, was quite fatal, and there, too, it was found that quinine was the remedy most to be relied upon and absolutely necessary to eradicate the disease.

Prior to the war of secession there was but little if any malarial disease, originating at Old Point Comfort proper, met with, and Fort Monroe was regarded as one of the few places in the tide-water region of Virginia exempt from its influence. So highly was its sanitary condition regarded that

it became emphatically the great watering place of the Southern States. Pleasure seekers, in great numbers, congregated here during the summer months to enjoy the salt-water bathing, and many invalids who had been suffering from the effects of malarial cachexia, came to Old Point Comfort to recuperate their health by the tonic sea breezes, and, at the same time, remove themselves from the depressing influences of the fever poison to which, at their homes, they had been subjected. Now, however, the sanitary status has changed, and malarial disease is quite common here. There is no doubt whatever of its being contracted not only on the Point, but within the walls of the fort. Formerly the few cases of malarial fever reported occurred in men who had been on picket guard at Mill Creek bridge, or in those who, going on leave, would get drunk and, sleeping out during the night, expose themselves to the malarial exhalations on the mainland. To what this great change may be attributable is not certain. Two hypotheses are, with claims of reason, advanced. Before the war occurred, the lands under cultivation were well drained and well cared for. They had been worked for a long time, and could not be regarded as fresh soil, the upturning of which is always productive of malarial disease in the Southern States; much of the country, too, was covered with virgin forests of pine, oak, and hickory, extending from a short distance north and west of Mill Creek, to Back River, thus intercepting, to a great extent, the winds impregnated with malarial exhalations which came from over the swamp lands in its vicinity. This Back River is the receptacle of the waters of the many small streams and creeks which head in the swamp lands, and find their way through it into Chesapeake Bay at a distance of about a league to the north of the fort. The lands proximate to these creeks are swampy for the greater part; the waters upon them being only brackish. These swamps, when the tides are low and the rains heavy, as is often the case in late summer and early autumn, become stagnant fresh-water marshes, and furnish all the material necessary for the production of southern autumnal fevers. On the banks of, and in all the country near to Back River, malarial fevers have full sway during the greater portion of the year, and in the autumn, when not promptly and skillfully treated, are very destructive to life, as in many cases they assume the malignant type here called congestive-remittent, corresponding to the disease so admirably described by Professor George B. Wood, in his work on the Practice of Medicine, under the name of pernicious fever. There has been no case of this type of disease at Fort Monroe in 1866-'67-'68, or '69, though several have occurred immediately over Mill Creek, a distance of no more than a mile from the fort.

During the war the greater part of the forests to the northwest of the fort was cut down, thus giving free scope to the winds blowing over the marshes of Back River. Much, too, of the virgin land formerly covered by forest has been turned up for cultivation. The cultivated land, too, which was lying fallow during the five years of the war, is once more being worked, poorly it is true, for the drains are all filled up or choked, and the owners, wanting as they are in labor or the means of procuring it, cannot put them in proper order. The result of this want of proper drainage is that the rains collect upon the low lands, to be removed only by solar evaporation.

Immediately to the north of Mill Creek many large excavations have been made for the purpose of procuring soil with which to erect military works and repair defective ones. These large holes, never yet filled up, collect the rain water in considerable quantities, and form ponds, which, exposed to the hot sun of summer, furnish fruitful sources of malarial poison.

The other hypothesis—and I regard it as the correct one as far as the production of malarial disease inside the fort is concerned—is “that large quantities of clay and soil have been brought into and around the fort for the purpose of repairing and filling up the roads inside and outside of the same, as well as for repairing portions of the work.” This clay and soil were procured at and brought from the western side of Mill Creek, in the locality where malarial fevers are most common. Prior to the spreading of this clay upon the roads there were few if any fevers of a malarial type originating in the fort, but in a very short time afterward they presented themselves for medical treatment. Previous to this the young children who went not outside of the walls in the night or in the early morning, did not suffer from malarial disease, but since then children who seldom go outside the fort, and never off the Point, are attacked with both remittent and intermittent fever. In addition to fevers of a malarial origin, diarrhœas and dysenteries are frequently met with, caused either by irritating ingesta or showing symptoms and complications of malarial disease; indeed, there is scarcely any disease of importance presented for treatment which does not in its course give indications of malarial complications, and which, too, does not require for its treatment anti-

periodics of some kind or other. In early summer, which is generally hot and humid, there is much derangement of the hepatic secretions, at times excessive, producing severe diarrhoeas; at others diminished, running oftentimes into jaundice. These conditions, if not promptly relieved, seem to be but the precursors of remittent fever, more or less severe, which is often warded off, in cases of torpidity, by a moderate dose of a mercurial combined with podophyllin and a cathartic, and in cases of excessive secretions by a large dose of calomel combined with an opiate. But neither of these articles, as a general rule, has any permanent effect unless followed by Peruvian bark, or some of its preparations, till cinchonism is produced. In cases of continued torpidity of the liver, no combination has been found more efficacious at this post than a combination of quinine, extract of taraxacum, podophyllin and leptandrin. In the course of four years, there has been but one case of acute hepatitis. This occurred in an attaché of the army, who was a good liver and a very free drinker. Enlargement of the spleen is but seldom met with among the troops, and when met with could always be traced to intermittent fever, from which the patient had suffered at some other place. It yields very easily to a combination of quinine and iodide of iron, aided oftentimes by muriate of ammonia. The diarrhoeas met with, when not complicated with malarial disease, yield readily to astringents following a mild cathartic. Seldom or never do they, when contracted here, degenerate into a chronic condition. The only cases of that disease which have required treatment were the results of typho-malarial fever; fortunately but little of that type of disease has come under observation here. I do not remember a case of severe dysentery not caused by irritating ingesta, treated here during the four last years, which was not malarious in its origin, and which did not require the salts of quinine or some preparation of cinchona to be administered ere other remedies had any perceptible effect. Scarcely, indeed, was any other remedy required.

Of epidemic cholera there has been but one case since 1865. This case was fatal. Cholera infantum is common, and is often of a severe type. The second summer of a child's life is here looked upon by mothers with much anxious fear, and with great reason, too, for with it comes sickness to the children and consequent care and trouble to themselves. Until the summer of 1869, there was no disease which gave the medical officers on duty here more trouble and anxiety, or was treated with less satisfactory results. There was no disease in which the mortality was greater, or if the little sufferers did not die, they remained puny or debilitated until the deciduous teeth were through, or cold weather came to their aid. At that time there appeared in the New York Medical Record a paper on the treatment of cholera infantum by bromide of potassium. The treatment proposed and recommended by Dr. Salvatore Caro, of New York, the author of the monogram, was carefully carried out with the greatest success. I know not how it has acted in other portions of the country, but at Fort Monroe it has done all claimed for it by Dr. Caro in the treatment of cholera infantum; and, as far as the experience of two summers goes, both in the practice of the medical officers here and in that of Dr. Townsend, of Norfolk, Virginia, the bromide of potassium is looked upon as certain in its effects as is quinine in malarial disease, and as equally prompt in its action. Since the remedy has been used for cholera infantum, there has been no trouble of any account experienced, and then only in consequence of the ignorance and stupidity of the parents, who could not be prevailed upon to follow the directions given them.

During the latter part of the autumn and in the winter pulmonary diseases are very common—catarrh, bronchitis, pneumonia, and pleuropneumonia. Pleuritis has not been met with save in connection with pneumonia. The cases of pneumonia were all of the asthenic type, and would bear but little depletion. With one or two exceptions they have been complicated with malarial diseases, presenting all the characteristics of the disease so common in the Southwest, and there known as winter fever. Here, as there, the only remedy which can be relied upon for its treatment is quinine in large doses. Nothing else has any effect upon it nor has it, if not given promptly and to the fullest extent of the sedative influence of the drug. There is much leucorrhœa among the females in the garrison, and it is of a very intractable kind, too. Remedies serve only to check it or diminish the discharge, which generally returns on their discontinuance. This peculiarity is caused, I believe, by the relaxing tendency of the humid atmosphere upon the mucous membranes. The amount, too, of the menstrual discharge is, I learn from some of the females, much greater than they are subject to at other and less humid places at a distance from the sea. There is a general belief here, true or false as it may be, that conception occurs more promptly than

at most other places. I know not if there be any real foundation for such a credence, but many cases are cited of women who were regarded as barren conceiving shortly after their coming to Fort Monroe or Hampton, which is some two miles distant. Be this as it may, the number of small children met with, in and round the fort, would cause one to believe that no obstacle to conception was often met with.

Rheumatic affections are often met with, though they are not so numerous as might be anticipated from the locality of the fort and the habits of the soldiery. When, however, they do show themselves, and are not dependent upon syphilitic or malarial diseases for their origin, they are intractable, and the treatment is both tedious and unsatisfactory.

Venereal disease is very common at the post, and the type varies from the mildest to the most malignant. The prostitutes in the neighborhood of the fort, who are negresses of the most debased and filthy kind, and white women even worse than they, are rotten to the core. The venereal disease contracted from them is almost as virulent as snake poison, and, in the end, is little if any less destructive of human life. In many of the cases of true chancre presented, an endeavor to treat them without using any mercurial preparation has been made. In not one case, however, of unmistakably true indurated chancre, has satisfactory success followed the non-mercurial mode of medication, and it was found absolutely necessary to have recourse to mercury before the disease could be conquered. There is one class of chancre met with here, fortunately but seldom, which is, without exception, the most difficult to treat of all presented. For want of a more expressive name it has been designated the "glazed chancre." This name has been given to it from the peculiar appearance it presents, which is that of skin denuded of the cuticle by vesication, which is then exposed to the action of the atmosphere for two or three hours, and then covered with the finest varnish. It has, too, much the look of the outer edge of a malignant pustule when the detached skin can be raised up and the glazed fiery surface beneath exposed. This chancre is not dug out; its edges are regular; there is little inflammation of the surrounding tissues, and not near as much induration as is met with in an Hunterian chancre. It is rather indolent and spreads but slowly, even when not counteracted by medical treatment. The prominently distinctive mark of this chancre is the smooth and glazed surface it presents, the enlargement of the inguinal glands almost synchronously with the development of the chancreous sore, and the appearance of syphilitic rupia in about three weeks time subsequent to it. Rupia, and no other syphilitic eruption, has shown itself as a consecutive symptom in each and every case treated, which was conquered only after a long and most careful medication. This peculiar form of chancre was never met with by the writer except in New Mexico, until it showed itself here, which occurred shortly after the arrival of a company of the Third Artillery, which had been stationed in that Territory, and which, in all probability, brought the disease which I have endeavored to describe with it.

Gonorrhœas are numerous, and quite difficult to treat. Under the most careful medication the results, both as regards the length of time required and the permanency of the cure, are unsatisfactory. Whether this be owing to special malignancy in the disease here, to a peculiarity of the climate causing similar results to those met with in leucorrhœa, or to the unsettled life of the soldiery, it is impossible, with any degree of certainty, to determine. The frequency of masturbation among the troops interferes, in a great measure, with the medical treatment, as many cases apparently cured have broken out anew from the local irritation consequent upon this cause. Experiments have been faithfully and most carefully made to test the relative merits of nitrate of silver, sulphate of copper, sulphate of zinc, chloride of zinc, subnitrate of bismuth, permanganate of potash, carbolic acid, corrosive sublimate, and a number of other remedies recommended by different writers on the subject, as injections in the treatment of gonorrhœa, without being able to fix upon any one as being pre-eminently the most efficacious. The decision arrived at is that alternations between sulphate of zinc, permanganate of potash, and carbolic acid give perhaps better results, in most cases, than any other method of treatment. Almost if not as good results have resulted from frequent injections of cold water once in every half hour as from the most complicated medication. Internal remedies, used more from the force of habit than from the expectation of decided results, have given but little satisfaction. Of all these prescribed none seemed to have as much effect as a combination of balsam copaiba and the ethereal oil of cubebs. From what I have seen at this post I would be inclined to think that there is less tendency to the formation

of urethral stricture by the use of permanganate of potash than by any of the irritating injections employed for the cure of gonorrhœa.

Child-bearing at Old Point Comfort seems to be a more easily performed female function than it is in many other places. During the past four years, out of nearly one hundred and fifty children born, there have been but two cases of death consequent upon their delivery, and in not one case did the mothers die. Two of the infants were still-born, in consequence of long-continued pressure on the cord in breech presentation. There has been but one case of puerperal convulsions; no dangerously severe floodings; no puerperal peritonitis; and not a case even of mammary abscess. One peculiarity attending the lying-in condition here is the almost universal appearance, about the seventh day after delivery, of a severe chill, which is the first symptom of a remittent fever which then develops itself. With this fever comes considerable tenderness of the abdomen, severe pain in the uterus, with somewhat of assimilation to child-bed fever; but both pain, tenderness, and febrile excitement yield promptly to free doses of quinine. I have observed no tendency to flooding, but a more than usual inclination to quick and permanent contraction of the uterus immediately after delivery of the placenta. Were it not that the irritation set up by child-bearing develops the malarial poison, the attending physician, in a case of labor, would have little to do except to ligate the cord and see to the proper delivery of the secundines. The physicians practicing in the adjacent counties inform me that easy and uncomplicated labor is the characteristic of this whole region of country. The employment of an educated physician as accoucher is the exception, and illiterate negresses perform that duty as they did before the war. I can learn of but two cases of instrumental labor occurring in this neighborhood since 1865.

Fortunately, but few serious injuries requiring surgical treatment have occurred at the post since the close of the war, though for the greater part of the time the command has numbered near 500 men, exclusive of the employés. In all the uncomplicated flesh wounds the healing process has gone on rapidly, and with as much regularity as in the most healthy stations of the country.

I cannot close the medical portion of this report without referring to the beneficial effect of serpentaria as a remedy in the convalescence of malarial fevers and in malarial cachexia, when combined with some one of the preparations of iron. In all cases of convalescence from remittent fevers it has been my custom to administer serpentaria, in some form or other, with much benefit to the patient. The relapses so common in the disease, when exposed to the morbid influences after convalescence, appear to be warded off, and the pale and clay-like face soon changes to the ruddy complexion of health. In the case of one of the government pilots, now residing in as sickly a district as can be found in Nansemond County, where quinine, too, is wont to be taken as part of the morning meal, who had suffered greatly from malarial fevers and whose health was absolutely broken down, the exhibition of the infusion of serpentaria in full doses, morning and night, has changed his whole appearance. From being a pale and cachectic-looking man, he is now one of the most robust and healthy-looking who come upon the Point. The same, too, is, he states, the condition of his whole family, to whom he gives serpentaria, sick or well; while his neighbors, who do not use the remedy as a prophylactic, are constantly suffering from malarial fevers, and are, in consequence, almost incapacitated from performing the duties incident to their stations.

The cemetery of the post is situated to the west of the ridge of sand-hills to the north of the Point. It has been used for many years as the garrison cemetery, and in the early part of the war was used to inter such as died at the Hygeia hospital. The capacity of the cemetery, if all used, would be at least for ten or fifteen thousand graves. Many of the bodies there interred have, since the war, been removed to Hampton National Cemetery, which is about two miles from Fort Monroe.

Statement showing the mean strength, number of sick, and principal diseases at Fort Monroe, Virginia, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.	480.33	1,445	211	252	39	135	49	4	278	4
1869.	477.	976	152	140	23	103	42	4	115	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT MACON, NORTH CAROLINA.

REPORT OF ASSISTANT SURGEON ELLIOTT COUES, UNITED STATES ARMY, DATED JUNE 30, 1870.

Fort Macon is situated in latitude $34^{\circ} 4'$ north, longitude $76^{\circ} 40'$ west from Greenwich. It occupies the eastern extremity of Borden or Bogue Island, commanding Beaufort Harbor, one of the southern outlets of Pamlico Sound. The town of Beaufort lies about two miles off, a little east of north, across the harbor. Morehead City, at the same distance westwardly, is the terminus of the Atlantic and North Carolina railroad. Fort Johnston, some 80 miles distant, is the nearest military post.

The island is a mere sand-bar, lying nearly due east and west, separated from the mainland by a narrow, shallow sound, (Bogue Sound.) It is 26 miles long, with an average width of less than a mile. The sea front is a gently undulating beach, flanked by extensive sand-hills, which slope gradually to a low, flat marsh on the sound side, a narrow strip of comparatively fertile soil intervening. The sand-hills are constantly shifting, and the marsh is mostly overflowed at high tide. Part of the island is wooded, but the eastern extremity is treeless for several miles. The neighboring island of Shackleford has the same general character; the adjoining mainland is low, and consists chiefly of sandy tracts, pine barrens, and swamps. Beaufort Harbor is shallow, and obstructed by numerous extensive shoals; the channel, navigable for vessels of ordinary tonnage, is narrow and tortuous; it sweeps around the point of the island close to the fort. The deepest soundings, for some miles, do not exceed eight fathoms; the average in the main channel is only about half as much; the bottom is mostly sandy, often shelly, occasionally clayey and muddy in the shallowest places. Vessels reach the wharf at the railroad terminus, but only those of lightest draught go to Beaufort. The bottom, as well as the coast line, is subject to constant change, and hydrographic surveys can be relied upon, in detail, for only comparatively short periods.

This locality is in the midst of the auriferous region which extends from Long Island to North Florida. There are no rocks whatever in the vicinity, except those that have been brought hither. The beach consists of pure sand mixed with shelly detritus.

It is evident, from the foregoing considerations, that the foundations of the fort are to be looked upon with some suspicion, and that in engineering operations the unstable nature of the ground should be held in view. A useful lesson may be learned from the fact that the site of Fort Hamilton is now indicated by a line of breakers, nearly a mile off. The present fort has been in imminent danger from the encroachment of the sea, the water having reached to the base of the glacis. It was preserved by a system of stone jetties, by means of which the beach was carried some 200 yards or more away from the fort. Although they have thus far answered their design, the fort must still be regarded as in an exposed and precarious condition. The channel, as already stated, sweeps rapidly close in shore around the point of the island, with constant erosive action. The trend of the land lays it open to the prevailing and the most violent winds. The open sea beats directly upon the beach, and the sand-hills are always shifting. As long as the fort is not

defended by extensive and permanent masonry, care should be taken to disturb the surface as little as possible, since every formed or forming sand-hill is something of a natural protection. The more grass and weeds are allowed to grow about the fort the better, as they help to bind down the sand. Any gully that might be formed by the rain, or other cause, in the glacis, would enlarge indefinitely, and be difficult to remedy.

Since 1839 the fort has been only garrisoned at intervals. It was abandoned in 1849, and at the beginning of the late war was in charge of an ordnance sergeant. It was taken possession of by the "confederates" April 12, 1861, and held by them until its recapture April 25, 1862. The rebel officer in command having refused to capitulate, the fort was bombarded by batteries located 900 yards down the island among the sand-hills, and surrendered after an engagement of five hours' duration. The loss of life was trifling, but the fort was much damaged by shells. The more necessary repairs have been made since its recapture. The fort has been continuously garrisoned of late years.

The reservation comprises about a mile of the end of the island; the limits are at present indicated by a few stakes standing here and there in the mud of the marsh, of which the whole consists, with the exception of the sandy sea-front above mentioned.

Of the geological formation and mineral products of the vicinity I have no information of consequence to offer. As may be judged from what has been said, the soil is generally poor. Most of the land is unreclaimed, and probably is unreclaimable, without more trouble and expense than such crops as could be raised would repay. The products of the pine are perhaps of more importance, in an economic point of view, than those of agriculture proper. Among the latter may be mentioned cotton, which is cultivated to some extent, with an annual export from Beaufort and Morehead of perhaps 1,000 bales. Sweet potatoes, peanuts, various kitchen vegetables, &c., are raised, but the vicinity of Fort Macon will never be noted as an agricultural region.

The latest authority (Rev. M. A. Curtis) on the flora of the State enumerates 1,873 phænogamous plants, exclusive of cultivated species, of which 147 are naturalized, the rest indigenous, and 2,444 cryptogamia, of which over 100 are edible fungi. The State is divided, by the same author, into three botanical districts—the upper, middle, and lower. Fort Macon is situated in the last of these. Wanting space for a general list of the plants found here, I append a few notes upon some of the species that are interesting or important, chiefly in an economic or medical point of view.

A common species of crowfoot (*Ranunculus sceleratus*) is so acrid as to be vesicant. The may-apple, whence the well-known podophyllin is extracted, occurs. Two species of pitcher plant (*Sarracenia purpurea* and *S. flava*) are common in the swamps; the first-named is noted in connection with variola, but its remedial efficacy probably remains questionable. Two species of *Papaver* are cultivated, but rather for ornament than use; both are escaping and becoming naturalized. Among the *Crucifera* are several important agricultural products, *e. g.* three species of *Brassica*, (kale, turnips, and cabbage,) radishes, (*Raphanus sativus*), two varieties, and mustard, (*Sinapis nigra*), the latter frequently escaping into neighboring waste places, while the same order furnishes some of the most characteristic weeds upon the fort. The *Violaceæ* are reputed emeto-cathartic; one species (*V. cucullata*) is extremely abundant. The troublesome weed (*Hypericum perforatum*) is making its appearance in cultivated fields. Curtis gives it from the middle district only. A larger number (about twelve species) of *Caryophyllaceæ* are among the most abundant weeds of the sandy soil. *Kosteletzkya Virginica* is the characteristic indigenous mallow of the salt marsh. Several other species are highly ornamental in cultivation, and one, cotton, is a staple product. The beautiful China tree (*Melia azedarach*) is established, and a fine shade. There is but one species of *Oxalis*, (*O. stricta*;) it is agreeably acid to the taste, but if taken freely produces unpleasant sensations in the fauces and stomach. The cultivated rue (*Ruta graveolens*) is a reputed remedy for fits, of but highly doubtful efficacy. Another plant of the same order, the prickly ash, (*Xanthoxylum Carolinianum*), is an abundant and characteristic indigenous shrub, or small tree; the leaves are full of a highly acro-aromatic oil, and are used as a cataplasm in neuralgia and toothache. Its close-set habit, prickly branches, and easy growth adapt it for hedges. The *Vitaceæ* furnish three important indigenous species—the summer, fox, and muscadine grape, of which the two last are cultivated. Experiments now making in wine producing from the scupper-

nung, a variety of *V. vulpina*, seem to promise good results. *Anacardiaceæ* are chiefly represented by several poisonous species of *Rhus*. The only representative of the *Sapindaceæ* is the *Æsculus pavia*; an almost universal superstition accredits the fruit with remedial agency in hemorrhoids. The *Leguminosæ* afford numerous and highly important products; besides the common peas and beans which are much grown, the peanut (*Arachis hypogææ*) is a common and favorite esculent. Several kinds of clover afford pasturage; of the last named, one, *Trifolium procumbens*, is an important turf in holding together the loose soil of the glaciæ. Besides its ornamental members, the order *Rosaceæ* gives us, among indigenous species, at least two species of blackberry, (*Rubus villosus* and *R. trivialis*.) In the gardens, strawberries are abundant and finely flavored, though never large, and in the orchards, apples, pears, peaches, and plums. Little attention, however, is paid to those fruits, and I have seen none but the most ordinary qualities. The prickly pear (*Opuntia vulgaris*) is an abundant and indigenous species; its fruit may be held edible, but it is small, and not to be compared to the rich, juicy timas of our Southwestern Territories. The *Cucurbitaceæ* flourish vigorously in the sandy soil; watermelons, cucumbers, canteloupes, and summer squashes are all abundant, and of excellent quality. The gourd, (*Lagenaria vulgaris*,) useful for domestic utensils, has become naturalized. *Umbellifera* furnish the well-known and violently poisonous *Cicuta maculata*, which is abundant in low moist ground, and in the gardens, carrots, parsnips, celery, and parsley, none of which, however, are much cultivated. There are few indigenous *Caprifoliaceæ*, of which the alder and Shawnee haw (*Viburnum nudum*) are the characteristic representatives, but several others are highly ornamental in cultivation. Of the madder family, *Galium trifidum*, here an abundant species, is said to yield red dye. The *Spigelia Marilandica*, a well-known anthelmintic, is rare. Of the great number of *Compositæ*, comparatively few are of consequence; among them may be mentioned boneset, to which the very abundant *Mikania scandens* is probably allied in properties as well as botanical characters. Tansy (*Tanacetum vulgare*) is a common emmenagogue in domestic practice—species of *Artemisia*, *Anthemis*, and *Matricaria parthenium* are used as a tea. Mayweed is much too common about waste places, as may be said of the cockleburrs. The yarrow, white weed, two everlastings, sow thistle, an aster, (near *A. miser*?) thistle, golden rod, the sea oxeye and groundsel are all common and characteristic species; the last, an introduced species, is extremely abundant about the fort.

I do not find mentioned by Curtis *Lactuca sativa*, (lettuce.) It is the chief agricultural product of the order. I should not omit to add that *Chaptalia tomentosa*, our only representative of the composite sub-order *Labiataefloræ*, is common here. Of the heaths, the huckleberry, (*Vaccinium corymbosum*,) and probably another species, is the only plant of economic consequence, though several others are extremely abundant and highly ornamental. All are indigenous. Among the hollyworts, the Yaupon, (*Ilex cassine*,) a plentiful shrub, furnishes a drink often used by the lower classes as a substitute for tea. The persimmon is common; so is the rosemary in the salt marshes; its roots are reputed powerfully astringent. *Scrophulariaceæ* furnish numerous species, none, however, of special consequence, though the leaves of *Verbascum thapsus* are frequently used as a cataplasm. The *Verbeniaceæ* are mainly the ornamental cultivated varieties. The indigenous *Labiata* are not specially noticeable in this connection, but numerous naturalized or cultivated species, as of *Mentha salvia*, *marrubium*, *ocymum*, *lavandula*, *origanum*, *nepeta*, *leonurus*, &c., are more or less useful for their well-known aromatic and carminative properties.

Of *Convolvulaceæ*, the sweet potato (*Batatas edulis*) is one of the most important products. An indigenous jalap (*Ipomæa sagittata*) is very abundant in the marshes. Nearly all the *Solanaceæ* are important, tomatoes and potatoes the most so; of the latter many are raised, but they do not keep in this climate, and shortly after the season is over nearly all those we use are imported. Tobacco is not a staple here. Two species of *Solanum* are very common, *S. Carolinense*, an indigenous, troublesome, prickly plant, and *S. nigrum*, poisonous. Other familiar representatives are *Datura stramonium*, *Nicandra physaloides*, and *Physalis lanceolata*. Capsicum is cultivated. I have seen no belladonna or hyoscyamus. *Sabbatia stellaris* is the characteristic gentian, (salt marshes.) *Asclepias variegata*, one of the principal silk weeds. *Phytolacca decandra* is abundant. Among the *Chenopodiaceæ* are numerous highly characteristic species of the sea-shore or salt marshes, such as samphire (*Salicornia herbaceæ*) and saltwort (*Salsola kali*) and others. Lambs' quarters, (*Chenopodium album*,) possible to be used as a pot-herb, and *C. anthelminticum*, a well known vermifuge, are

common weeds. The beet is much cultivated. Buckwheat is not much cultivated; I find it occasionally spontaneous about the fort. Several species of *Polygonum* and *Rumex crispus* and *R. acetosella* are abundant. Among the spurge-worts, *Croton maritimum* is the characteristic species of the sand-hills. *Euphorbia maculata* is very common, as is also *Chidoscolus stimulosus*. I have not noticed the castor-oil plant in cultivation. *Cannabinaceæ* are represented by the hop, (*Humulus lupulus*;) the artocarps chiefly by the Otaheite mulberry, (*Broussonetia papyrifera*;) a thoroughly naturalized and very valuable shade tree, and the fig, (*Ficus carica*;) which flourishes vigorously in the open air, and is much cultivated. Important shade trees of the neighboring orders are the sycamore and elm. Walnuts are not common. Among oaks, the live (*Quercus virens*) is the most noticeable species, though several others occur. It grows here vigorously. Of the *Myricaceæ*, the wax myrtle (*Myrica cerifera*) is very abundant about the marsh. The birches furnish the common alder, (*Alnus serrulata*;) and the willows, *Salix humilis*, besides the introduced *Salix Babylonica*, together with its curious curly variety. The products of the pine, tar, turpentine, and resin, are among the most important resources of the State in a commercial point of view. Other *Coniferæ*, as the red cedar, the white, and the cypress, afford valuable woods.

Among endogens the sea wrack (*Zostera marina*) grows abundantly in shallow parts of the harbor; *Typha latifolia* and *Sagittaria* in stagnant water. The orchids furnish numerous ornamental species, all indigenous. The Spanish moss (*Tillandria usneoides*) festoons the trees of the swamps. It is held, with good reason, to be an infallible index of miasmata. The irids are represented by several flags, and the abundant *Sisyrinchium Bermudianum*. Of several species of *Smilax*, *S. tamnoides* is probably the most common. Besides the numerous *Liliaceæ* that are cultivated for ornament, the indigenous *Yucca gloriosa* is a common and splendid species. The introduced garlic (*Allium vineale*) is abundant. It imparts a disagreeable flavor to the milk of the cows, which eat it with the grass. The onion is commonly cultivated; asparagus (*A. officinale*) less frequently. The marshes give place to several species of *juncus*, and the sandy soil about the fort to a pretty *commelina*.

It is impossible, within our limits, to speak duly of the various important cereals that the *Glumifera* afford, or to mention even the principal of the numerous species of *Cyperaceæ* and *Gramineæ*. I will only refer to two of the latter. In August and September the sea-side oat (*Uniola paniculata*) hides the nakedness of the sand-hills, to which it is confined, with a luxuriant growth, causing them to resemble a field of the cultivated cereal. The sandspur (*Cenchrus tribuloides*) grows in profusion everywhere about the fort and is our most annoying plant; the bur-like involucre beset with acute spines, which ripen late in summer and in early fall, are for a time attached, but subsequently fall and are scattered over the ground. The burs adhere to whatever touches them, and the minute barbs, which resemble, in their effects at least, the fine bristles of the *Opuntia*, inflict a painful wound, liable to fester, especially when, as often happens, they are broken off in the skin.

Fort Macon is a locality of unusual interest to the zoologist, its marine invertebrates, famed in particular, being very rich and varied. Want of space, however, prevents my presenting the copious lists which have been prepared in various departments. In the following paragraphs I mention only a few species that are of consequence in an economic or sanitary point of view.

None of our many radiates present anything for consideration in this connection. Among *Mollusca* several species contribute largely to our support; foremost among them the oyster, which is abundant, cheap, and of excellent quality. It should be added, that those grown in too shallow water exposed to the air at low tides, (Raccoon oysters,) are unfit for food and have even proved at times decidedly injurious. The Quahog clams and one or two other species of the same genus are plentiful, and afford good food. The scollop is also much used; the muscle is the only part that is eaten. The conchs (*Busycon carica*) and two other species are eatable, but are scarcely used except by the lowest classes. The muscle (*Modiola plicatula*) would only be used in the absence of anything preferable. These are the only species noticeable in this connection, out of about 125 species of marine shells that I have personally determined. Articulates furnish a few noticeable species. The lobster does not occur so far south, but two species of crabs are very abundant and excellent articles of food. Most of the crabs are efficient scavengers; but two species, the sand (*Ocypode arenaria*) and fiddlers, (*Gelasimus minax* and *G. pugnax*;) deserve special mention in this regard. The former polices the sea beach, and the latter the marsh. Both are extremely numerous. Shrimps of one or two species are found, but they are scarcely eaten. Of the *Decapod crustaceæ* about 40 species are enumerated by recent authority.

The insects of the locality that have any special relations with man are chiefly those affecting him injuriously. Various species of wood-ticks (*Ixodes*) abound; while indoors the *Cimex lectularius*, *Pulex irritans*, and a species of *Blatta*, are only too common. *Phthirus pubis* is the characteristic representative of the parasites. The garrison, probably, is never free from its infestation. The prevalence of southwest winds free us in part from the mosquitoes, but these and a sand midge are often annoying pests in summer. The waters give employment and support to a large part of the population and furnish important additions to the army ration. A dozen or more of small or medium-sized fish may always be taken at the wharf, and fishing for these is the chief amusement of the troops. Of larger fish the "sheephead," two species of drum, and the sea trout, are abundant in season and easily secured. Blue fish are abundant late in summer, and trolling for them furnishes the most agreeable and healthful exercise that is had here. The most important fishing, however, in a commercial point of view, is undoubtedly that of the mullet, (*Mugil*), vast shoals of which make their appearance late in the fall. They are only taken in the seine. Of useless or hurtful fish may be mentioned the various species of rays, or stingers, as they are called. The wound from the spine of the tail is tedious, painful, and even dangerous. Sharks of different species, including the hammerhead, (*Zyganea malleus*), are sufficiently large and numerous to require the exercise of some caution in bathing. Like the rest of the Carolina coasts this locality is noted as a habitat of the somewhat celebrated devil fish, (*Ceratoptera campyrus*), which must not, however, be confounded with any of the smaller species of *Raiidae* that commonly receive the same name. Reptiles furnish only two species of economic consequence. These are the loggerhead turtle (*Chelonia midas*) and the terrapin, (*Malacoclemys palustris*), both of which are excellent for the table. Of venomous reptiles I have noticed but two—the rattlesnake and copperhead; both are common in swampy wooded places. The island itself seems singularly destitute of batrachia, though several occur in the mainland. I have noticed four species of harmless snakes and three of harmless lizards about the fort. One of the latter, the glass snake, is the most abundant and characteristic reptile of the island. The alligator is a frequent inhabitant of the swamps in the vicinity. Out of over 200 species of birds that I record from the locality, several species are of special economic importance. With the exception of the quail, which is abundant on the mainland, though shunning the barren island, these belong, as was to have been anticipated, to the waders and swimmers. The first named furnish (chiefly in spring and fall during the migration) curlew, plover, various kinds of snipe, and sand birds and rail. All these are abundant, and may be procured with little trouble. In November, and during the winter, water fowl throng the harbor. They are represented by two or three kinds of geese and a dozen or more of ducks, as mallard, teal, widgeon, red-heads, and raft ducks; but the most abundant water fowl, the fishing duck, (*Merjus serrator*), is hardly eatable. The various pelagic birds that enter the harbor are rather interesting in their scientific aspects than important from our present standpoint. In a sanitary point of view there are three species of decided consequence: the turkey buzzard, fish crow, and herring gull, which effectually remove the garbage that is carried out of the fort.

The list of indigenous mammals is comparatively small. Deer (*Cervus Virginianus*) occur in numbers in the vicinity, and venison is sometimes as cheap as beef. They are said to reside on the wooded portion of the island itself as well as on the main land. A hare (*Lepus palustris*) is the most abundant and characteristic mammal of the island. The opossum is common. Among fur-bearing animals may be mentioned the gray fox, mink, otter, and raccoon. Our noxious species are confined to the rat and mouse, naturalized species that have permanent foothold about the fort.

There are no springs upon the island, and the pools, &c., are all more or less subject to the tides; all the water is brackish and most of it somewhat hard. It may be procured anywhere by sinking a barrel or two. I do not, however, indorse the current opinion that it is sea water filtered through the sand.

The mean temperature may be estimated at near 60° Fahrenheit. The extremes are not great, owing in winter to low latitude, comparatively speaking, and the scarcely appreciable elevation above sea level, and in summer to the almost constant southwest sea breeze. Occasionally a film of ice forms, and there are usually one or two slight snow falls during the winter. We are, however, subject to sudden and decided changes of temperature. The humidity of the atmosphere is usually great, and the dew point correspondingly high. At most seasons articles of dress, books, the solid extracts, &c., rapidly gather mold, and instruments must be constantly cleaned.

The prevailing winds are between south and west; these usually blow with great violence during most of February, March, and April, and are subject to sudden shiftings. One effect of the shifting to the northward, in summer at least, is the wafting of malaria from the swamps of the mainland, for the salt marsh itself is not, I am satisfied, appreciably miasmatic. The seasons are of the average length for the latitude; but in January a week or more of almost summer weather is liable to occur to the prejudice of fruit trees by forcing the budding.

The fort stands on the eastern extremity of the reservation at from 250 to 400 yards from the (present) watermark, but very high tides flood the level shingle nearly to the foot of the glacis. The glacis has a long and gradual slope on the sea front, but is short and abrupt on the sound side. The bottom of the ditch is just about at high-water mark. During unusually high tides it is flooded a foot or more in depth by water that enters from the marsh through a culvert into a drain running under the glacis. The parade wall, of brick, incloses an irregularly pentagonal area of about half an acre. The parade is about 3 feet above the level of the ditch; its longest diagonal is 183 feet, the shortest 100 feet.

There are no barracks at the post; with the exception of a few married soldiers the troops are quartered in the casemates, a part of which have been furnished with iron-grated doors and windows to further fit them for prison cells, for which they are in other respects well adapted; all are of solid masonry throughout, plastered and ceiled overhead, and with board flooring laid over the brickwork. They are nearly of the usual tunnel shape, with low perpendicular walls and arched ceilings; they measure 38 by 18 feet in superficial area, by 15 feet to the ridge; they are warmed by an open fire place, lighted in the rear by embrasures and port-holes, and in front by a door and window of ordinary dimensions, opening directly into the parade; ventilation is further provided for by two chimney-like openings in the ridge. There are twenty-four casemates of this description, six of which are used as men's quarters, five as officers' quarters, two respectively as prison cells, company mess-rooms, company offices, and store-rooms for quartermaster and commissary property, one respectively as adjutant's office, ordnance store-room, guard-house, bakery, and kitchen. The triangular spaces left between contiguous casemates at three of the five angles of the fort are partly used as magazines and partly as cook-rooms, a brick wall separating them into two compartments. With the usual garrison of two companies the men are overcrowded; the dimensions of the casemates afford only 10,260 cubic feet, without taking into consideration the arch of the ceiling by which, with the cumbrous wooden bunks, boxes of clothing, &c., the capacity is further diminished materially. With 20 men in each casemate—there have never been fewer and sometimes more—the air space per man is only about 500 cubic feet. It may be said that the casemates will only accommodate 10 or 12 men, with due regard to hygiene, and even when not crowded cannot be considered as eligible quarters. In spite of the several openings above mentioned, the ventilation is defective. When the doors and windows are closed it is insufficient, as is readily perceived on entering a casemate at midnight; when open, there is generally a strong draught of air directly through from one end to the other. One of these conditions produces morning languor and depression, the other exposes the men to taking cold, and no gentle, equable renewal of the atmosphere is practicable. Most of the casemates are, moreover, extremely damp; in one of them, at least, a defect in the conduit leading to a cistern causes constant trickling of water down the walls. Although the sick report does not show the result of these unhealthy conditions in an unusual number of men actually unfit for duty, an injurious effect is perceptible in lowering the general standard of health.

Suitable barracks remain an especial desideratum, and in case of an epidemic it would probably be necessary to evacuate the fort.

The men sleep in wooden bunks, each holding four persons. The bedding is sufficient and of good quality. There are no bath or wash-rooms—the men wash under a shed in the ditch at the postern gate. The kitchens are cramped in space, but otherwise eligible. The two mess-rooms answer every purpose and are supplied with proper fixtures. There are no water-closets. A large and well-constructed sink is located on the edge of the marsh, within high water-mark, so that the excreta are constantly carried away by the tide. The general prisoners are confined in two casemates; their mess and other arrangements are the same as those of the men, except that they have no bunks.

The married soldiers occupy six small wooden buildings scattered irregularly about the fort; these are of the most wretched description; they were mere sheds to begin with, and are now going to pieces; they all leak, and afford but little protection from the weather, although assiduously patched up with odd bits of boards and pieces of canvas. Nor is there a sufficiency of even such quarters as these; in some instances different families are crowded together in a manner that almost violates decency.

Three cottages have recently been erected for officers' quarters, and a fourth is now being built. They are of wood, one story, and finished with more regard to economy than for the comfort of the inmates. Each contains four rooms of inadequate dimensions, two on either side, separated by a central passage, and two small kitchens in the rear. The division into sets of quarters becomes a matter of mutual disaccommodation when more than one family occupies the same house. The rooms are warmed by open fires, and inconveniently ventilated by the cracks in the doors, windows, and floors. The quarters are supplied with water by the prisoners, who bring it from the wells and place it in barrels at the back doors. There are no water-closets or bath-rooms. Junior officers occupy casemates within the forts.

The use of certain casemates as offices and store-rooms has been already mentioned. Besides these, half of a large wooden building, situated where was once a wharf, before this was washed away by the tide through lack of timely repair, is used as a quartermaster's storehouse. A recently constructed railroad connects this building with the fort, and affords easy transportation by means of a hand-car. One of the casemates, opening in the covered way leading to the sally-port, is used as a guard-house; of its unfitness for the purpose there is no question. The garrison prisoners are confined within, when not at work, but the guard generally occupies the covered way outside.

The hospital is a disgrace to the service. A flimsy wooden building was removed in sections from Morehead City some time near the close of the war, and put up here as a hospital. It is radically defective in plan, rudely built, and now so much out of repair that it is liable to be blown down by one of the storms that sometimes prevail here. It is situated about 250 yards southwest from the fort. The building was hastily erected upon a sand-hill, without adequate support; the foundations have given away in all directions, and the building has settled unevenly in the sand; the flooring presents a rolling surface, gaping here and there, the walls bulge outward and the roof sags inward; none of the doors or windows can be closed tightly, the former have broken locks and hinges, or none at all; many of the window lights are unglazed, the wind and rain are freely admitted through openings in the roof and walls; the interior woodwork, as that of the partition, &c., is of one thickness of undressed plank, warped and bent; there is not a straight line about the building. The adaptation of the building for hospital purposes is on a par with its present state of repair. The building is T-shaped; one ward of ample dimensions (54 by 22 by 10 feet) occupies the whole stem. It will accommodate 12 patients, with an air space of nearly 1,000 cubic feet per man. The cross bar affords four small rooms; an inconveniently narrow passage leads into the ward from the front. On either hand is a small room, $9\frac{3}{4}$ by $8\frac{3}{4}$ feet in superficial area; one is used as surgeons' office the other as dispensary. The larger rooms, ($16\frac{1}{2}$ by 14 feet,) at the extremities of the cross-bar, are used as steward's room and store-room; the former has been rendered inhabitable by assiduous repair, but the stores in the latter require to be protected from the rain by gutta-percha cloths. The wash-room is merely a corner of the ward partitioned off. The door leading to the porch has been nailed up, as the latter has gone to pieces since the plan was drawn; the veranda in front will shortly follow. The kitchen is a rough shed (12 by 8 feet,) detached in the rear. Until recently the privy was a rough box (5 by 4 by 5 feet,) with no door. There is no matron's or attendant's room, mess-room, bath-room, water-closet, or dead-house. There are no special arrangements for ventilation. The ward is heated by a stove. No possible repairs will fit the building for hospital purposes. The absolute and pressing necessity for a new hospital is obvious. It is a severely unfavorable reflection that this state of things has endured so long after the more than one inspection by proper authorities, and repeated communications from different medical officers.* There is no laundry, chapel, or school-house. One of the casemates is used as a post bakery, and may be said to have thus far answered such purpose in an unsatisfactory manner.

* The erection of a new hospital on the plan given in Circular No. 4, dated Surgeon General's Office, April 27, 1867, has been ordered, and proposals have been invited by the quartermaster's department for its construction.

The post library consists of about two hundred volumes, representing a few valuable standard works, much light reading, and a number of school-books, (the latter unworn;) these are piled up in a corner of the hospital steward's room.

Drinking-water is obtained from two wells, situated at the end of the glacis; it is daily distributed in barrels by the prisoners. Within the fort are four cisterns that collect the water from the inner parapet. This water is only used for washing. There is no distribution of water from the cisterns.

Fire-buckets are kept in constant readiness, but there is no other apparatus for extinguishing fires. When the hospital took fire last fall from a defective flue, it was saved, except the roof, by the individual exertions of the men in bringing water in buckets from the neighboring marsh.

The porosity of the soil and the slope of the glacis render the natural drainage unusually effective. The level parade ground within is drained by a system of five sewers, opening by six culverts, one for each side of the pentagon, and one in the middle. The several drains center here, whence a single sewer conducts under the sally-port to the ditch, and the water flows thence through a tunnel under the outer parapet and glacis into the marsh. The drains are constructed of wood and masonry; they have scarcely pitch enough inside of the fort, but are otherwise well adapted; nothing offensive is allowed to be poured into them; all slops and garbage are twice daily removed by the prisoners, in barrels, and thrown far out upon the beach, where they are partly devoured by birds and crabs, and partly washed away by the tide; the most wholesome regulations in this regard have always been enforced since I have been at the post.

The sea affords constant bathing facilities in summer. There is no special provision for bathing in winter.

There are no post, hospital, or officers' gardens. There is daily (except Sunday) communication by rail with large cities north, and a weekly line of steamships from Newberne (28 miles distant) to New York. The daily mail is quite regular. Letters require between two and three days to reach Washington and New York.

The inhabitants of the vicinity probably represent a fair average of the southern seaboard population; they are mostly native Carolinians, both white and black, the latter representing a considerable proportion; the greater number are fishermen. To their regular employment with the seine they add the capture of an occasional whale in spring, and not unfrequently become wreckers for the time; most of them cultivate small patches of ground about their cabins. The next class, representing nearly all the rest of the white population, are the small trades-people and farmers. It is difficult to specify the occupation of the colored element. There are now no aborigines in the vicinity, but tribes formerly living here have left their traces in at least one "Kjoekkenmoedding," (that on Harker's Island,) in which pieces of pottery and various implements may be found.

In spite of some obvious violations of hygienic principles that have been noted above, the general sanitary condition of the post is good; the locality is, perhaps, unusually healthy for one on the southern coast; the sudden changes of temperature are the chief drawbacks; these, joined to the humidity of the atmosphere, operate unfavorably in pulmonary complaints. Phthisis makes rapid progress when fairly established, while common colds and coughs are apt to prove tedious and troublesome, even when they do not have more serious terminations. Pneumonia requires close attention. It is difficult to specify any as the prevailing diseases; there have been no epidemics for some years at the fort itself; its isolation appears to confer comparative immunity, and would be an efficient furtherance of quarantine and other sanitary measures. An importation of yellow fever from Newberne to Beaufort a few years since did not spread, and subsided with comparatively small mortality; the residents assert that it is not known to have originated there. A moderate amount of malarial fever occurs in summer; it is of a mild form, and the type tends toward suppression of the chill, and corresponding lengthening of the febrile state; it is most probable that what little miasma is experienced is wafted by northerly winds from inland swamps; the marsh itself appears non-malarious. Nearly all the bowel diseases, of which there is a moderate amount, chiefly occasioned, I think, by sudden changes in the weather, have proven of a transient character, yielding readily; though occasionally cases of dysentery, dependent upon or associated with malarial conditions, have been found intractable. Considering the atmospheric influences there is a remarkable freedom from rheumatism. Venereal disease is at a minimum.

Statement showing mean strength, number of sick, and principal diseases at Fort Macon, North Carolina, white troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Diphtheria.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (five months).....	62.4	32	15	3	.....	3	.....	.....	2	.....
1869.....	127.83	171	48	55	1	16	7	2	5	1

Statement showing mean strength, number of sick, and principal diseases at Fort Macon, North Carolina, white prisoners, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (eleven months).....	56.54	115	25	29	3	5	6	.....	4	.....
1869.....	31.16	17	7	.....	.....	1	2	1	1	.....

Statement showing mean strength, number of sick, and principal diseases at Fort Macon, North Carolina, colored troops, for the year 1868.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (eight months).....	173	509	152	45	11	26	39	26	1

Statement showing mean strength, number of sick, and principal diseases at Fort Macon, North Carolina, colored prisoners, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	24.4	28	8	6	1	1	2	.....
1869.....	14.5	4	2	1	.....	.....	.....	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT JOHNSTON, NORTH CAROLINA.

REPORT OF ACTING ASSISTANT SURGEON S. S. BOYER, UNITED STATES ARMY.

Fort Johnston, North Carolina, on the west bank of Cape Fear River, four miles from its mouth, is in latitude 34° N., longitude $78^{\circ} 05'$ W., at an elevation above the sea of 20 feet. The village of Smithville surrounds the fort on the north and northeast, and on the west and southwest sides. On the southeast and east sides it is bounded by the river. Wilmington, the nearest city, is 30 miles distant in a northerly direction. This fort receives its name from Gabriel Johnston, who was governor of the province of North Carolina from 1734 to 1752. It was erected by the British soon after France declared war against England, in 1744. Since that period it has been garrisoned at irregular intervals.

The reservation is of an irregular shape, 337 feet on the northwest side, 591 feet on the west side, 558 feet along the water front, and 548 feet on the northeast side, and is inclosed by a board fence. Two brick walks pass through, one in the center, the other at the east end. A number of shade trees are distributed over the ground. There is a salt marsh on the northeast side and one on the west of the village, just outside its limits; beyond these marshes the woods begin and extend into the country. The land is more or less flat, soil marshy, porous, and not very productive. Fish are caught in abundance in the Cape Fear River and Atlantic Ocean, both being near the fort. There are many wells and a few springs located in different parts of the village around the fort. The wells vary in depth from 15 to 20 feet.

The climate is warm and more or less equable. Mean annual temperature, $65^{\circ} 7'$. Warmest month, July; mean, $81^{\circ} 5'$. Coldest month, January; mean, 49° . During spring and part of the summer months the prevailing winds are south-southwest, and bring with them the breeze from the ocean. During the remainder of the year the winds are mostly north-northeast, and have the effect of increasing the humidity of the atmosphere. Winds coming from the northwest carry the malaria from swamps two or three miles distant.

There is no fort built upon the reservation. During the late civil war it came into the possession of the rebels, and they constructed some minor works upon it, which have since been removed by United States troops.

The barrack is a one-story frame building, 100 by 25 by 14 feet, with an open veranda passing the whole length of the southeast side. There is an open fireplace at each end, and a large stove in the center, and by these the room is kept comfortably warm in cold weather. On the northeast side of the building are six windows and three doors; on the northwest side eight windows and one door, and on the southwest end two windows, thus affording sufficient light and ventilation. The room has a capacity for 60 men, with an air space of 550 cubic feet for each. Double wooden bunks are arranged in rows on each side the room, three feet apart, with a passage way in the center of the room, $8\frac{1}{2}$ feet wide. Double and single bedsacks, filled with straw, are used for bedding. No wash or bath-room is connected with the barrack. A latrine is built on the river at low-water mark, the ebbing and flowing of the tide preventing the excreta from accumulating. At high tide the water comes within two feet of the seats.

The kitchen and mess-room are in a one-story frame building, 46 by 22 feet, the former being a room 21 by 12 feet, the latter taking up the remaining space, 33 by 21 feet. One large cooking stove is used in the preparation of food.

The laundresses' quarters is a one-story frame building, with four rooms, each having an air space of 1,890 cubic feet. There are two windows and doors in each room, and a piazza extends along the whole southeast side.

One brick house with a tin roof contains the officers' quarters. The main part of the building is two stories in height; that on each side, northeast and southwest, is but one story. It has twelve rooms in all. There is a double piazza in front. On the second floor there are three rooms. Of

those in front, one is 18 by 15 feet, the other 12 by 13 feet. The rear room is 22 by 15 feet, each of the three being 9 feet high. Beginning at the northeast end of the first story, the room is 19 by 17 feet; height, same as those in the upper story. In the rear of this room is one 14 by 9 feet, and 7 feet high; the next is 19 by 15 feet, and 9 feet high. In the rear of this room is one 12 by 9 feet, and 7 feet high. The next is 12 by 10 feet, and in its rear, one 17 by 15 feet. The next room is 14 by 15 feet. Next to this room is a hall running through the building from southeast to northwest. It is 5 feet in width, and of the same height as the last room, 9 feet. The first room, southwest of the hall, is 18 by 14 by 9 feet; the last, 20 by 17 by 9 feet. These quarters are not divided into sets. Each room has an open fireplace for burning wood. Ventilation and light are secured by means of the windows. Water is supplied by hand. There are no bath-rooms in the house.

The office of the commanding officer is located on the southwest side of the reservation. It is a brick building, 22 by 20 feet, with one room. One of the storehouses is located alongside the government wharf; it is 94 by 29 feet, and divided into four rooms, two of which are occupied by the quartermaster and commissary as an office. Of the other two rooms, one is for commissary's, and the other for quartermaster's stores. The second storehouse is situated about the central part of the reservation. It is a brick building, one story high, and is the old "block-house" erected in the earliest history of the post.

The guard-house is located upon the southeast part of the reservation. It is 22 by 18 by 10 feet, with a porch facing the river. The guard-room is 12 by 18 feet, and two rooms open into it; one is the lockup, 12 by 10 feet, the other the cell, 10 by 6 feet. The rooms are heated by stoves, and ventilated through the windows.

The hospital is located on the northeast side of the reservation. It is a frame building 52 by 28 by 26 feet. The central part is two stories high, and contains a ward on the upper floor 16 by 26 by 9½ feet. On the southwest side are four windows, and on each end, two. In the rear of the ward at the head of the stairs are two rooms, one on each side; the one to the right upon entering the ward is the store-room, 12 by 10 feet, the other is the bath-room, 12 by 6 feet. On the first floor are four rooms and a hall, the latter being 26 by 12 feet, with stairs leading to the second story. To the left of the hall are two rooms. At the northwest end of the hall is a space 6 by 4 feet, inclosed by a counter; this is the dispensary. Shelves and drawers are constructed along the walls on three sides. Underneath the stairs is a closet. There are two rooms northwest of the hall; the first is the dining-room, 14 by 12 feet, the second the kitchen, 12 by 12 feet. The ward has a capacity of twelve beds; air space per man, 748 cubic feet. Bathing and washing are done in the bath-room, which is provided with a bath-tub and wash-stand. There are no water-closets in the hospital; a latrine is situated on the river-bank, 30 yards distant.

The dead-house is a frame building, 14 by 8 by 9 feet, located on the northwest side of the reservation.

The post bakery is a frame building, 9 by 8 feet, with an oven 7 by 6 feet, capable of baking 140 rations at once. There is no laundry, chapel, or school-house upon the reservation.

The stable is located at the southeast part of the reservation, upon the bank of the river above high-water mark. It is a square building, formerly used for storing provender, and contains one row of stalls. Most of the boards inclosing the south and west sides are separated half an inch, so there is abundance of light and ventilation.

There is no permanent library belonging to the post.

The water supply upon the reservation is from two sources, a well and a cistern; the former is 20 feet in depth, and located 15 rods from the barracks; the latter is located in the rear of the officers' quarters, and has a capacity for 5,000 gallons, although it seldom contains that quantity at one time. In both, the water is raised by a pump and distributed by hand. Should the quantity become insufficient, it could be obtained from wells in the vicinity. Its quality is slightly brackish. From the porosity of the soil, the natural drainage is good.

A bath-house, 20 by 18 feet, is erected upon the river beach, at low-water mark. The boards on each side are half an inch apart, thus allowing the water to enter. There is a partition running nearly the whole breadth of one side above water, which separates the building into two parts; the first is divided into four small dressing-rooms, the second contains the water. The men bathe daily in summer.

The dead of the command are interred in a cemetery located upon the northern boundary of Smithville, which is the property of the village. The bodies remain here but temporarily, as they are afterwards removed to the government cemetery near Wilmington, 30 miles distant.

There are no gardens at the post; but six acres of land, half a mile from the fort, are hired for a post garden and cultivated by men of the company; a variety of vegetables is raised, but the yield is small.

The means of communication with the nearest large city, Wilmington, North Carolina, is by water; steam-tugs run to and fro at uncertain times. There is no established line between the two points. We have a regular tri-weekly mail. Letters mailed here for department headquarters or Washington generally reach their destination in three days.

The general sanitary condition of the post is good. Remittent and intermittent fevers are the prevailing diseases. Salt marshes upon the northeast and west sides of the village around the fort are an undoubted source of malaria, as those persons living immediately upon their borders suffer most from these fevers.

Statement showing mean strength, number of sick, and principal diseases at Fort Johnston, North Carolina, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (seven months).....	68.14	106	1	45	24	14	1	2	2	.....
1869.....	69.08	102	1	32	11	19	2	.....	5	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

POST OF RALEIGH, NORTH CAROLINA.

REPORT OF ACTING ASSISTANT SURGEON JOHN B. WHITE, UNITED STATES ARMY.

This post is situated just without the limits of Raleigh, between Crabtree and Walnut Creeks, latitude $78^{\circ} 47' 8''$, longitude $35^{\circ} 47'$, and has an elevation of 317 feet above the level of the sea. It has been uninterruptedly garrisoned since April 12, 1865, and known as "Camp Russell." Previous to that date most of the buildings within the garrison were occupied by the confederate government for hospital purposes, and known as the "Pettigrew hospital."

The reservation contains about six acres, in the shape of a parallelogram, having a slight inclination toward the south, and situated about one mile due east from the city of Raleigh. The grounds in the vicinity are moderately rolling—mostly of granitic formation—representing shades of sandy and red-colored earth, eagerly absorbing and retaining water. The land is under partial cultivation, and free from marshes. The mineral productions are of the most varied character. Veins of graphite and marble extend to within a short distance of the post. As a rule, flowers blossom from four to six weeks earlier than in the middle States; some of them open as early as December.

The German element pervades the city and suburbs; the principal street of Raleigh presents decidedly a Teutonic aspect.

This post has long been noted for its salubrity and freedom from diseases due to climatic causes. The maximum temperature for the year 1868 was 108° F.; minimum, 12° F. The annual fall of rain was 45 inches; the number of cloudy days, 130; of rainy days, 60; the prevailing winds are southwest and northeast.

Within the post limits are five barracks, ranged in lines, the axis due east and west, and separated by an interval of 38 feet, sufficient for the sun's rays to fall on each side. These buildings

were erected by the confederate government for hospitals. They are frame buildings, 90 by 26 by 15 feet, with shingled roofs; windows on both sides and ends; warmed by stoves and fireplaces. The average occupation of each barrack is 50 soldiers, allowing 465 cubic feet of air space to each lodger. The bunks are double, in two rows, running the entire length of the room. The construction of sixteen opposite windows of good size, and dormer windows in the apex of each roof, with ridge ventilation, allows vertical motion of the polluted air from below, and secures the most desirable amount of ventilation. Besides, the elevation of each building from the ground permits perflation of the winds under the same.

The sinks are distant from the men's quarters and are well arranged, being provided with drawers, which admit of constant correction and the removal of refuse.

Each barrack is well provided with a kitchen and a mess-room, which are well furnished with modern facilities for cooking, &c.

Married soldiers have separate quarters, in a long, narrow building, containing accommodations for fourteen families. These quarters are comfortable, convenient, and healthy.

There are at the present time five buildings in use by the officers, all save one built by the confederate government on a very cheap scale—style antique—and when erected never thought of being more than day-rooms for the medical officers attending upon the sick. They are built of wood, one story high, shingle roof, built without piazzas, and unplastered. The one built by the United States government, in 1866, is more modern, but faulty in design. The rooms are narrow and contracted, varying in size from a hall bed-room to the proportions of a lecture-room. On this account assignments have with many difficulties been made.

The guard-house, situated on the northwest corner of the garrison, is a new frame building, 38 by 13 feet, one story high, with shingled roof; it contains a guard-room and prison-room of two cells, which are, with the present strength of the command, (100 men,) adequate. The building is warmed by a stove in the guard-room; lighted by two windows; ventilation is very imperfectly supplied.

The building set apart for hospital use is located on the southeast corner of the post, and, like those before mentioned, was erected by the confederates, and faulty in construction. It is a frame building one story high, 80 by 21 feet, with shingled roof, containing a ward 48 by 21 feet, and a convenient room for the steward, one for wash-room, one for store-room, and one for storing baggage. Natural ventilation is good, viz., by twelve opposite windows and openings in the ridge, permitting a free vertical movement of vitiated air from below. Two large stoves are used for heating the hospital. The ward contains fifteen beds, giving to each an air space of 630 cubic feet.

There is a post library, consisting of 85 volumes, of bad selection, much worn and very incomplete, under the direct supervision of the post surgeon.

The water used by the command is obtained from one well, situated without the camp limits; in quantity and quality it is all that could be desired. Previous to the war the water was chalybeate; but during the progress of the war the shock of an earthquake, of a moment's duration, had the effect to change the well-water from a chalybeate to that of a limestone character. There are no cisterns or reservoirs about the camp. Water barrels have been placed near each building for the prompt extinguishment of any fires that may occur.

Being situated on an inclined plane the drainage of the post is naturally good. A small creek, some 200 yards distant from the post, affords bathing facilities to the men during the summer months, and is not without its beneficial effects in a hygienic point of view. A special room for ablution purposes is set apart for the command during the winter months.

The site of the present post is pre-eminently healthy, as is also the vicinity. The climate, in summer and winter, is mild and pleasant, the range of temperature is small, and the place is free from malarial or epidemic diseases, or those traceable to atmospheric or climatic causes.

Statement showing mean strength, number of sick, and principal diseases at Raleigh, North Carolina, white troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (eight months).....	292.37	267	1	63	25	1	.....	43	14	1	29	2
1869, (eight months).....	53.33	84	.....	14	13	.....	2	20	6	.....	1	.....

Statement showing mean strength, number of sick, and principal diseases at Raleigh, North Carolina, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (three months).....	262.33	220	60	24	.....	15	67	8	14	.....
1869, (three months).....	291.66	279	32	10	2	32	97	35	1	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF THE LAKES.

POSTS DESCRIBED.

Madison Barracks, Sackett's Harbor, New York.
Fort Ontario, Oswego, New York.
Fort Niagara, Youngstown, New York.
Fort Porter, Buffalo, New York.

Fort Wayne, Detroit, Michigan.
Fort Gratiot, Port Huron, Michigan.
Fort Brady, Sault Ste. Marie, Michigan.
Fort Mackinac, Mackinac, Michigan.

MADISON BARRACKS, SACKETT'S HARBOR, NEW YORK.

REPORT OF SURGEON E. P. VOLLUM, UNITED STATES ARMY.

Madison Barracks is situated at Sackett's Harbor, New York, on the south shore of Black River Bay, about 10 miles from Lake Ontario, and 320 miles from the Atlantic coast. It is in latitude $43^{\circ} 57'$ north, longitude $76^{\circ} 15'$ west; height of the barometer, 262 feet above the sea. Black River, a stream of considerable size and importance as an unfailing water-power, falls into the head of Black River Bay, eight miles east of the post, at the town of Dexter, a manufacturing place; and the mouth of Mill Creek bounds the reservation in the same direction. The waters in the bay in the vicinity of the post change color as the winds blow from the northeast or southwest. When they come from the former direction the dark brown water from Black River is forced into Lake Ontario past the shore fronting the post; coming from the latter direction, the clear lake water takes the place of the river water. The land in the neighborhood is free from marsh, but at the head of Black River Bay there are some marshy places, which, however, do not produce any appreciable bad effects. The surface of the surrounding country is gently undulating, and the soil, originally rich, is now somewhat worn out by careless cultivation. The timber is mostly cleared off, and the country is thickly settled by thrifty farmers who, of late years, have turned their attention to the dairy and stock-raising, while formerly grain was the chief product of the country.

The site of the post is about 30 feet above the water, and excepting a short space in front of the parade, the land overlooks the water by a perpendicular bluff of limestone. Originally a deep gully, filled with cedars, occupied a portion of the parade. This was filled, the rough place in front sloped off, and the boundary of the parade toward the water was secured by a stone-wall, brought up as high as the plane of the parade, the surface of which was allowed to slope gently from the officers' quarters toward the water.

The soil of the reservation is chiefly a dark loam, resting on a stratum of fossiliferous limestone, which lies from one to four feet below the surface. A large part of the surface, especially the cultivated portion, is flat, and difficult to drain in a thorough manner. The reservation contains $39\frac{1}{2}$ acres, purchased in parcels at different dates, as required. The whole is inclosed by a substantial cedar stockade.

The roads about the post are partly covered with broken stones, with a covering of sifted hard coal ashes about an inch deep, thrown on, wetted, and packed down by a horse-roller. The result has been a smooth and quite durable light carriage road and foot-path, which can be easily and cheaply repaired. As the ashes accumulate, it is designed to finish off the paths in front of the men's quarters in the same manner.

All of the buildings, except the ordnance sergeant's quarters, stables, ice-house, and engine-house, are constructed of limestone, a material much used in the neighboring country for building purposes. The stone is used in pieces of various sizes and shape, and neatly fitted together, making the walls about 19 inches thick, and sufficiently durable to stand for centuries to come.

The roofs of all the buildings are shingled, except the quartermaster and commissary store-

houses and guard-house, which are covered with tin, painted. The parade is a smooth grassy surface, 552 feet by 452 feet in extent, bounded on three sides by officers' and men's quarters, and open on the water side, allowing a beautiful and extended view of the bay and opposite country. The officers' quarters face the northwest, and consist of two rows of buildings on the same line, raised about two feet above the ground and separated by the sally port, which is 30 feet wide. Each row is 217 feet by 33 feet, and consists of five double sets of quarters, protected in front by a continuous portico, six feet wide. The first set of quarters on each side of the sally-port is two stories high. In the quarters on the right of the sally-port there are two rooms on each side of the hall on both stories, and a kitchen in a wooden extension in rear. The ceilings on both stories are 10 feet high. The lower rooms on the right, in front, measure 15 feet by 16 feet 7 inches; in rear, 14 feet 3 inches by 15 feet 6 inches; up stairs, same side, in front, 14 feet 7 inches by 15 feet 6 inches; in rear, 11 feet 8 inches by 15 feet 3 inches; left of hall, lower story, front, 13 feet by 15 feet; rear, 12 feet 6 inches by 15 feet 1 inch; up stairs, front, 13 feet 2 inches by 14 feet 4 inches; rear, 13 feet 3 inches by 14 feet 5 inches; kitchen, 23 feet 8 inches by 11 feet 10 inches, by 10 feet high, with a sky-light. Inclosing the yard, which is 25 feet by 30 feet, are a carriage-house and stable for two horses, water-closets, wood shed, and coal-bin, constructed of wood, and a root-house constructed of stone and covered with earth and sod. The walls of the quarters are hard-finished. In the front of the second-story hall is a bath-room, 6 by 16, the water for which is carried up by hand. There are plenty of closets and cupboards. The first set of quarters, on the left of the sally-port, is the same as the above in every particular, excepting the bath-room and out-houses. The kitchen is a wooden extension in rear 11 feet 9 inches by 11 feet 4 inches, by 10 feet high; the water-closet is an ordinary wooden structure in the yard. The remainder of the officers' quarters are all one story and an attic high. Each set consists of a front and rear room on the first floor, a front and rear attic room, and a kitchen; a hall and stairway are in common for the two sets, a very objectionable arrangement for domestic comfort and privacy. The height of all the ceilings on the first story measures 9 feet 2 inches, and the height of the attics is 8 feet 4 inches in the middle, 5 feet 2 inches at the side, with a slope of 8 feet. The front rooms on the first story are 13 feet by 14 feet 6 inches; rear rooms 13 feet by 15 feet. The end set of the right-hand row is divided up on the lower story into three rooms; the front one is 34 feet 6 inches by 15 feet 6 inches, with five windows, and is used as a post library, reading-room, and school; the two rear ones are respectively 13 feet 2 inches by 21 feet 6 inches, and 12 feet 4 inches by 13 feet 2 inches, and are used as court-martial rooms. The attic is thrown into one apartment, 34 feet 6 inches by 29 feet 3 inches, with four dormer windows on each side, and is used as a ball-room and chapel. The end set on the left is partitioned off the same as the above, except the attic, which is divided into four sleeping-rooms, averaging each 12 feet by 12 feet 6 inches. The large room on the lower story has five windows, and is used as an officers' mess-room. A board fence, 7 feet high, extends along the rear of each row of quarters, and separates the yards which, excepting the first set described, are 60 feet by 60 feet. A ditch for drainage runs underneath each row along the middle. The heating of the officers' quarters is effected at present partly by coal stoves and partly by grates. Last winter the wood fireplaces heretofore in use were all closed up and coal stoves were introduced; but it was found that the rooms were heated to an unhealthy degree by them, and this winter grates are being put in all the rooms as rapidly as possible. The ventilation in the rooms having grates is found to be sufficient. In front of the portico is a grassed terrace, 10 feet wide and the length of each row, with a stone path and steps leading from each front door to the carriage road. This road describes a circle at each end of the line of quarters and in the middle at the sally-port, and the parade ground and the circles are protected by rows of cedar posts turned in the form of cannon, and connected by chains. The circles are sodded and raised about two feet, and surmounted by brass field-pieces for ornament.

The men's quarters consist of two buildings, one story and an attic high, constructed of limestone, each 452 feet long by 23 feet wide. These buildings face each other from the opposite sides of the parade, and run perpendicularly to the water front. A portico extends along the front of each. The windows of the western barracks are, as formerly, all in the face looking upon the parade, excepting two in the kitchens, but in the eastern barracks, in addition to these, three windows have been cut into the blind wall, into each squad-room. Owing to the slope of the ground toward

the water, the buildings at that end are considerably higher than at the other, allowing in one space enough below the squad-rooms for mess and store-rooms—in the other for coal-cellars. The ceilings of all the rooms on the lower story are 9 feet high. Each building is subdivided into four squad-rooms, 64 feet by 20 feet; two mess-rooms, 30 feet by 20 feet; two kitchens, 20 feet by 19 feet 9 inches; two wash-rooms, 20 feet by 7 feet 9 inches; two sergeants' rooms, 20 feet by 10 feet 9 inches; and two store-rooms, 19 feet by 10 feet 9 inches. Omitting the first sergeants, who sleep in their own rooms, and the married men, who sleep in the attics, there are 138 men who sleep in the squad-rooms. The greatest number who occupy one room is 26; this allows each man 49 superficial feet of space, and 443 cubic feet of air; the smallest number is 9, which allows each man 142 superficial feet of space, and 1,280 cubic feet of air. The average for each man in all the squad-rooms is 74 superficial feet of space and 1,667 cubic feet of air. This is ample. Each squad-room is thoroughly fitted up with gun-racks, lockers for the clothing and effects of the men, tables, chairs, shelves, and clothes-hooks. Each man has an iron bedstead, of the hospital pattern, to himself, and his locker and shelf are painted with his name and company number. The ventilation of the squad-rooms is effected by wooden shafts, 16 inches square, reaching from the ceiling at each end of the squad-room to latticed ventilators in the roof. The lower openings of the shafts are covered by ornamental iron registers for controlling the passage of air, and in the attics an aperture is cut into the shaft for the ventilation of those apartments. The movement of the air up and down these shafts, as the temperature favors either end of the room, is found to afford an atmosphere, after the men have been sleeping for several hours, quite free from taint. Formerly the ventilation in the squad-rooms was effected by the draught of the stoves and by letting down the window-sash a little; a very objectionable way, as the men often suffered from the draught of cold air while asleep, if carried out; and if omitted, as was generally the case, there was scarcely any change of air in the room at all. A double door opens into the middle of each squad-room front and rear. The heating is effected by one coal-stove in each squad-room, which is found to be sufficient for ordinary winter weather.

In the eastern barracks there are nine windows in the squad-rooms, six in the dining-rooms and three in the kitchens; and in the western barracks, six in the squad-rooms, four in the dining-rooms, and four in the kitchens. These admit sufficient light. Candles are used at night, but the illumination is insufficient. The wash-rooms open out of the squad-rooms, and each is provided with a trough on each side, with holes for basins, and a barrel of water with a faucet. Every man has a tin basin, which has its appropriate hook and number. In summer a half hogshead is placed in the room for the use of such men as do not bathe in the bay.

The kitchens are provided with Jewett & Root's hotel cook-stove, No. 15, for wood, and every necessary utensil for proper cooking. The mess-rooms are well furnished with cupboards, shelves, mess-chests, and table furniture.

The attics, 90 feet by 20 feet by 8 feet 6 inches high, are plastered, lighted by dormer windows, and each one is partitioned off into several rooms, and till recently they have been used as laundresses' quarters, for which purpose they are badly suited. They are reached by a steep stairway from the portico. Two or three families have been crowded into these apartments at a time, and as there was but one common entrance they were compelled to pass through each other's rooms. In winter the laundresses suffered great inconvenience in having to carry their water and wash up and down the stairs, which were often dark and icy. During the winter of 1868-'69, there was one fracture and a number of injuries from falling on them. According to Surgeon H. L. Heiskell, United States Army, these miserable little low-ceiling apartments were used in 1839 as sleeping-rooms for the men; and from 60 to 90 were crowded into them, allowing only 133½ cubic feet of air to each when there were 60 occupants, and one-third less when there were 90. The doctor says: "This would seem to have been designed as an experiment to try how many human beings could be crowded into the smallest possible compass without inducing suffocation." Happily such experiments are not now so much in vogue as in former times.

The men's sinks are wooden structures, set over deep pits, walled up, and situated 60 paces to the rear of each barrack building. They are emptied in the winter season, by chopping out the soil in frozen blocks and depositing them on the ice about half a mile out from shore.

The guard-house, situated near the south gate, on the main road to the sally-port, is a very

durable, fine-looking stone structure, 54 feet by 39 feet, roofed with tin, painted. The portico, supported by five wooden columns, is 39 feet by 10 feet. All the ceilings are 9 feet 6 inches high. It is partitioned off into a room for the officer of the day, 14 feet 11 inches by 13 feet; a guard-room, 20 feet by 18 feet; a prisoners' room, 30 feet by 20 feet, six cells, each 8 feet 11 inches by 4 feet; and a passage in front of the cells, 34 feet by 5 feet. The officer of the day's room and guard-room are well lighted, by two windows each. The building is well ventilated, except the prisoners' room, into which pure air can only enter by the windows, which are seldom opened in cold weather, and by a grated opening a foot square in the door leading into the guard-room. The cells have no ventilation whatever, and there is no light, except a narrow spot that appears at an aperture near the ceiling, 12 inches by 3 inches in size. They are dark, cold, damp, and gloomy, and in them a prisoner is smothered and punished in a chilly, stony-den, in a style worthy of the dark ages. The exhalations of a man in a single night accumulate in sufficient quantity to nearly extinguish a lighted candle set on the floor. In them a man is not only deprived of his liberty, light, and his life's breath, but his own effluvia turns upon him as a poison. Happily they are seldom occupied. The heating is effected by coal stoves, and is sufficient. The guard-room and prisoners' room are furnished with the customary board platforms used in the army guard-houses to sleep upon. Whatever may be said as to the propriety of the prisoners being compelled, as part of their punishment, to sleep in that uncomfortable way, there is no good reason why the members of the guard should be forced to catch the little sleep and rest allowed them between their hours of guard on hard boards in the same manner. It is a traditional cruelty that has become fastened upon the army, like the leathern stocks, and should be abolished without delay. The members of the guard, the *élite* for the time, always charged with the most important duties known to army life, should be lodged in time of peace as comfortably as when they are in quarters; and when off post their inducements for sleep should be as good as may be—a straw mattress, at least. The sink is a wooden structure, set over a deep pit, walled up; and is situated 20 feet in rear. It is reached by a covered way, opening into the passage in front of the cells, from which it is separated by two doors. The object of the covered way is to protect the prisoners from the weather and to prevent their escape at night.

The quartermaster and commissary storehouse is situated near the wharf, midway between the barrack buildings, about 20 feet below the plane of the parade, and is approached from that surface by a broad wooden bridge leading to the hall on the second story. It is a fine substantial stone structure, two stories high, 137 feet by 42 feet, covered with a tin roof, painted, and surmounted by a look-out and a weather vane. The building is put together with the best materials, and in the strongest manner. The wharf is a wooden crib, filled with stone, 75 feet long, L shaped, 61 feet front. Upon it are a boat-house and a force-pump housed in. There is a fine ten-oared barge. The bakery, situated at the water's edge near the quartermaster and commissary storehouse, is a stone structure, divided into two rooms. The oven, recently rebuilt of brick, is capacious enough for a regiment. The furnace, for wood, is at the side of the oven and communicates with it by side apertures, and four flues run over the top of the oven from the back to the chimney, situated over the front. It is well supplied with all the necessary fixtures, and the bread is usually good. The ice-house is a wooden structure, situated near the water, 32 feet by 16 feet, by 10 feet to the eaves. It rests on a stone foundation 2 feet high, on a gentle slope favoring the drainage, which is allowed to sink into the ground. The floor is made of inch boards, not tongued and grooved, and the outer and inner walls, of the same stuff tongued and grooved, are separated 5 inches and filled with coarse sawdust. An aperture in each end, 3 inches wide, runs across nearly to the eaves and communicates with the space above the eaves inside. There is a single door, 4 feet square, on the north side, 5 feet above the ground. The roof is shingled, and projects 3 feet over the sides, which are whitewashed. It is calculated for 150 tons. The ice last winter was put up in pieces from 2 to 3 feet square, packed in straw, and it kept well.

There is a hand-suction fire-engine, a "double decker," with room for thirty men to work at a time; a hose cart and 600 feet of rubber hose. Besides these, each barrack building, store-house, the hospital, and the guard-house, are well supplied with ladders, hooks, axes, and fire-buckets, which are always kept filled with water and standing in convenient places. The water supply for this purpose is from the bay and from a well in rear of the eastern barracks, and another in rear of

the officers' quarters. In case of fire, the bay would be too far off for some of the buildings, and the wells, if used, would soon give out.

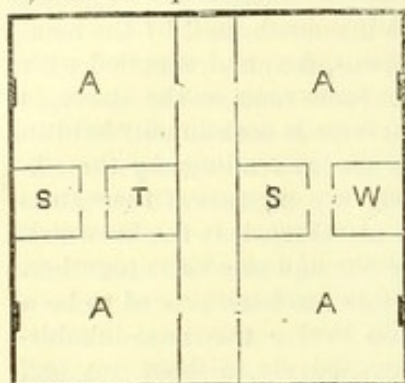
The post library is supplied with 250 well selected volumes, which are much used by the men. The reading-room is furnished with a long table, and benches, ink, pens, &c., and supplied with several newspapers and periodicals. The post school, which is in the same room as the above, is attended by six of the men and six children, on an average. Divine service is occasionally held in the chapel by clergymen from the neighborhood, and sometimes there are lay readings by the officers. The water supply for drinking and cooking, as taken from the bay, is a mixture of the waters of Black River and Lake Ontario. At times it is clear from the lake; at others, it is the brownish water from the river, according as the winds drive the waters about the bay and mix them together. Formerly the Black River water was regarded as unwholesome, but this has been proved to be a mistake by the experience of Watertown, a place ten miles off, of some twelve thousand inhabitants, where for a number of years past this water has been used exclusively, without any bad effects whatever. The water is forced up by a No. 3 Davis & Co. hand-pump, situated on the end of the wharf, where it is taken from a place 12 feet deep, free from much current and the effects of surface drainage. From thence it is conveyed by a rubber hose to barrels placed on an army wagon, and thus distributed about the post. This arrangement occupies five men and two horses for most of the day, with a decided damage to the health of the men, especially in winter, and a considerable expenditure for forage and wear and tear of wagon and harness. An estimate of cost shows that this work could be done cheaper by a steam-pump and reservoir, with a great saving to the health of the command.

The post garden comprises about ten acres within the stockade. It is under the charge of an officer who is responsible for the cultivation and equitable distribution of the product to the companies and hospital—a plan that gives satisfaction.

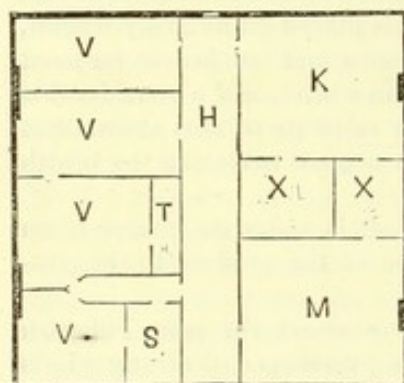
Shade trees have been set out from time to time in various places about the post, but with little success, owing, doubtless, to the shallowness of the soil and the prevalence of strong winds that disturb the tender roots of the young trees. In front of the eastern barracks there is a fine row of sugar maples, and here and there are isolated trees that once formed part of a row of the same kind; there is also a cluster of Lombardy poplars on the bluff near the earthwork called Fort Pike, where they have stood like stately sentinels since the war with Great Britain, visible for many miles around. During the past spring Brevet Lieutenant Colonel R. C. Duryea, First United States Artillery, commanding post, set out about two hundred elms and maples along the roads bounding the outside of the buildings, a row in front of the western barracks, and along each side of the roads leading to the gates. They were selected and set out with great care, and thus far they all promise to live. If they do, they will form a great improvement and an enduring beauty to the place, which is in great need of trees to break the long hard lines of the buildings.

The drainage is effected by ditches leading to the bay. In a few level spots the ditches have to be cleaned out occasionally. During the past six months a great deal of work has been put on the drainage, and but little more can be done without considerable labor in blasting out the rock from the bottom of the more shallow ditches. The hospital is situated at the eastern limits of the reservation, about 50 feet from the water. The site is sandy, and elevated about 15 feet above the bay, and the grounds, which are well sodded, slope off in every direction from the building, making the drainage excellent. It commands a beautiful and extensive view of the harbor and islands toward the lake; but the situation is exceedingly bleak in winter, from being swept by the powerful and searching winds that come from the frozen bay. The building is square, with wings on either side, and is constructed in the most desirable manner of neatly cut limestone. It is covered by a hipped roof, shingled, and painted olive, and presents a very imposing appearance. The main building has two stories, and measures 56 feet 5 inches by 53 feet 6 inches, by 35 feet high; and the wings have one story, and measure 18 feet 2 inches by 15 feet 3 inches, by 20 feet 5 inches high. The basement is dry, and is lighted by windows above ground. The building is entered by stone steps, 12 feet wide, front and rear, and by basement doors under the steps. The basement is 8 feet 4 inches high. For plan of division of the basement and second floor see Figure 14.

1. *Basement*.—K, kitchen; M, dining-room; X, pantries; H, hall; S, store-room; T, closet; V, matron's quarters.



2



1

Figure 14.

inches by 8 feet, by 12 feet 9 inches high, furnished with shelves and double-locks. The second story is reached by a stairway, 4 feet 2 inches wide, in the hall leading from the front, the steps of which are only 6 inches high, for ease of ascent for the sick. Opening from the right of the passage between the wards on the south side of this story is a room, 7 feet 7 inches by 7 feet 2 inches, by 12 feet 6 inches high, containing a water-closet and a water-tank for supplying the bath and water-closets; opposite this is a lavatory, 7 feet 7 inches by 7 feet 2 inches, by 12 feet 6 inches high. Opening from the passage between the wards on the opposite side are a lavatory and closet of the same size. A skylight in the apex of the roof, with a wooden railing about it, admits abundance of light upon the halls and stairway. Iron balconies project from the front and rear windows in the hall of the second story. The uses of all the rooms are indicated by tin signs over the doors; the wards are lettered.

The wing rooms on each side open out of the front wards, 16 feet by 11 feet 2 inches, by 12 feet 9 inches high, and each has a rear door and stone stairway to the ground. The one on the south side is used as a surgery, the other as a *post-mortem* room. Both are nicely grained in imitation of oak. Under each of the wings is a stone masonry rain-water cistern, arranged with a filter. The one on the north side is not in use, for want of water-pipes from the roof, which seem never to have been put up; the other is in good order, and is fed from the roof by copper pipes. Except in winter, when all the water is hauled, this cistern supplies about half the quantity required. The lighting is ample. Each ward, the kitchen, dining-room and matron's room, have two windows each; the small rooms, except the close rooms off the passages, have one window each. The windows on the first and second stories and wings are furnished with double sash for winter weather. At night kerosene lamps are used. The heating is sufficient, and is effected by base-burner hard coal stoves, except in one ward, where there is a wood fireplace, for the accommodation of a special class of patients. The ventilation is effected by fireplaces in each room, which are kept partly open, by the draught of the stoves, and by letting down the tops of the window-sash when required. The drainage from the bath, water-closets, and kitchen passes off by a main into the ground under the hospital;

2. *Second floor*.—A, wards; S, lavatories; T, closet; W, water-closet.

The kitchen is provided with a boiler and plumbing for sending hot water to the bath on the first story, and a force-pump for sending water from a rain-water cistern to a tank on the second story. The pantries are well fitted up with shelves and cupboards.

There are two wards opening into each side of the halls on both stories, making eight in all, and all of the front and rear wards communicate by passages 8 feet 4 inches by 4 feet 6 inches; from each side of which open closet rooms, eight in all, appropriated to uses to be mentioned below. The four wards on the first story measure 20 feet by 19 feet 9 inches, by 12 feet 9 inches high each, and those on the second story measure the same, except in the height, which is 3 inches less. Two wards on each story on the south side are generally the only ones in use, and are occupied by from four to six beds each. When there are four patients in a ward, omitting fractions, each has 1,290 cubic feet of air, and 101 superficial feet of area; when there are six, each has 860 cubic feet of air, and 67 superficial feet of area. On the right of the passage, between the lower wards on the south side, is a bath-room, 7 feet 2 inches by 8 feet, by 12 feet 9 inches high, in which is a water-closet; the bath is furnished with hot and cold water. Opposite the bath-room is a lavatory, 7 feet 3 inches by 8 feet, by 12 feet 9 inches high, furnished with ordinary tin basins and towels.

Opening from the passage between the wards, on the north side of the same story, are two medical store-rooms, each 7 feet 3

but whether it goes to the sink in the yard or to the bay cannot be discovered without taking up the floors and considerable excavation, which is not warrantable, as the drainage is good. Occasionally the water-closets taint the air, as is usual when they are built indoors, but they are only used when the weather is too severe for the patients to go to the sink in the yard. The sink, situated 50 feet in rear, is built of limestone, and measures 10 feet by 20 feet, by 9 feet high, and is divided into three apartments. The pit, the area of the building, is very deep, and walled up with stone, and seems to drain into the ground, as it always keeps the same level. When the writer took charge of the hospital he found the grounds, which comprise about three and a half acres, a surface partly grassy, cut up by wagon-roads and foot-paths. The fences that once inclosed it were gone, and the trees and bushes that once ornamented it all dead, or trampled down and neglected. Now a substantial picket-fence incloses the grounds; foot-paths describing ornamental figures have been laid out, and hundreds of trees, bushes, shrubs, and plants have been set out; but, unfortunately, owing to the light, sandy character of the soil, but few of these have survived, except some 430 feet of lilac hedging along the edge of the bluff, a few rose-bushes and Missouri currants, a few Lombardy poplars, set out especially to embellish the effect of the building, and a number of plum trees.

Statement showing mean strength, number of sick, and principal diseases at Madison Barracks, New York, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	259.75	1,331	78	207	50	186	1	241	1
1869.....	94.58	367	16	28	12	88	.....	78	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT ONTARIO, OSWEGO, NEW YORK.

REPORT OF ASSISTANT SURGEON H. E. BROWN, UNITED STATES ARMY.

Fort Ontario is situated in latitude 43° 27' 30" north, longitude 76° 32' 30" west, and is 282 feet above the level of the ocean, and 49 above the level of Lake Ontario. It is on the right bank of the Oswego River, at its junction with Lake Ontario, and faces the lake. The city of Oswego, a flourishing town of about 26,000 inhabitants, is in the immediate vicinity.

The military history of Fort Ontario is very interesting. The first mention that I can find of Oswego, in the early history of the colonies, is that in 1687 the Onondaga Indians presented a petition to the mayor and common council of Albany requesting them to establish a trading post and fort at this point. The request seems to have been disregarded, as no defenses existed here in July, 1696, when Frontenac, the governor of Canada under the French rule, landed with a force at the mouth of the river, built a small stockade, and advanced into the Onondaga valley to attack the Indians, (Five Nations.) Beyond burning a few villages, the expedition was unattended with results, and he returned to Canada. Lord Bellemont, while governor of New York, saw the importance of the location, both for trading purposes and to keep the Indians in subjection, and, contemplating establishing a post at this point, material was ordered from England for the purpose; but the project was interrupted by his death, and nothing was done until 1725, (some authorities say 1722,) when the English and Dutch, with the consent of the Iroquois, made a settlement here, and opened trade. Governor Burnet, of New York, in May, 1727, calls the attention of the Board of Trade to the importance of the position, and states that "he has commenced a fort at Oswego in order to trade with the Six Nations, and with their consent." He further announces that he has

sent a captain, two lieutenants, and sixty men to protect the workmen, and that he will always keep a garrison of one officer and twenty men there. This coming to the ear of the French governor of Canada, Beauharnois, he, in a letter, dated July 20, 1727, protests against the erection of the fort as a violation of the treaty of Ghent, (1713,) by the provisions of which both parties were forbidden to build any works on neutral or disputed territory. Governor Burnet, in reply, asks why, in violation of that treaty, the French have erected a work at "Oneagorah," (Fort Niagara,) and states that he proposes to go ahead and finish his fort at Oswego, which he did in spite of the opposition of the French, who sent several expeditions of a petty character to worry the traders.

This fort seems to have been a very simple one, only intended for the protection of the traders. Beauharnois, indeed, complains of it as "a redoubt with galleries, and full of loop-holes, and other works belonging to fortifications;" but the circumstances under which he wrote would induce him to magnify its importance as much as possible. Burnet says the "walls were four feet thick, of large, good stone." In 1741 the general assembly of the colony authorized the expenditure of £600 sterling to "erect a sufficient stone wall at a proper distance around the trading house at Oswego, either in a triangular or quadrangular form, as the ground will best admit of, with a bastion or block-house in each corner to flank the curtain." Subsequently complaints were made to the same body that the contractors having charge of the work were building the wall of clay, and not of stone, and were making money out of the job.

On the breaking out of hostilities between the French and English in 1744, the traders and others at Oswego, fearing a raid from Canada, abandoned the post, and it remained in a defenseless condition until 1755.

In that year the English authorities agreed upon a plan for the invasion of Canada, one portion of which comprehended an attack on Fort Niagara, with Oswego for a base of supplies. Accordingly, Colonel Shirley, with his own and Sir William Pepperell's regiments, was ordered to Oswego, and arrived there about the end of June, 1755, accompanied by some New York and New Jersey militia. They were prevented by bad weather and sickness in the command from completing their original intention, and remained at Oswego during the winter, building an intrenched camp, and fitting out a fleet for operations in the spring. They also commenced a fort on the east side of the river, which they called Fort Ontario. The result of their work is thus given in the *Gentleman's Magazine*, 1756:

When it was determined that the army at Oswego should go into winter quarters, they began a new fort upon the hill upon the east side of the river, about 470 yards from the old one; it is 800 feet in circumference, and will command the harbor; it is built of logs, from 20 to 30 inches thick; the wall is 14 feet high, and is encompassed by a ditch 14 feet broad and 10 deep; it is to contain barracks for 300 men. On the other side of the river, west from the old fort, another new fort is erecting; this is 170 feet square. A hospital of frame-work, 150 feet by 30, is already built, and may serve as a barrack for 200 men, and another barrack is preparing of 150 feet by 24.—(*New York Col. Docs.*)

While the English were thus employed the French were not idle. They had long seen the importance of weakening the alliance between the English and the Six Nations, and of securing that powerful confederation as an ally of their own. No energetic steps seem to have been taken, however, until the fall of 1755, when the forts occupied by the French were heavily re-enforced. Large garrisons were sent to Fort La Présentation from Ogdensburg, New York, to Fort Frontenac from Kingston, Canada, and a regiment to Fort Niagara. To the latter post was also ordered Captain Pouchot, a young French engineer, to repair the work, it being at that time "a mere rotten stockade, garrisoned by but 60 Canadians." In February, 1756, Pouchot addressed a memorial to the French authorities, setting forth the feasibility of the capture of Oswego. His plan was well thought of, and the celebrated Montcalm, then at Fort Frontenac, assigned to organize the expedition. Preparatory to doing so, he ordered a body of 700 French and Indians, under command of De Villiers, to proceed from La Présentation to the head-waters of the Oswego River, and observe the enemy at Oswego. This force advanced rapidly, surprised and took Fort Bull, (or Brueil,) on Wood Creek, near the head of Oneida Lake, and destroyed a large amount of provisions, destined for Oswego. On the 7th of May, 1756, a party of Indians set out from Niagara, made a raid upon the ship-carpenters at work near Oswego, and returned with twelve scalps and three prisoners. These repeated successes, together with the defeat of Braddock at Fort Duquesne, (the artillery captured there had arrived at Niagara,) produced a profound impression on the Six Nations, and induced them to declare in favor of the French. Through the early summer the par-

tisans, under the command of De Villiers, continued to scout about the upper waters of the Oswego River, frequently capturing the stores and provisions destined for Fort Ontario, and keeping the garrison in a constant state of alarm. Montcalm hurried his preparations, and on the 4th of August was able to leave Fort Frontenac with a force of about 3,000 men. He landed on the 11th at Four-inch Point, east of Oswego. His forces were composed of French troops, Canadians, and Indians. He marched to a swamp a short distance in rear of Fort Ontario, and sent his chief engineer to make a reconnoissance. That officer in returning to the French camp was unfortunately killed by an Indian, who mistook him for an enemy. Montcalm now gave charge of the engineering operations to Pouchot, who was the suggester of the siege, and who had rebuilt Fort Niagara. He built a road through the swamp during the night, and opened a battery within 60 paces of Fort Ontario, and continued his work with such effect that the English abandoned the fort, and fled in disorder across the river to Fort Oswego, (or Pepperell.) Montcalm immediately sent a strong force to cross the river above, and cut off all retreat on the west bank, and opened fire the next morning on Fort Oswego with a strong battery posted on the river bank. Colonel Mercer, the English commander, was killed by a cannon shot, and the English, finding themselves surrounded, surrendered in the afternoon. Montcalm captured 120 cannon, 9 vessels of war in process of construction, and an immense quantity of munitions of war and of provisions. He took 1,700 prisoners, many of whom were citizens employed to work on the ships. Montcalm pledged his word for the safety of the command, but, notwithstanding, 100 unfortunate prisoners were delivered over to the Indians for torture, to atone for their losses, and a horrible scene of massacre now took place. The sick in hospital were dragged out, scalped, and murdered; one wounded officer was killed in his tent, and a large number of the garrison put to the torture. The French losses in the siege were 30 killed and wounded; the English over 150, a large number of whom were murdered after they had surrendered. On hearing of the projected attack, the English had ordered re-enforcements from Schenectady to Fort Ontario, but receiving information of the surrender, they did not proceed further than Fort Williams, on Wood Creek. Montcalm had the artillery and munitions of war removed to Niagara, and the forts dismantled, and he returned with his army to Canada, where a short time afterwards he fell, bravely fighting on the Plains of Abraham. The forts thus captured are described by a French officer, present at the siege, (probably Montcalm himself,) as follows. (Paris Docs. No. 12, in Documentary Hist. of New York.)

Fort Ontario is situated on the right bank of the river, in the middle of a very high plateau. It consists of a square of 30 toises (180 feet) a side, the faces of which, broken in the center, are flanked by a redan placed at the point of the break. It is constructed of pickets 18 inches in diameter, smooth on both sides, very well joined the one to the other, and rising 8 or 9 feet from the ground. The ditch that encircles the fort is 18 feet wide by 8 deep. The excavated earth had been thrown up *en glacis* on the counterscarp, with a very steep slope over the berm, (covered way.) Loop-holes and embrasures are formed in the pickets on a level with the earth thrown up on the berm, and a scaffolding of carpenters' work extends all around so as to fire from above. It has eight guns, and four mortars with double grenades. The old fort, Chonaguen, (Oswego,) situated on the left or west bank, consists of a house with galleries, with loop-holes on the ground-floor and principal story, the walls of which are 3 feet thick and encompassed, at a distance of 3 toises, (18 feet,) by another wall 4 feet thick and 10 high, loop-holed, and flanked by two large square towers. It has likewise a trench incircling on the land side, where the enemy (the English) had placed eighteen pieces of cannon and fifteen mortars and howitzers. Fort George is situated 300 toises beyond that of Chonaguen, on a hill that commanded it. It is of pickets, and badly enough intrenched with earth on two sides.

The forts thus dismantled remained unoccupied until 1759, when the English, advancing to the attack of Fort Niagara, left a camp of 500 men here as a corps of observation. The French commander at La Présentation, thinking they would have no time to intrench themselves, advanced to attack them, and would have surprised the whole force, had not a priest, who was along, insisted on delaying the attack that he might make a speech to the troops. The English thus discovered the approaching force, sallied out and defeated them. In July, 1760, General Amherst strengthened the forts and collected a large force here, which was subsequently used for the final capture of Canada. After this the English kept a garrison at Forts Ontario and Oswego until the revolutionary war. During a large portion of that contest, on account of its isolated position, it was unmolested and but slightly garrisoned. In 1777 Colonel St. Leger rendezvoused here with 700 men detached from Burgoyne's army, and was joined by Brant with 700 Indians. They marched to besiege Fort Stanwix on the Mohawk, but were defeated and pursued to Fort Ontario, when St. Leger hurriedly embarked for Montreal. In 1783 Washington prepared an expedition, under command of Colonel

Willett, to capture Fort Ontario. The command assembled at Fort Stanwix, and marched for Oswego, were overtaken by heavy snows, and suffered greatly. When within a few miles of Fort Ontario some wood-cutters observed them and went to the fort with the news, which Colonel Willett learning, he retreated without attempting the capture. Peace was soon after declared, and no further operations were conducted. In 1796 the post, with all others that had been in possession of Great Britain, was transferred to the United States. From that time until the war of 1812 the fort was suffered to fall into decay, and on the breaking out of hostilities it was but partially armed, and unable to resist an enemy. The English, influenced by the reports of large amounts of stores collected here, sent a fleet with 3,000 men to attack the place, which appeared before the town on the 5th of May, 1814. The Americans prepared a battery on shore, and in the most gallant manner repulsed an attempt to land the troops. On the 6th an engagement took place of several hours' duration between the fleet and our forces, ending in the British effecting a landing. The Americans, but 300 in number, retreated in good order up the river, burning the bridges in their rear. The British, not succeeding in capturing any prisoners, burned the barracks, spiked the guns, and retired. Our loss was 6 killed, 38 wounded, and 24 missing. The loss of the enemy was 235. From that time to the present Fort Ontario has remained in possession of the United States, with a small garrison, generally of one company. The present garrison is Battery A, First United States Artillery.

The reservation embraces about 75 acres, extending from the river on the west to Ninth street, in Oswego, on the east, and from the lake on the north to Schuyler street. Of the geology of the vicinity there is not much of interest to be said. The rocks belong to the transition period, between the primary and carboniferous systems, (designated by the State geologist as the "New York system," and which probably correspond to the upper silurian and lower devonian rocks of the English geologists,) and to recent formations, (quaternary rocks.) The transition rocks are divisible into four groups, commencing with the oldest: 1. Pulaski shales, consisting of sandstone shales, with a large intermixture of carbonate of lime, and containing various fossil shells, but not in great quantity; 2. Gray sandstone; 3. Medina or red sandstone. These two layers are in many places so intimately mingled, the color extending one into the other, that it is difficult to distinguish them. The medina sandstone is colored with oxide of iron; is lighter and less compact than the gray, which is extensively quarried for building purposes. The fossils are very few in number and chiefly fucoids. 4. Clinton group, composed of green, blue, and brown argillaceous shales, alternating with greenish-brown sandstones and with Oneida conglomerate. The quaternary rocks consist of clay, sand, loam, boulders, lake marl, calcareous tufa, and, in some portions of the county, bog iron ore. These are all superficial, resting on the bed-rock, and rather caused by the transportation of materials from elsewhere than by the decomposition of rocks *in situ*. They are deposited as soil in ridges and small hills, completely hiding the bed-rock from view. This soil is fertile and well adapted to the growth of wheat, barley, and other cereals. Apples, pears, cherries, and the various berries are raised in great abundance, as are also the ordinary garden vegetables.

There are no springs or ponds of water on the reservation. The ground is boggy, and saturated with water in some places, being merely the drainage toward the lake, from the higher ground behind the town. Several wells have been dug in the fort, which obtain their water in this way, at a depth of 25 or 30 feet. One was bored to a depth of 280 feet without striking a spring.

The average monthly fall of rain for six years was 3.66 inches. The largest fall in any one month was in May, 1864, 6.73 inches; and the smallest in June, 1864, 0.88 inch. It should be stated that these figures include snow and rain. The yearly mean of temperature since 1864 has been as follows: 1864, 26.46°; 1865, 46.38°; 1866, 44.88°; 1867, 45.03°; 1868, 44.67°; 1869, 48.65°.

The extremes of temperature in each year have been as follows:

Date.	Highest observation.	Lowest observation.
1864.....	July 10, 87°.....	January 2, 6°
1865.....	August 31, 86°.....	January 8, 4°
1866.....	July 15, 88°.....	December 21, 8°
1867.....	June 30, 88°.....	December 9, 5°
1868.....	July 4, 94°.....	January 10, 5°
1869.....	August 2, 91°.....	March 1, 6°

The average of the barometer during the years named has been 29.58°. I can find no observations which can be depended on to ascertain the degree of humidity. There are no prevailing winds peculiar to any period of the year. In winter the winds seem to blow in about equal proportions from the north, south, southeast, and southwest; in summer from the west and northwest; and in the fall from the north, northwest, and west. As regards the length of seasons, the winter may be said to commence with the first fall of snow, about the 1st of November, and lasts until the middle of May. There are seldom more than two months of really warm weather.

The old fort was rebuilt in 1839, with kyanized wooden revetment and earth parapet, under charge of Lieutenant Daniel Leadbetter, United States Engineers. This is now being replaced by sandstone quarried on the reservation.

The soldiers' barrack is a two-story building, constructed in 1842, of limestone quarried on the lake shore, about 30 miles from Oswego. The building is 62 feet front by 39 feet deep, and 24 feet from floor to eaves, and contains on the first floor a mess-room and kitchen, 35 by 27 feet 9 inches, and 10 feet 2 inches from floor to ceiling, and a reading-room of the same dimensions. The second story contains two squad-rooms, each 35 by 28 feet, and 12 feet from floor to ceiling; each having a small non commissioned officers' room partitioned off in one corner, giving, with the present command, about 550 cubic feet of air per man. They are warmed in winter by sheet-iron coal stoves, and lighted and ventilated by the ordinary windows and doors. The building has a piazza 10 feet broad in front, and at either end of the piazza, on the ground floor, are a urinal and wash-room, supplied by pipes from the city water-works. The men's sinks are in the ditch of the fort, outside the main work.

The quarters for married soldiers and laundresses consist of four small wooden buildings, and one of stone, (the latter the old post hospital,) situated on the reservation outside the work. Each wooden cottage contains three rooms, and is well adapted for the purpose. The officers' quarters are two two-story limestone buildings, each intended for two sets of quarters. Each set of quarters contains, on the ground floor, one dining-room, 15 feet 6 inches by 14 feet 10 inches, and a kitchen of nearly the same dimensions, with a closet opening in each room. The second story contains a parlor, 15 feet 10 inches by 14 feet, and a bed-room, 15 feet 6 inches by 14 feet. There is also a small hall bed-room, 7 feet 8 inches by 9 feet 6 inches.

In the attics are two good rooms, on either side, measuring, one 16 feet by 13 feet, and the other nearly the same. There are large closets in every room. The quarters are comfortable, well built, well lighted and ventilated; the only objection to them being the common passage-way for two families. There are no arrangements for bathing purposes. The water-closets or sinks are in out-houses, detached from the main building, and are very defective in their arrangement. At one end of each out-house is a cistern, and at the other the sink, only separated by a stone wall, and so constructed that there is always great danger of the contamination of water in the cistern. The water-closets consist merely of a well, communicating with the main drain of the fort by a small drain, which, instead of leading from the bottom of the sink-well, opens some two feet above it, thus causing the drainage to be always incomplete. The sinks can be flushed with water by means of hose attached to the fire-plug on the parade, and this, to some extent, obviates the defective drainage. There is one other two-story building inside the work; the upper story, containing two rooms, used for ordnance and commissary store-rooms, and the lower story being in temporary use for a guard-house. The room for the guard is 16 by 13 feet, and 9 feet 10 inches from floor to ceiling. Behind this are two prison-rooms, one 12 feet 6 inches by 6 feet, and the other 12 feet 6 inches by 9 feet. Through the center of the building runs a hall, 26 feet by 6 feet, and on the other side of the hall is a tool-room and three cells, each 8 feet long by 3 feet 6 inches broad, and 9 feet 5 inches from floor to ceiling. These cells hold but 264 cubic feet of air, and are utterly without ventilation, except a small grated aperture over the door, six inches square. Fortunately they are but very seldom used. The guard-room is warmed by a coal stove in winter, but the prison-rooms, behind, are never supplied with stoves, and are very imperfectly heated, being entirely dependent on what heat comes from the front room through an open door and a small grated window. Several prisoners have come on the sick report during the past winter suffering from the effects of cold. There are no means of heating the cells at all. The permanent guard-houses are on either side of the sally-port, and are now used for adjutants' office and first sergeants' quarters.

The hospital is situated on the reservation, outside the fort, about 275 yards from the sally-port. It is built on the plan indicated in Circular No. 4, Surgeon General's Office, April 24th, 1867; there being a central executive building, two stories high, with two wings, each one story, and accommodations for twenty patients. The whole built of wood, lathed and plastered. The wings are each 44 feet long by 24 broad, and are divided into a ward, 33 by 23 feet 6 inches, a water-closet and bath-room, 11 feet by 8 feet 6 inches, and an attendant's room of the same dimensions. Between these small rooms is a passage way, 11 by 6 feet. The hospital is warmed by coal stoves—lighted at night by oil lamps and candles, and ventilated by the ridge system. The water-closets and baths are arranged with a pull connecting with the water pipes, so as to keep a constant stream of water flowing in them. There is no dead house; an unoccupied room in the hospital being so used, when required. The hospital is too far from the garrison, is on the lowest ground of the reservation, and very much exposed to cold winds. The propriety of moving it to a more favorable locality is under consideration.

While stationed at the South it was often a matter of serious consideration to know how to isolate cases suspected to be epidemic or infectious in their character, the ordinary lathed and plastered wards being entirely unfitted for the purpose on account of their liability to absorb and retain the infection from the sick. I have thought that at all stations, when infectious diseases are apt to prevail, it would be advisable to construct a ward entirely of carbolized wood—no other material being permitted to enter into the floors, walls, or ceilings. The process for carbolizing wood, by the aid of superheated steam, is very reasonable in cost, does not interfere with its being worked into any shape desirable, nor with its appearance, and renders it absolutely impervious to absorption of any kind. The only objection to it is the possibly increased inflammability of the material used. The subject of warming hospitals becomes a matter of great importance in stations so far north as this is. With the mercury at or near zero, the single stove in the center of the ward heats it very imperfectly. The beds nearest to the fire are overheated, and those in the further corners of the ward are uncomfortably cold. I believe it would be a much better plan to heat the wards by means of hot air, or water pipes, with a coil under each bed, which could easily be so arranged as to cut off the heat from any given bed at any time.

The post bakery has a capacity of 100 loaves per day.

There is no laundry, chapel, or school-house at the post. A room in the soldiers' barracks is fitted up as a reading-room, where the soldiers receive occasional instruction from the commanding officer. There is no post library. There is a library of 84 volumes belonging to Battery A, First United States Artillery, kept in the first sergeant's quarters. It consists of a few standard works on history and biography, and miscellaneous literature. The officers and soldiers have access to the Gerritt Smith Free Library, and the City School Library of Oswego, two excellent collections, embracing over 10,000 volumes, in every department of literature. The post is supplied with water by the City Water Company, obtaining its water from the Oswego River, about three miles above the city. The supply is unlimited, and of good quality. There are also four wells inside the work, the water of which is more or less impregnated with lime, and of ordinary quality, and a cistern of small dimensions attached to each officer's quarters, the water of which, on account of its contiguity to the privies, is unfit for general use. The means of extinguishing fire are ample, by hose attached to the hydrants of the water company. Fire-buckets, constantly filled, are also kept for immediate use in the hospital. The post is drained by means of sewers of masonry work, there being one main sewer encircling the parade, and having subdrains connecting with each building. The main sewer discharges into the lake just below the fort. The system of sewerage is good, but the construction of some of the drains is bad, and some of them are out of repair. The troops have unlimited opportunity for bathing in the lake in the summer season. In winter there are no facilities for the purpose.

The post garden contains about $2\frac{1}{2}$ acres of land, and is cultivated by details from the post. Last summer the vegetables raised were enough for a constant supply for the command, and consisted of peas, beans, radishes, carrots, potatoes, beets, onions, parsnips, egg-plant, and corn.

Mails are received and depart morning and evening to all points. It requires twenty-four hours for a letter to go to department headquarters at New York City, and forty-eight to Washington. There are no ambulances at the post.

Acute diarrhœa has more or less prevailed during the fruit season last summer, and in the autumn months intermittents of a tertian type attacked a limited portion of the command. Since my arrival the troops have suffered from ordinary catarrh to a certain extent, the result of careless exposure to the weather. I have seen but one case of pneumonia, and none of acute rheumatism, originating here.

I believe the post to be a healthy one, but that the troops need more and better clothing than that now issued—during the long and severe weather to which they are exposed—to secure them from frequent attacks of a catarrhal and pulmonary character.

Statement showing mean strength, number of sick, and principal diseases at Fort Ontario, New York, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	61. 16	111	.....	16	14	3	1	7	.....	23	.....
1869.....	54. 41	188	2	30	47	2	5	12	2	16	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT NIAGARA, NEW YORK.

INFORMATION FURNISHED BY ASSISTANT SURGEONS C. K. WINNE AND G. P. JAQUETT, UNITED STATES ARMY.

Fort Niagara is situated on a point of land at the junction of Lake Ontario and the Niagara River, latitude $43^{\circ} 15'$ north, longitude 2° west from Washington. Elevation above the sea about 271 feet. The nearest town and post office is Youngstown, on the bank of the river, one mile south; it contains about 800 inhabitants. Lewistown, six miles further south, also on the bank of the river, is the terminus of a branch railroad from Suspension Bridge and of a steamboat line from Toronto. The land near the river is low and sandy, being but a few feet above high-water mark. Immediately east of this the bank rises about 20 feet to a level plateau, on which the fort is built. The underlying rocks are lime and sandstones. The climate is mild. The extremes of heat and cold are seldom experienced, making it one of the most comfortable and salubrious locations in the country. The mean temperature is about 48° , the highest 98° , and the lowest 7° below zero. The amount of rain for the past year measures 36 inches, with snow included. The prevailing winds are southwest and northeast. The winter is the longest season; it continues about five months of the year. The other seasons are about equally divided.

This post, which has been garrisoned by the troops of three different powers, exercised from the time of its erection an immense influence over a vast extent of country; it served as a center of civilization, from which all the commerce of that time radiated; prevented or checked encroachments of rivals, and served as a depot for preparing expeditions to explore or devastate adjacent territory.

In 1675 Louis XIV conferred upon Robert Caralin, Sieur de la Salle, a grant of land at Fort Frontenac, (now Kingston, Canada West.) He extended and increased its fortifications, but, dissatisfied with his position after the brilliant discoveries of Marquette and Joliet, determined to lead an expedition and connect the territory which he hoped thus to acquire with Montreal by a chain of military posts. Empowered by additional letters-patent, he commenced building a vessel called *Le Griffon*, on the Niagara River above the falls, supplies being conveyed from Fort Frontenac, established by him in 1678 or 1679, from thence to present site of Lewiston, and by portage over the "Three Mountains" to mouth of Cayuga Creek. The post of Niagara thus founded by him was continued,

and in 1687 converted into a "fort with four bastions" by the Marquis de Nonville, at that time governor of New France. De Nonville, returning to Montreal after an unsuccessful campaign against the Indians, left Troyes with 100 men in command of Niagara. The post was soon after closely besieged by the Senecas, and nearly all the garrison perished from disease; shortly after it was dismantled and deserted. During the succeeding years of French disaster, other posts, including Fort Frontenac, were abandoned, and so remained until 1725, when Fort Niagara was reoccupied and strengthened.

"It had its ravines, its ditches and pickets, its curtains and counterscarps, its covered way, drawbridge, and raking batteries; its stone towers, laboratory, and magazine; its mess-house, barracks, and bakery, and blacksmith shop;" and for worship, a chapel with a large ancient dial over the door to mark the course of the sun. It was, indeed, a little city of itself, and for a long period the greatest place south of Montreal or west of Albany. The fortifications originally covered a space of about 8 acres. At a few rods from the barrier gate is a burying ground; it was filled with the memorials of the mutability of human life, and over the portals of the entrance was painted the word "Rest." It is supposed by De Veaux to have been used as a state prison, and probably about this time, "the dungeon of the mess-house, called the black-hole, was a strong, dark, and dismal place; and in one corner of the room was fixed the apparatus for strangling such unhappy wretches as fell under the displeasure of the despotic rulers of those days. The walls of this dungeon, from top to bottom, had engraved upon them French names and mementos in that language. That the prisoners were no common persons was clear, as the letters and emblems were chiseled out in good style."

In 1755, during the series of petty conflicts between the French and English in America, before the declaration of war in Europe, an expedition was fitted out against Fort Niagara, by Governor Shirley, of Massachusetts, but after the troops reached Oswego nothing was attempted, owing to sickness, desertion, and unfavorable weather.

In 1759, General Amherst being commander-in-chief, a force of English colonial troops and Indians was dispatched, under General Prideaux, against Fort Niagara, then garrisoned by 600 French soldiers, commanded by Captain Pouchot, Chevalier de St. Louis. The investment was commenced July 8, and continued after the death of General Prideaux, by Sir William Johnson; four parallels were opened and batteries planted. July 24, re-enforcements marching to relief of garrison were intercepted on the river road near what is now called Bloody Run, and defeated after severe fighting, the French losing heavily in officers. Further defense on the part of the garrison being useless, they, on being summoned, surrendered. The post was garrisoned by the English, who continued to hold it, though small detachments were frequently attacked by the hostile Senecas, particularly in 1763, when, during the Pontiac war, the Indians made an unsuccessful attack upon the fort. Heavily garrisoned by the English during the Revolution, it served as headquarters for the war parties which devastated a large part of the State of New York, as both the expedition led by Colonel Butler, which culminated in the massacre of Wyoming in 1778, and that which desolated Cherry Valley in the same year, started from Fort Niagara.

The force led by General Sullivan against the Indians in 1779 was intended, originally, also to operate against Fort Niagara, but the campaign ended with only the destruction of the Indian villages. Peace was declared between England and the United States in 1783, but the English continued to hold Niagara until 1796, when it was garrisoned by United States troops. In 1799 another Indian war was anticipated, and the garrison re-enforced. In May, 1801, General Wilkinson then being in command of the frontier, and directed to open a military road between the two lakes, ordered Major Porter, at Fort Niagara, to commence operations, but this road was not completed by the general government, for in 1802 the United States mail was still carried from Utica to the fort, via Buffalo and the Canadian side of the river. A daughter of Dr. West, surgeon to the post from 1805 until 1814, thus describes the fort at that time:

It was then surrounded on three sides with strong pickets of plank, firmly planted in the ground and closely joined together; a heavy gate in front of double plank, closely studded with iron spikes. This was inclosed by a fence with a large gate just at the brow of the hill, called the barrier gate. The fourth side was defended with embankments of earth, under which were formerly barracks, affording a safe though somewhat gloomy retreat for the families of soldiers, but which had been abandoned and the entrance closed long before my remembrance, having been so infested with rattlesnakes that had made their dens within, that it was hardly safe to walk across the parade.

June 26, 1812, the official declaration of war between Great Britain and the United States reached Fort Niagara, and vigorous preparations were at once made for defense and means taken to strengthen the work. But after a feeble and pusillanimous warfare had been kept up for some time, General McClure wantonly burned the village of Newark, (now Niagara City,) evacuated Fort George, and removed his headquarters to Buffalo. Fort Niagara was then garrisoned by 370 men under command of Captain Leonard, United States Artillery. In the night of December 19, 1813, during the absence of the commanding and several other officers, the English, 500 strong, led by Colonel Murray, crossed the river, captured the sentinels, and took the work by sudden assault or surprise, losing only five men killed and six wounded; 65 of the American garrison were killed, and nearly all of the remainder taken; 27 cannon of large caliber, 3,000 stand of small arms, besides a large amount of clothing, garrison equipage, and commissary stores, fell into the hands of the enemy.

General Cass, who was ordered to the frontier, in a letter addressed to the Secretary of War, thus speaks of the capture of the fort: "The fall of Niagara was owing to the most criminal negligence; the force in it was fully competent for its defense." The English, to retaliate for the outrage perpetrated by General McClure in burning Newark, destroyed the villages of Lewiston and Buffalo, besides all the dwellings on the lake as far as Eighteen-mile Creek.

The English held Niagara until the close of the war, and surrendered it to the United States in March, 1815. This restoration was the last event of public interest that has occurred in the history of the work.

The old barrack is a stone building within the fort, 134 by 24 feet. The walls are but 8 feet high, and as it is situated very near the western wall, the ventilation is very deficient. The barrack now occupied is outside the fort, in an open and airy situation, and was erected in 1868-'69. It is a two-story brick building, the lower floor being divided into kitchen, mess-room, and wash-room, the latter supplied with hot and cold water, and furnished with a trough for the reception of basins. The wash-room is also used as a bath-room in winter—half-barrels serving for bath-tubs. The second floor contains two dormitories, each 52 by 22 by 10 feet, giving 476 cubic feet air space per man. They are heated by stoves, and lighted and ventilated by sixteen windows each. The bunks are iron bedsteads. New sinks have recently been built near the barrack. The kitchen is well furnished, containing a range and apparatus for hot water; and the mess-room is commodious and well lighted.

Laundresses' quarters are contained in a new frame building situated 200 yards south of the fort; they comprise six rooms, and are in good condition and well ventilated.

The officers' quarters are in what is called the old castle or mess-house—a solid stone building within the fort, 96 by 48 feet, and two stories high. It contains nineteen rooms.

The guard-house, erected in 1869, is a two-story frame building, 32 by 26½ feet. The first floor contains two rooms for the guard and six cells, the latter divided by a hall measuring 13 feet 8 inches by 10 feet 5 inches. The cells measure 7 feet by 4 feet 4 inches, and are ventilated by small windows opening exteriorly, and openings over the door into the hall between them. The windows are 2½ feet long and 1 foot wide, and the openings 1½ feet long and 6 inches wide, with a board sliding over it. There is no ridge ventilation, except for the walls and space between the ceiling and roof. This is 2 feet square. The second story is divided into three rooms and a hall, each 10 feet high, and ventilated by windows. These rooms measure respectively 14 by 24½ feet, 6 by 10 feet, 9 by 24½ feet. The room designed as court-martial room is now used as a billiard room for both officers and men. Fresh and foul air are exchanged through the same openings. The whole building is ventilated by windows.

The hospital, located near the river, about 400 yards south of the fort, is a temporary wooden structure, ill adapted for the purpose. For the general arrangement of the building see Figure 15.

A, ward, 23 by 40 feet; B, steward's room, 9 by 17 feet; C, surgery, 9 by 17 feet; D, attendant's room, 10 by 15 feet; E, store-room, 10 by 15 feet; F, wash-room; H, commissary store-room; K, kitchen, 24 by 17 feet; L, coal shed.

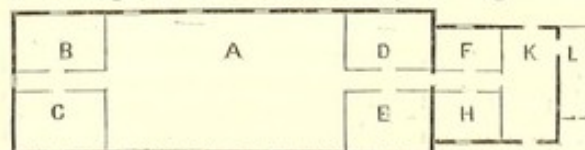


Figure 15.—Scale, 37 feet to 1 inch.

Its location, on the high bank of the Niagara River, insures all the air necessary, and sometimes more than is comfortable. The rooms are ventilated by windows opening at the top, aided by small openings near the floor, the latter communicating by flues with the attic above. Stoves are used for heating, and kerosene oil for the artificial illumination of the building. The ward contains nine beds, giving to each 1,431 cubic feet of air space. The water-closets are situated to the right and rear of the hospital. They are two compartments in a small wooden building, and conveniently arranged. The dead-house is a small frame structure, situated 70 yards to the north of the hospital. The water supply for the hospital is from the Niagara River. The water at times is unpleasant, and at all times unsuitable for hospital purposes, owing in part to the great number of dead animals which are thrown into the river and find their way to its mouth, or are stranded along its shores in various stages of decomposition. The most unpleasant water is obtained after a severe storm of rain and wind. Besides the washings from an extended surface, the bottom of the river is made to yield largely of a deposit, which, when diffused, does not add to the pleasant character of the water. There have been, however, no cases of disease traced to its impurities nor any unpleasant effect produced by its use.

The laundresses are mostly supplied with river water, which is furnished by police parties, in a cart duly constructed for the purpose. Buckets filled with water and hooks and ladders are conveniently placed in and about the various buildings of the post, to be used in case of fire.

The country lying back of the fort, though generally level, is sufficiently undulating to afford perfect drainage. The cleared portions of the public lands mostly discharge their waters into the Niagara River by natural surface drainage. The portion still covered by timber has its drainage eastward, and through a small creek enters Lake Ontario. The hospital grounds are especially well provided with natural drainage. Slops and offal from the kitchens are consumed by swine, and the excreta either buried or used as a fertilizer.

There are about 15 acres under cultivation near the post, known as the company garden. This amount of land produces sufficient for the use of the entire garrison.

The sanitary condition of the post is good. During the past year diarrhoea has been the prevailing disease. This disease is probably produced more by indiscretion than by any influence of climate, as it is of a temporary character and readily cured. The sudden changes of temperature, with exposure, are also influential in its production. Malarial diseases do not originate at the post; they are imported, or are developed in cases which have endured the disease in more southern latitudes.

Statement showing mean strength, number of sick, and principal diseases at Fort Niagara, New York, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	Number of deaths.
1868.....	64.66	156	11	25	10	9	.....	23	1
1869.....	65.58	54	6	5	8	3	2	8	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT PORTER, BUFFALO, NEW YORK.

REPORT OF SURGEON A. F. MECHEM, UNITED STATES ARMY.

This post is pleasantly located within the city limits of Buffalo, on the right bank of the Niagara River, about half a mile from where Lake Erie empties into that stream. Latitude 42° 53' north, longitude 78° 58' west; altitude, 660 feet.

The post grounds at present in use are about 200 yards from the river, and 60 feet above its level. A part of the ground was ceded to the United States by the State of New York in 1844,

and other lots have since been purchased, making the reservation at present about 20 acres, one half of which is used for the purposes of the post. The average temperature is 46° F.; extreme cold, 9° F.; extreme heat, 90° F. The prevailing winds are west, northwest, and southwest.

Fort Porter proper was originally described as barracks and defensive works at Black Rock, New York, consisting of a block-house surrounded by a terre-plein and outer battery. The work, as completed, was a sunken redoubt, with a stone keep or citadel, surrounded by a terre-plein. The keep or citadel was burned by bounty-jumpers confined therein in 1863. Barracks for two companies were erected in April, 1867. They consist of two frame buildings, 115 by 25 feet, and two stories high. The dormitories are in the second story, each being 55 by 26½ feet, and 8 feet 10 inches high, giving 518 feet air space per man.

The officers' quarters are one-story frame cottages, without cellars. All the buildings are badly built of unseasoned lumber, and are very uncomfortable in the winter season.

The hospital is an L-shaped frame building. One wing, 63 feet long by 23 feet wide and one and a half stories high, contains the offices, kitchens, &c. The other wing, 80 feet by 27, and one story high, contains the hospital ward, 41 by 26 feet, and 12 feet high. The ward is warmed by stoves, and ventilated by an air-shaft of ingress one foot square, which conveys the air underneath the ward and opens under one of the stoves, which is partially surrounded by a zinc sheathing. The vitiated and heated air is carried off by a shaft passing with the stove-pipe through the roof. The bath-room, water-closets, attendant's room, and mess-room are also in this wing.

The quartermaster's and commissary's store-house is a frame building, 56 feet 10 inches long by 20 feet wide. It is one story and a half high, and contains an office and two store-rooms on the lower floor. On the upper floor are two rooms, one used as quartermaster's and the other as subsistence store-room. A good cellar extends about one-half the length of the building.

The guard-house is a stone building, one story and a half high, converted from a stable to its present use. On the first floor are the guard-room, 17 by 19 feet, and cell-room, 15 by 19 feet, containing eight cells, four on each side of a corridor opening into the guard-room. The prison-room, 16 by 17 feet, is on the second floor, and is tolerably well lighted and ventilated.

The subsoil drainage of the parade and other grounds about the fort is by means of tile drains emptying into the larger earthen pipe drains, which carry off the drainage and sewage from the barracks, and some of the officers' quarters. All the contents of the sewers and drains of this part of the post are discharged into the Erie canal, at least 50 feet below the lowest part of the post grounds now used, and 100 yards from the stable, which is the building nearest the mouth of the sewer. The drainage and sewage from the hospital and the officers' quarters, which are on the higher ground, are carried off by means of earthen pipe drains connecting with the city sewer.

The post is supplied with good water by means of iron pipes extending from the Buffalo City reservoir to the fort. The reservoir, two squares distant from the fort, is filled with water pumped from the Niagara River. In winter the supply is insufficient, as it is necessary to allow the water to run from the hydrants in very cold weather to prevent it from freezing in the pipes, the feed-pipe not being large enough. The supply fails in some of the officers' quarters and at the hospital, which is on higher ground, and the last point that the water reaches. Independent of this supply, the officers' quarters have large cisterns, which are filled with rain-water from the roofs of the buildings.

Statement showing mean strength, number of sick, and principal diseases, at Fort Porter, Buffalo, New York, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	140.83	114	1	20	36	2	3	7	1
1869.....	154.5	193	16	25	34	16	1	41	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WAYNE, DETROIT, MICHIGAN.

REPORT OF SURGEON B. J. D. IRWIN, UNITED STATES ARMY.

Fort Wayne, Michigan, is situated on the right bank of the Detroit River, about two and half miles from the city of Detroit, Michigan. Latitude $42^{\circ} 23'$ north; longitude $82^{\circ} 58'$ west; height above the sea 580 feet.

Since the first settlement at this point, which took place toward the close of the sixteenth century, it has constituted an important military station, receiving its garrisons from the several nations which have consecutively exercised dominion over the regions of country in its vicinity. The first settlement of Europeans at Detroit consisted of a religious mission under the Jesuits, which was promptly followed by a military trading post, established under an officer then in the service of the French government. After remaining in possession of its Gallic owners some sixty-odd years, it passed from beneath their authority, and became a part of the colonial possessions of Great Britain. In the early part of the present century it again changed owners, and became a part of the vast territorial domain of the United States, embraced within what was at that time known as the Northwest Territory.

During the occupancy of Detroit by its French and English owners, and subsequent to the change that brought it under the control of its present possessors, the troops stationed for its protection were quartered at points which have long since been absorbed by the growth and expansion of the city.

The site of Fort Wayne was selected some thirty years ago, shortly after which the Engineer Department of the army commenced the construction of a stockade fort in the northern part of the grounds.

The military reservation pertaining to the United States at this place consists of an irregularly oblong plat of ground, containing some 63 acres, lying parallel with and fronting the river. The geological features of the reservation present but few peculiarities. The formation consists of drift or subaqueous deposits. A thin superficial stratum of yellow sandy clay rests upon a strata of sand and gravel. Some few points in the vicinity of the river margin present accumulations of dark loam, the result of successive deposits of vegetable debris. The watershed of the country back of the military reserve manifests itself by the appearance of several small springs, which discharge their contents along the paludal margin of the river. The country in the vicinity of the fort is almost a plain or dead level, and presents the general physical characteristics of the Michigan peninsula.

The military reserve and the neighboring country produce an abundant supply of white oak, black oak, walnut, and hickory.

To the south of the fort the American side of the river is fringed with an extensive border of marshy bottom land, which extends some ten or twelve miles. At a point about a mile south of the fort, the river Rouge enters the Detroit River at almost a right angle. Much of the land bordering on the Rouge consists of marsh or swamp, and is intersected in many places by small streams, lagoons, and stagnant quagmires, wherein the aquatic vegetation is of the rankest and most prolific character.

The average mean temperature at Detroit from 1831 to 1842 was given as 47.21° F. During the last year the mean temperature at this post was 48° F. The lowest range of the thermometer was at 7 a. m., February 28th, when it descended to 3° ; the highest at 2 o'clock p. m., August 20th, when it reached 96° F. March was the coldest, and July the warmest, months in the year. The amount of rain was 44.53 inches. Extremes in June and February, 9.10 inches during the former, and amount inappreciable during the latter month. Snow, amounting to 9.65 inches of water, fell during the year. The prevailing winds were from the southeast and southwest. Fierce thunderstorms are very frequent during the summer and autumn months.

The original design of the fort appears to have undergone extensive changes, as the works have received almost a complete remodeling, and now consist of an extensive permanent fortification

constructed of brick and stone, and the necessary earthen additions. When completed, the works are to be armed with some sixty or seventy guns, many of which will be of the heaviest caliber.

The interior of the main fort is a perfect square, and affords a parade ground, or *place d'armes*, containing 84,759 square yards.

The quarters for the troops at this station consist of two kinds: Those constructed of stone situated within the fort, and those built of wood on the outside of the fortifications. The barracks consist of an oblong stone structure, three and a half stories high, facing the north, and built perpendicular to the eastern and western sides of the square. The exterior is plainly but neatly finished. It is 186 feet long and 36 feet 6 inches wide. The front is devoid of balconies or galleries, but the rear of the building has solidly constructed balconies, ten feet in depth on the second and third stories, extending the whole length of the structure.

The quarters were evidently designed and finished for the accommodation of a battalion of five small companies of troops. The building is divided into five equal divisions, which are in turn subdivided into halls, dormitories, dining-rooms, &c. The halls are 33½ feet long, 6 feet wide, and 11½ feet high.

Cast-iron stairways, of a graceful and substantial kind, lead from the ground floor to the several stories of each set of quarters.

The facilities for heating the quarters consist of large open fireplaces in the dining-rooms and dormitories. Wood stoves, placed in the center of the sleeping apartments, are used in preference to fireplaces.

In addition to that afforded by the doors, windows, and chimneys, the walls of the building, on each floor, are perforated with ventilators for furnishing a constant supply of pure air and aiding in removing the impure gases generated by the occupants.

The amount of cubic space allowed to each occupant of the sleeping apartments is seldom in excess of 300 feet. The quarters occupied by Battery G, Fourth Artillery, are furnished with iron bedsteads. New wooden bunks are used by troops composing two companies of infantry.

The dormitories connect with ablution-rooms and the balconies previously described. These quarters are unexceptionably good and well adapted for troops serving in this latitude. They are every way superior to the wooden or frame quarters at the post. The sinks are badly arranged and miserably constructed, being nothing more than a temporary shed over an open trench, which latter is shifted as often as it becomes filled to repletion. The kitchens, store-rooms, and mess-rooms occupy the first floor of the barracks, which are divided into five equal sections, allowing one to a company. While the dining-rooms are unexceptionable, the facilities heretofore afforded for cooking were inadequate, owing to the stoves and kitchen furniture being frequently out of order, by reason of breakage and wear.

On the grounds outside, and to the south of the fortifications, a number of wooden buildings have been erected. The officers' quarters, hospital, guard-house, quarters for the post band, non-commissioned officers, married soldiers, and laundresses; the store-houses, bakery, sutler's store, artillery stables, quartermaster's stables, ice-house, work-shop, and corrals are irregularly scattered over the grounds, covering an area of some 300 yards from east to west, and 500 yards from north to south. Excepting the officers' quarters, the buildings are one-story frame structures, of a frail and very imperfect character. The fortifications being in an unfinished state, almost everything else at the station partakes in a great measure of their character. The buildings situated outside of the defensive works appear to have been constructed with a view to meeting the temporary wants of the garrison until such time as casemate quarters and other buildings suitable for a permanent stronghold could be furnished. Owing to these facts, but little has been done where much might have been accomplished in improving the quarters, grounds, drainage, &c. The quarters occupied by laundresses and married soldiers are well-constructed pavilion barracks, divided into twenty-four sets, which are excellent and ample for the wants of the command.

The officers' quarters are two-story frame cottages, built somewhat in the cheap tenement style. The house for the commanding officer is unexceptionable in its most minute details, while the remainder of the officers' quarters are miserably constructed, badly arranged, and unsuitable, owing to a variety of defects. The rooms are all under the regulation size, varying from 10 feet

square to 14 feet square. The lighting is sufficient. The ventilation, especially in winter, superabundant. The quarters are built to face the east and the river, to which they are parallel. There are three double buildings, with common entrances to halls which lead to four sets of quarters. Owing to the frail nature of the material used in their construction and to the fact that the buildings are raised about two feet above the ground, they are intensely cold and uncomfortable during the winter season. Their position is a very bad one, and they are necessarily crowded, both as to location and in their subdivision into so many sets of quarters. The privies are inconveniently situated within a few feet of the dining-room doors. Bath-rooms have been constructed for the quarters on the lower floors, but, owing to the difficulty of obtaining a supply of water, they are seldom used for their legitimate purpose.

The artillery stables have been occupied temporarily as commissary and quartermaster's store-rooms since the battery was dismantled. They are properly fitted up for the purpose, and in good condition.

The guard-house is on the southwest corner of the new parade ground, outside of the fortifications, and is a strongly constructed frame building, 54 feet long by 30 feet. It is divided into the guard-room, 30 feet by 26 feet by 12 feet, two prison-rooms, and seven small cells. The ventilation is by twelve windows and two doors and a chimney. The windows in the cells and prison-rooms are heavily barred with close iron gratings. The heating is afforded by one large No. 10 wood-stove, placed in the center of the guard-room. There are no stoves or fireplaces in the cells or prison-rooms.

Until recently the hospital consisted of a main or pavilion building of one story, and a detachment of one and a half stories high. The main building is a frame structure, resting on posts three feet above the surrounding level, weather-boarded on the outside, with shingle roof. Its site is a little westward of about the center of the reservation, south of the southwest bastion of the main fortification, forming a large part of the west side of the parade grounds. During the autumn of 1869 it was moved on rollers to its present position, and early in the present year it was remodeled, repaired, and improved in accordance with plans submitted by the medical officer, which were carried out under his own supervision. An extension, 15 feet to the entrance end of the building, was erected, affording suitable accommodation for an office and dispensary. Four of the small rooms, used as store-rooms, office, dispensary, and steward's quarters, were removed and their space thrown into the ward, thereby enlarging it, and giving 22,666 cubic feet of air space, which is occupied by twenty beds, giving 1,133 cubic feet of space to each occupant of the ward when all the beds are filled. Each bed has an allowance of $83\frac{1}{2}$ feet superficial space for its occupant. The exterior of the building is 120 feet 6 inches long by 24 feet, surrounded by a porch 11 feet high by 8 feet wide. The roof of the porch is supported by twenty-eight handsome pillars. The building is lighted and ventilated by thirty-three windows, five doors, and partial ridge ventilation. The plan of the hospital is shown in Figure 16.

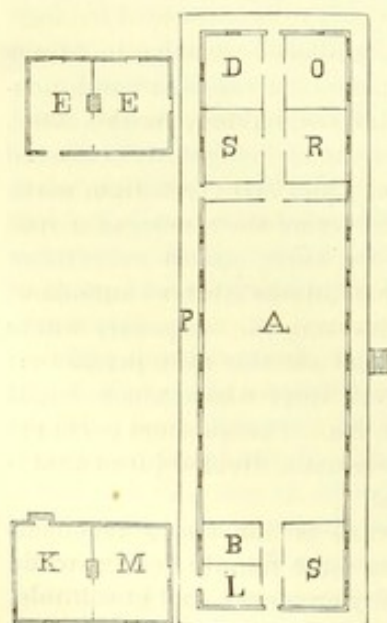


Figure 16.—Scale, 30 feet to 1 inch.

A, ward, 73 by 23 feet; B, bath-room; D, dispensary; E E, steward's quarters; L, lavatory; K, kitchen; M, mess-room; O, office; R, reading-room; S S, store-rooms. Height of ward, 13 feet 6 inches. It is heated by the necessary number of wood and coal stoves. On the west side and at right angles to the end of the pavilion are two buildings, each containing one and a half stories, constructed over brick cellars, 7 feet deep. They are 12 feet distant from the main structure, allowing the porch to extend, without interruption, around the main building, thereby affording a full and unimpeded circulation of air. The detachment on the north end is 24 feet by 16 feet, and is subdivided above and below into two compartments, which are set apart for and used as quarters by the hospital steward on duty at the post. Prior to moving the main building, this was used as the kitchen, dining-room, and attendant's sleeping apartments. Parallel with this, on the corresponding end, a new structure, 36 feet by 18 feet, has been recently erected, the main floor

of which is divided equally into a spacious kitchen and dining-room. The upper or half story is intended for an extra ward, to be used in case of necessity.

The exterior of the building is painted a light salmon color, relieved by dark bases and moldings, and light green blinds and lattice work. The interior wood-work is painted white, and the walls and ceilings hard finished and kalsomined. The flooring is of pine, except that in the ward, which is of white ash. On the outer or west side, a yard containing 137 feet by 130 feet is inclosed by a substantial board fence. Two-thirds of this is platted and laid out as a flower garden, with graveled walks and sodded borders; the remaining or outer portion contains the dead-house, laundry, wood-house, fowl-house, and privies. There are no water-closets in the hospital buildings, but that in the yard is a well arranged structure, recently erected. The dead-house is a neat frame house, 15 by 15 feet, fitted up with table and other suitable conveniences. The baggage of patients is properly labeled, and kept in one of the store-rooms. From the lower yard a door leads into the hospital garden. Owing to the limited amount allowed for the repairs and alterations of the hospital, the dispensary, bath-room, and office have not been completed.

Prior to changes recently made, the buildings used for the accommodation of the sick at this post were not only inadequate, but in many particulars were defective and unsuitable for the use of the invalids.

The original plan of the building was spoiled by endeavoring to get all the necessary apartments and subdivisions of a hospital within one long narrow structure, causing the space to be cut up into rooms but little larger than closets, as the central hall, 5 feet wide, left but 15 feet for lateral subdivisions, which constituted the store-rooms, office, dispensary, steward's quarters, &c. As the ward occupied the center of the pavilion, it escaped in a measure this defect. The strongest objection to the hospital lay in the fact that formerly when a patient entered it he had to remain by his bed until he was pronounced well and returned to duty, as the institution afforded no accommodation for the convalescent. This has been remedied by the erection of the spacious porches heretofore described, where comfortable seats afford him rest and enable him to indulge his choice of sunshine or shade as his inclinations or wants may dictate. Hitherto a sojourn in the hospital was little better than a mild form of imprisonment; but now the inmates who wish to do so can enjoy themselves in many ways without offending or annoying others who may require or desire strict quiet or repose. Everything about the place has a bright, cheerful aspect, causing the sick man who enters to feel that within the institution he shall find comforts and conveniences, as well as medicines, to aid in his restoration to health. With the small amount allowed to remodel the hospital, I have endeavored, as far as practicable, to remedy the defects and errors perpetrated in the original construction of the buildings.

The post bakery is a suitable frame building, 30 feet by 18, with brick ovens capable of baking for one thousand men. The building is divided into a capacious well-ventilated work-room, store-room, and a sleeping apartment for the baker.

There is no general laundry at the post, the washing of the command being done by the laundresses at their quarters.

The post chapel consists of a frame structure, 44 feet long by 24 feet wide, by 15 feet high, with a gabled roof, a vestry-room, 10 feet by 10, and a vestibule or entrance, 10 by 8 feet, which is carried up above the main building, forming a contracted steeple.

The stables consist of a strongly constructed frame building one and a half stories high, 250 feet long by 26 feet wide. One-half thereof is subdivided into quartermasters' and commissary store-rooms, and the remainder into stables for officers' private horses and those pertaining to the transportation of the post. It is built of heavy, rough plank, and is well ventilated.

The post library is a room 15 feet square, and adjoins and opens into the school-room. There are some 200 volumes of miscellaneous light reading. It is under the charge of the post treasurer, supervised by the post council.

The supply of water is furnished from the Detroit River; that for the use of the troops quartered within the fort is hauled in barrels from the dock, which extends into the river 75 or 100 yards. The officers and all others domiciled outside of the fortification formerly were supplied by a wind-mill, which worked irregularly and afforded but a meager supply. In the summer or calm seasons

the wind-mill ceased to be reliable, and in winter the supply from the river is frequently cut off, owing to the pipes freezing up where they pass over the shallow margin of the river. During the summers of 1868 and 1869 the water supplied for the use of the garrison was very bad, as it was taken from the stagnant margin of the river where the vegetable growth and accumulated drift and débris discharged from the city are carried down by the current, lodged and accumulated in immense quantities, rendering the water impure and injurious in its effects upon the health of those who were obliged to use it.

The proximity of the cistern to that part of the interior of the work wherein the privies and cess-pools have been excavated and filled up from time to time during the last ten or more years, renders it most probable that the water is contaminated in percolating through the porous sandy soil impregnated more or less with the drainage from the privies. The cistern should, correctly speaking, be denominated a well, as it is not lined with cement, and has the bottom open to allow water to ooze up through the sand. The internal use of this water is quickly followed by nausea, purging, and diarrhœa. Upon examination it is found clear and free from sediment, but possessing a disagreeable saline or brackish taste.

Upon my recommendation the use of this cistern water has been positively interdicted. A small old-fashioned hand fire-engine was furnished for the use of the post in the early part of last year, and has been in daily use in filling up the water-tank since the wind-mill was destroyed in the autumn. A steam fire-engine has recently been added to the material of the post.

The level nature of the ground in the vicinity causes the drainage to be defective in an extreme degree. A system of sewerage is connected with the interior of the fort, but it is frequently choked or disarranged. Slops, offal, rubbish, and excreta of the post were deposited in the shallow water on the river bank or margin about 300 yards *above* the water-pipe during the year 1868. The point of discharge of the drain or sewer from the fort bears this same relation, while the sewer from the officers' quarters draining the privies empties into the river about 50 feet *above* the mouth of the pipe which carries water from the river for the use of those quartered outside the main work.

During the summer and autumn the men of the command are ordered to bathe daily, and are conducted to the river at dusk by the first sergeants of the companies. In winter there are no facilities afforded, nor is there any disposition on the part of the men to indulge in general ablution.

The cemetery is located near the extreme southwest angle of the reserve, and is surrounded by a neat picket-fence. The area inclosed is 150 by 75 feet.

Instead of a post garden the troops at this station cultivate company gardens. The amount cultivated consists of a piece of rich, loamy soil, measuring 1,100 by 140 feet. The hospital garden contains 250 feet by 100 feet. That set apart as an officers' garden has an area of 400 feet by 100 feet. They are cultivated by details from the command, and yield an abundance of almost all varieties of table vegetables.

The rations procured through the post commissary have been abundant, and are generally of good quality, with occasional exceptions, owing to meat or flour contractors endeavoring to furnish articles inferior in quality to that called for by their contracts. Eggs, milk, butter, chickens, and all varieties of fruits and vegetables are abundant in the vicinity of the post.

The clothing issued for the use of the troops, especially that furnished to the infantry, is very inferior in quality when compared with that in use some few years ago. The artillery clothing has been of fair average quality, and much better than that supplied for the foot soldiers. In any of the infantry companies it would be a difficult matter to find the clothes of any two men alike in color, texture, or finish. While the uniform is inferior in quality, it is, to the soldier who is obliged to purchase it *volens volens*, quite expensive, costing much more than similar articles sell for when sold by private parties.

The medical supplies are obtained from the purveying depot in New York City, and are received in good condition.

From the physical and geological peculiarities of the military reserve and the neighboring country, it will be readily inferred that fever of a malarial type usually constitute a large proportion of the sickness prevalent among the troops at this station. The number of cases of intermittent fever

during the year 1868 was 228—164 of the quotidian type, and 64 of the tertian variety. More than three-fourths of the cases took place during the last six months of the year. The malady became epidemic toward the latter part of July, and continued to make serious inroads on the strength of the command until the month of November. It attacked all classes, young and old, male and female, and the robust as well as the weak and feeble. In some few cases the fever assumed quite a severe type. Three young children and an adult female had the disease ushered in by violent convulsions. The prevalence of diarrhœa during the summer and autumn months was doubtless owing, in a great degree, to the causes that gave rise to the malarial fevers. Malarial emanations from the contiguous and surrounding paludal and marshy grounds; the deleterious effects produced by the use of impure water, and injurious consequences resulting from the constant upturning of extensive portions of the subsoil of the reservation in grading and finishing the ditches and glacis of the fortifications, were the fruitful sources engendering the element that produced the diseases having their origin in miasmatic poison. In the treatment of the fever it was frequently necessary to administer a mild mercurial, following it with a cathartic, in order that the liver and intestines should throw off their torpor and resume their normal functions. Afterward sulphate of quinine, in ten to twenty-grain doses, was given at bedtime. In many cases the quinine failed to break up the recurrent paroxysms. Relapses were frequent. Suspecting that the quinine, sulphate of quinine, and quinedia, was not a pure and reliable article, it was determined to try other remedies. With this view twenty-four cases were treated with chloride of sodium in drachm doses, given every hour during the period of intermission, for four consecutive hours before the expected paroxysms. The disease yielded readily to this remedy, and but few of the cases required more than one or two days' treatment with this cheap but very reliable anti-periodic. Seven of the cases had septenary relapses. Fourteen cases were treated with "cedron bean," of which five had relapses.

Some two years ago Lieutenant A. M. Raphall, United States Army, while attached to the United States legation at Bogota, Colombia, received from some of the natives of that country specimens of bean which was reputed by them to be not only a "remedia" for *calentura*, i. e., fevers of a periodical type, but believed to possess, when carried about the person, preventive or prophylactic powers in warding off attacks of disease of this nature. The bean consisted of a large nut, resembling in size and form a butternut. In its dried state, the only form in which I have seen it, the bean consists of a thick porous epicarp, within which are contained two oblong beans or kernels of a yellowish gray color, and weighing from one to two drachms each. In color and fracture they bear some resemblance to a piece of rhubarb. To the taste it is bitter, but not otherwise disagreeable. When the disease was at its height Lieutenant Raphall informed me of the reputation of this remedy, and kindly placed at my disposal three or four of the beans, the efficacy of which I at once proceeded to test. Learning from him that the inhabitants of Bogota and Panama took, as a dose, a portion "sufficient to cover a five-cent piece," I prescribed the powdered bean in five-grain doses, given morning and evening, and was greatly gratified to find in it another efficacious and reliable remedy in the treatment of intermittent fevers. It requires only from ten to thirty grains to break up an attack. In its action it was entirely free from any of the disagreeable effects of quinine. The relapses were fewer than when the disease was treated with chloride of sodium or sulphate of quinine. The limited quantity in my possession prevented me testing its efficacy any further, or varying its mode of administration. I have no hesitancy in pronouncing it a valuable anti-periodic, and doubt not that future experiments will demonstrate the existence of a powerful and valuable vegetable alkaloid which, in all probability, will prove at least equal, if not superior as a remedy, to the preparations obtained from Peruvian bark. I regret my inability to indicate the botanical history or character of the tree or shrub from which the "cedron bean" is obtained, further than that "it is the drupe and seed of *Simaba cedron*, a tree botanically allied to the *Quassia excelsa* and *Q. amara*." It is used as an antidote to the poison of venomous reptiles, being given internally and applied to the wound.

Statement showing mean strength, number of sick, and principal diseases at Fort Wayne, Michigan, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	338.75	751	2	228	118	47	66	25	1	47	2
1869.....	330.58	612	1	264	76	25	75	29	2	36	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT GRATIOT, PORT HURON, MICHIGAN.

REPORT OF ASSISTANT SURGEON M. K. TAYLOR, UNITED STATES ARMY.

Fort Gratiot is situated on the west bank of the St. Clair River, about 1,300 feet south of the forty-third parallel, in longitude 82° 24' west. The distance from the fort to the light-house, at the foot of Lake Huron, is three-quarters of a mile, and the general direction north-northeast. Elevation above the sea 598, and above the lake 20 feet. North of the post, and adjoining the reservation, is the little village of Gratiot, containing two or three hundred inhabitants. Port Huron is south of the post, and one mile distant. The Detroit branch of the Grand Trunk railroad passes in the vicinity of the post.

The early military history of the posts along the northern frontier is inseparably connected with the history of the discovery and early settlement of the same region. As is well known the French were the explorers and subsequent occupants, and they brought with them the habits and national traits peculiar to that people.

In a military point of view the geographical importance of this post was very early appreciated. The site was first occupied by a fortified trading post, which was, in 1686, taken possession of by M. Du Shut, then commanding at Mackinac, under instructions from the French governor general, Count Frontenac. The English were making strenuous efforts to connect their interests on Hudson Bay with those of New York, and thereby hem in the French, looking ultimately to their entire extinguishment along the St. Lawrence. The occupation of this post, therefore, had a double purpose; one to thwart the English schemes, and the other, say the instructions, "to protect our savages who may go to the chase, and serve them as an asylum against their enemies."

In 1701 the post was abandoned for the establishment of a fort at Detroit. This point was occupied again, however, as a military station in 1763, when the English began to make permanent settlements in the country.

In 1807, soon after General Hull became governor of the territory, the post was occupied by the forces at his command, and immediately after the surrender of the English forces to General Harrison, in 1813, at Detroit, the post was again without military occupation; but in May, 1814, a party arrived from Detroit, consisting of Major Forsyth, Captain Gratiot, and Captain Cobb, with a detachment of about 40 men, with instructions from General Harrison to locate the post and erect works. The fort thus established was rebuilt in 1828 upon the present plan.

"The lake and river shore in the immediate vicinity of the fort," says Assistant Surgeon Motte, "is a low, gravelly ridge, extending nearly a quarter of a mile from the margin of the lake, when the ground suddenly rises to the height of 25 feet above the surface of the lake, and retains this elevation, with little variation, to near the shores of Black River. This elevated ground gradually approximates the St. Clair toward the fort, and, a few rods below, it becomes a perpendicular bluff in immediate contact with the water."

This geological section belongs to the upper portion of the devonian group. The subcarbon-

iferous system outcrops about fifteen or twenty miles west of this; while upon the Canadian side of the St. Clair River, the boundaries of the oil-bearing strata underlying this section are defined by the outcrops in the vicinity of Petrolia, Enniskillen, and Bothwell. The general dip of the several strata is to the westward, beneath the great coal basin in the central portions of this State. The peculiar situation of this region has led many to believe that petroleum oil might be obtained by boring to the depth of a few hundred feet, as the geological stratifications have been little disturbed by the upheavals between this and the oil-bearing regions of Canada. The result of explorations, though not favorable to the capitalists engaged in them, gave a very complete knowledge of the underlying formations, which may be made of some practical value.

All the wells sunk in the vicinity pass through the following formations from above downward: 1. Soil and yellow sand, 8 to 12 feet; 2. Compact blue clay, 85 to 100 feet; 3. Vein of coarse sand and gravel, 1 to 10 feet; 4. Limestone shale, intercalated with thin veins of sand and gravel, 875 feet; making a total depth of about 1,000 feet. Immediately beneath the strata of blue clay immense quantities of gas have escaped in many places, and continued to do so even after the lapse of twenty-five years; and, at the depth of two or three feet in the limestone shales, pure water has always been obtained, which has risen in the wells about to the level of Lake Huron, or within ten to twenty feet of the surface of the earth. At the depth of about 500 feet salt water veins were struck, with a supply and strength quite sufficient to warrant investments for the manufacture of that commodity. The soil is mostly a sandy loam, and the proportion of marsh is small. Most of the surrounding country is covered with forest. Among the vegetable productions are oak, elm, maple, ash, hickory, black walnut, pine, &c.

The physical peculiarities of the St. Clair and Black Rivers, which form the peninsula on which the post is situated, are noteworthy in many respects. The latter is formed chiefly by the superficial drainage of the bottom lands situated to the west and northwest, the smaller tributaries constituting its origin arising in the upland districts of the interior portions of the State. Its course through the low districts is tortuous, the current sluggish, the water highly colored with decomposing vegetable matters, to the extent of suggesting its appropriate appellation. In the early settlement of this region it was navigated by small sail vessels, and later for many years a little steamer traversed its turbid waters for several miles in the interior. Now, however, its surface is nearly covered with the products of the lumber trade, and millions of logs are annually floated down its current with the spring freshets, ultimately to be manufactured into lumber by the numerous mills situated within a few miles of its termination.

The St. Clair River presents many interesting features, alike as regards its physical relations and its connection with the early settlement and military occupation of the country. That the stream has undergone some very important changes since the historic period scarcely admits of doubt. Tradition and the configuration of the adjacent country both indicate it. According to the Indian tradition the ancient river channel was fully a half mile east of the present, and their canoes passed from Lake Huron directly to the head of Sarnia Bay. The river was then a broad, shallow stream, fully four or five times its present width, and scarcely 20 feet in depth. The changes effected are the result of the lake currents carrying down the sands along the eastern shore until, approaching the outlet, they have gradually accumulated and encroached on the river, thus forcing the stream into a narrower channel to the westward, with a corresponding increase of the rapidity of the current, and a final excavation of the clay bottom to its present depth of about 65 feet. Within the past ten years, and since the time Captain (now General) Meade made the survey, the shore has receded fully 100 feet, and nearly as much of an accretion has taken place on the Canada side. In confirmation of the view that the channel has become narrower, is the statement of Major Rogers, of the British army, the officer who took possession of the country in 1760, and who says "the river where it leaves Lake Huron is about 500 yards wide," a distance more than twice its present width.

The officers' quarters and barracks are so situated as to inclose a parallelogram 100 feet wide and 191 feet long, which is used for the parade ground. To the rear of the buildings is a pasture field, and to the south, between the buildings and the railroad, is the post garden. The field south of the railroad is the drill ground, and is also occupied by the Port Huron Driving Park Association as a race-course.

The buildings occupied by the enlisted men as dormitories are two in number, and built of wood. The size of each is as follows: Of the main building at the north end of the parade ground, 100 by 30 feet, and 10 feet between floor and ceiling; of the detached building, 40 by 30 feet, and 10 feet between floor and ceiling. On the east end of the main building 13 feet are taken off and divided into two apartments for the use of the first sergeants. This leaves the dormitory space occupied by the companies as follows: One 87 by 28½ by 10 feet, and one 40 by 30 by 10 feet, to be occupied by 145 men, the present strength, or an allowance to each of about 254 cubic feet of space. In the main building the men are furnished with old-fashioned bunks, with two tiers of beds, each to accommodate two men. These bunks are about 4½ feet wide and 6½ feet long, and are occupied by four persons, and are placed so closely together as to allow room barely to get between them.

In the detached building the men sleep on a raised platform elevated about a foot and a half above the floor, slightly inclined toward the middle of the room, and extending three-fourths round the interior of the building. It is needless to say the barracks are over-crowded, particularly so as the windows are all located upon the side fronting the parade ground, and there are no arrangements for ventilation through the roof. In consequence of this, the men situated at the backside of the room get no air except that which has first traversed the bedding and persons intervening, of an almost unbroken line of sleepers. The barracks are warmed by wood stoves, and lighted at night by kerosene lamps.

The allowance of air space recommended by the English surgeons for each man in quarters is 600 cubic feet, and the regulations of the military authorities have fixed the average at 450 feet. In the place of those bunks so common in the American army, they have adopted iron cots for one man only, with the heads of the iron frames fastened to the building, and so made as to be turned up during the day against the wall, and by an additional device the cots form seats for the men. As for bedding, each man is allowed an iron bedstead, a rug, a pailasse, a bolster, two blankets, and two sheets. I must believe that the addition of these sheets to the allowance of enlisted men when in quarters is a necessity to their health and comfort, as it admits of more personal cleanliness, and by the greater facility with which such articles are washed contributing to the improvement of the general sanitary condition of the dormitories.

Men sleep in their drawers from the first to the last of the week, and sometimes from two to three weeks together, and the blankets are rarely washed every quarter of a year. What must be the effect of the necessary accumulations of the absorbed effluvia of the body by these woolen fabrics, particularly in close quarters and in warm weather, is not difficult to imagine. I believe the government will ultimately see the necessity of some reformatory measures in this direction, and will feel constrained to adopt them.

The kitchen in rear of the main barrack is well arranged, and of sufficient size to meet the requirements of one company for cooking purposes. The mess-room and kitchen of the other company are very insufficient, being only 30 by 16 feet, and entirely unfinished on the inside. The kitchen is separated from the mess-room by a thin board partition. The table-room is only sufficient to allow of seating about one-third of the company at once. It is therefore impracticable to serve the food of the men as it should be, and some complaints have been made in consequence.

Married soldiers' quarters within the garrison grounds are mere huts, but a building below the railroad is used for some families, where the rooms are more comfortable.

The officers' quarters consist of one building for the commanding officer, and four for the line and staff officers, arranged to accommodate two families each.

Shallow wells have been sunk on the reservation, and are readily filled with surface water to within four or five feet of the top, and afford a moderate supply of very inferior quality, suitable only for the use of public animals and general police. One well has been sunk a few feet in rear of the hospital building, and another in rear of the adjutant's office. The water in the first is not used for any purpose; while that of the latter, which is several feet deeper, is used for general police purposes and for the government horses. At the foot of the bluff there are several places where small springs appear. The water supply of the post is very deficient as to quantity and quality. The present arrangements are as follows: A moderate supply of cistern water to most of the officers' quarters—the wells before alluded to—and a very limited quantity of

lake water obtained by a penstock connecting with the reservoir of the Grand Trunk machine shop. The cistern water at most of the officers' quarters is sufficient for all the ordinary purposes of domestic use, and if a filtering apparatus were constructed, would do well for drinking purposes, though it is generally colored either by the dropping foliage of the surrounding trees, or by collections on the roofs of the buildings of the soot, dirt, and other matters thrown out by the passing locomotives. The total amount of all the cisterns would be soon exhausted in the event of a conflagration of any magnitude breaking out in the garrison buildings. The supply from the reservoir of the Grand Trunk railroad is very limited, and often entirely cut off. The height of the reservoir is barely above the surface of the parade grounds, and to take advantage of this supply a depression has to be made in the earth, so as to secure even a moderate flow. The penstock is tapped near the magazine for the purpose of affording the enlisted men drinking-water, but, like the supply to the officers, the flow is often stopped when the head is exhausted to meet the requirements of the railroad. In a word, therefore, the supply of wholesome water for the post is very short, and better accommodations in this respect are greatly needed.

The natural drainage of the post is by no means what a casual inspection of the situation would lead one to expect. The superficial deposits of soil, with the substratum of fine sand intermixed with a small proportion of clay, render percolation down to the thin layer of coarse sand and gravel immediately overlying the clay beds exceedingly slow; hence, when the surface drainage is not good, the water, after heavy rains, will remain in pools for several days.

The surface of the surrounding country is quite level and the drainage very bad. Public and private enterprise has done something to reclaim the lands and render them tillable, but not a moiety has been accomplished as yet, compared with what is absolutely needed. The effect of this condition upon the general healthfulness of the region is seen in the character of the prevalent diseases and the mortality of the inhabitants.

The general character of the diseases of this section may be inferred in part from what has been said in relation to the medical topography and drainage. A clearer understanding of its salubrity may be obtained, however, by an examination of the mortuary records of the city of Port Huron for the last ten years, whence it appears that the average mortality for that city is at the rate per annum of one in every sixty of its inhabitants. This is a greater death rate than the average of the whole State, the latter being one in sixty-eight. The diseases are chiefly those of a malarial origin, embracing remittent, intermittent, and typho-malarial fevers, and along the lake and river, pulmonary diseases, often complicated with malarial manifestations. Rheumatism for the last year has been quite prevalent in its milder forms, chiefly in consequence of the extreme variability of the seasons. From observations, it would appear that typhoid fever, in the restricted sense of this term, is of very rare occurrence, nearly all diseases approaching this condition assuming the typho-malarial form.

Statement showing mean strength, number of sick, and principal diseases at Fort Gratiot, Michigan, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868	54.66	102	2	45	6	1	1	2	3	8	10	2
1869	115.08	320	3	113	24	11	3	.....	16	33	25	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BRADY, MICHIGAN.

REPORT OF ASSISTANT SURGEON M. K. TAYLOR, UNITED STATES ARMY.

Fort Brady is situated on the southern bank of the Sault Ste. Marie, Michigan, in latitude $46^{\circ} 30'$ north, longitude $84^{\circ} 43'$ west; altitude 600 feet.

The military history of this post extends back to 1750, at which time the French claimed jurisdiction over all the territory north of the Ohio, and sought to establish posts at the more important places, for the purpose of controlling the trade of the lakes, and excluding the English as far as possible from obtaining a foothold on Lake Superior, as well as to establish a depot of supplies and afford protection to the traders.

The Marquis de la Jonquiere, Lieutenant Governor General of "New France," as Canada was then called, on the 18th of October granted the Chevalier De Repentigny, an ensign in the Canadian troops, and Sieur De Benne, captain of a Condi regiment, six leagues of land fronting on the Ste. Marie River, and extending six leagues deep as a "seigniory," with the condition that they should take immediate possession, establish a fort, cultivate the soil, and raise stock for the support of the French element then trading along the lakes. A short time previously, however, a small fort had been established, and Repentigny had been in command; but it seems to have been only a temporary arrangement. Under the authority and orders following the grant, that officer proceeded to the post with a small body of French troops, and built a stockade a little east of the present stables and out-house, a portion of the inclosure extending within the old boundary of Fort Brady. The French held possession until 1762, after the fall of Quebec, when the commandant or governor, as he was called, hastily departed, and left the post in charge of Jean Baptiste Cadotte, a trader and voyageur in the employ of De Repentigny. In the course of the same season a small detachment of British troops, under the command of Lieutenant Jenette, arrived. On December 22d following the post was burned, and the English seem to have held only nominal possession until 1802, when another small force was sent to occupy it. As a matter of fact, however, from the abandonment of the post by De Repentigny until many years thereafter, it was under the control of Cadotte and the French Indian element. At the time of the massacre of Mackinac, during the Pontiac war, this was the headquarters of the Indian forces engaged. From the reoccupation by the English in 1802 until 1820, only a small force was present, probably as a mere exhibition of military possession for the purpose of protecting the traders.

In 1820 the late General Lewis Cass, then Indian agent for the northwest Indians, made a trip around the lakes, visiting the shores of Lake Superior and afterwards of Lake Michigan, going as far as Chicago, and when he landed at this place on his voyage up, the British flag was flying at the head of the rapids, near the termination of the canal. He proceeded in person to haul it down and raise his own in its place. There were nearly two thousand native and French residents whose sympathies were intensely Canadian, and consequently this act of his so enraged them that they were on the point of attacking him at once. Through the intervention of a few of the English half-breeds the Indians were quieted, and the general allowed to go in peace. On his return, however, from his voyage around Lake Superior, General Cass concluded a treaty with the Chipewas on June 20, 1820, for the purchase of sixteen square miles of land, with a river front extending from a large rock near the national boundary above the falls, to the Little Rapids, at the head of Sugar Island, the Indians reserving the right to fish undisturbed. This purchase constituted the original military district. Its boundary was about three and a half miles along the river, by four and one-third miles deep. This rock still remains as one of the leading peculiarities on Ashman's Bay, being a large boulder lying in shoal water about twenty rods from the ship channel, entering the upper end of the canal. In 1822 the government of the United States determined upon its permanent occupancy, and accordingly General Brady was directed to proceed, in the autumn of that year, to this place with six companies of infantry, and erect a stockade and buildings. The present hospital and bakery, the first of which was built for officers' quarters, and the latter for a guard-house, are all that are left of the structures then erected. The old stockade and

buildings remained until 1866, when they were so dilapidated that it was determined to enlarge the garrison grounds and to erect new buildings.

The occupation of the post by troops has been interrupted in two instances. The first was during the Mexican war when, at the outbreak of hostilities, the regular troops were withdrawn and replaced by a company of the first regiment of Michigan volunteers, under Lieutenant E. K. Howard, who remained here until the spring of 1848. These troops constituted part of an organization specially mustered into the government service for this purpose. From that time until the 1st of June, 1849, the post was unoccupied by troops. The second instance occurred in consequence of threatened hostilities in Minnesota, in 1857, when the troops were transferred to Fort Snelling, and the public property turned over to the custody of an ordnance sergeant. It remained unoccupied until May 8, 1866, when Company D, Fourth United States Infantry arrived, from which time to the present, one or two companies have been on duty.

The boundaries of the reservation have been a source of much trouble from the beginning, but more particularly was this the case when attention was drawn to the mineral wealth of the country west, with corresponding commercial activity along the lakes and enhanced value of the lands. Conflicting titles, growing out of long previous occupation or pre-emption, unsettled every one in his possessions, and from this annoyance the post was not exempt. To determine, therefore, what was necessary for military purposes, and should be permanently reserved, as well as to determine the titles to the lands, Congress passed an act, dated September 26, 1850, authorizing the appointment of a commission to adjudicate claims and for making an authoritative survey of boundaries. Under this act, Lieutenant Wescott, United States Army, was detailed to survey the tract reserved for the occupation of the garrison. Since then various encroachments have been made under different pretexts, until now it appears likely that the military are to be dispossessed of fully one-half of the ground really needed for culture in raising vegetables for the use of the post.

Fort Brady is situated on the right bank of the St. Mary's River, six miles from Lake Superior, and at an elevation ranging from 33 feet to 26 feet. The eastern portion of the garrison grounds slopes gently to the river, but that between the commanding officer's quarters and the river forms an abrupt bluff of about 26 feet in height. To the rear of the garrison inclosure, at a distance of 400 feet, there is a boulder ridge ranging from 30 to 34 feet above the surface of the river in front, which is the dividing elevation between the river slope on the one hand and the watershed to the creek in the swamp on the other. This boulder ridge extends from the head of the rapids to Hay Lake, a distance of four miles, and constitutes what may be called the second terrace. Back of this ridge, ranging from a third of a mile wide at the head of the rapids to a mile and a half at the head of Hay Lake, there is a slight depression of three to five feet, the surface of which is wet and known as the "Swamp," through which runs a small stream most of the year. In dry weather in summer, and when the lake above is at low water, this stream may be dry, but in high water of Lake Superior, with strong winds from the north or northwest, water will flow from Ashman's Bay at the head of the rapids through this little stream to Hay Lake, probably falling about 22 feet in four miles. Back of this swamp are the highlands, at an elevation of from 100 to 150 feet above Lake Superior. On the Canadian shore, at a distance of from six to ten miles, there are high lands ranging from 400 to 600 feet above Lake Superior, and on Sugar Island, in St. Mary's River, the elevation in the central portion attains to 300 or 400 feet.

All the swamp land situated between the hills on the river, from the head of the Portage, as it is called, to Hay Lake is susceptible of cultivation if properly drained, and would unquestionably be very productive; but as it is now the line of cultivation does not extend beyond the boulder ridge except for a short distance along the Mackinac road. The swamp is densely covered with *coniferae* and thick beds of moss, which hold water like a sponge, almost from one year to another.

The St. Mary's River properly commences at "Pointe aux Pins," six miles above the falls, where the river leaves the lake at a right angle with the general trend of its shores. From its commencement to the head of the rapids its current is moderate, but gradually accelerating until reaching the falls, the waters plunge tumultuously over the rocks on a declivity of 18 feet in three-quarters of a mile.

The quantity of water discharged, according to Lieutenant Henry, United States Army, is about 200,000 cubic yards per minute. The greatest depth on the rapids does not exceed eight feet,

and this only for a channel a few hundred feet in width. On either side of the channel the water is very shallow, being rarely more than three feet at ordinary stages, except in the pools. Below the falls the river has variable depths of from 16 to 100 feet. In the middle of the stream on the rapids, and below for nearly a mile, the water is about two feet higher than it is on either shore, so that the surface presents a divided convexity.

The geological peculiarities of this vicinity belong to the lower silurian system, but geologists differ as to the proper place of the out-cropping rocks. Exposed on the rapids and barely covered by the soil, for some two hundred yards on the American side, a ferruginous sandrock appears, varying in color from a light fawn to a dark red. According to American geologists, among whom may be mentioned Professor Hall, of New York, and Winchell, of the University of Michigan, and Messrs. Foster and Whitney, United States geologists, these rocks belong to the lowest in the silurian system, namely, the Potsdam sandstone, and until quite recently this has been accepted as satisfactory. The Canadian geologists, however, have classified them as belonging to the chazy system, or the second in the series above the Potsdam, which involves a corresponding correction, as Sir W. E. Logan says, of the whole geological classification of the upper peninsula. These rocks are nearly destitute of fossils, and hence the difference in opinion in relation to their position. No fossils have been found in this immediate vicinity, but on Laquamenon Bay, where the rocks again appear, one species of *lingula* was seen by Dr. Hall, and the same was found by Sir W. E. Logan on the Island of Lachache, near the Canadian shore. In consequence of this paucity of fossils, and from the peculiar relations of the superimposed rocks on the Canadian side, the latter bases his opinion; and if this classification were established, says the authority, "the copper-bearing portion of the Lake Superior rocks might reasonably be considered to belong to the calciferous and Potsdam formation." On the Canadian side, at a distance of from three to four miles, the laurentian system appears at an elevation above the lake of from 300 to 600 feet, forming the metalliferous rocks of that region, the metals found being chiefly copper as sulphuret, and iron as hematite, with some plumbago, though not as yet in such quantities as to repay for investment in working the mines. The limits of the Potsdam or chazy system are defined by a slightly elevated, well-timbered ridge, appearing about one-third of the distance from here to Mackinac. South of this ridge the Black River limestones appear, and as we proceed in that direction, the other diluvial series, underlying the coal measures of the lower peninsula. It will be seen, therefore, that the St. Mary's River defines the boundary between the Canadian azoic system and the diluvial rocks of the American side.

The special geology of the immediate vicinity of the post has some interesting features in a sanitary point of view. It has been stated that the sandstones crop out on the rapids and appear on the surface about 500 feet on the American side, barely covered by a light soil. This occurs to the west of the garrison inclosure about 1,500 feet, and can be traced to the hills in the rear. It forms the barrier to the drainage of the great lake above, and has resisted for ages the combined disintegrating action of water, ice, and frost in maintaining the general level of that vast inland sea. Superimposed on this are the clay hills forming the table lands between this and Mackinac, which are stratified in the following order from the surface downward, as appears by a dry well sunk about two miles from the river, viz: first, soil and clay, 20 feet; second, clay marls, 5 feet; third, boulders, 10 feet; fourth, gravel, 10 feet; fifth, sandrock, 10 feet—total, 55 feet. The rock in this instance is dense and very hard, light colored, and of the same color as that on the rapids. The superficial strata of these rocks are light colored, compact, with matted patches colored with oxide of iron, very hard to work, and withstand the weather most excellently. Beneath these it readily splits into thin layers, and there is more oxide of iron mixed with its constituents, so that on exposure, it readily disintegrates and crumbles into a dark red sand. Below, it becomes hard again, has a dark brown color, and is more compact. Within the fort limits these several strata appear as follows, from the surface downwards:

First. Soil, fine sand, infiltrated with a little clay from one to one and a half feet thick.

Second. A hard, compact ferruginous stratum, consisting of sand with clay and iron cement almost impervious to water, and difficult to disturb, except with a pick; depth, three inches to one foot. This almost totally prevents the water from percolating through to the loose lake sands of

variable depths beneath, and hence, wherever it is thickest, water stands until removed by evaporation, unless drained off by surface ditches.

Third. White sand, loose, pervious to water. In the lower parts of the garrison water may be obtained in it by sinking shallow wells, except during the dryer seasons of the year. It appears to be the natural under drainage of the swamp. Southwest of the officers' quarters, near the angle of the inclosure, and also along the Portage road in several places where the side ditches cut the dense stratum above, water comes to the surface; depth from two to three feet.

Fourth. A second dense stratum, consisting of white sand and clay and a little lime, moderately pervious to water, and rather hard to disturb with a spade simply; depth variable, from a few inches to one and a half feet.

Fifth. Lake sand of variable depth, extending down to the boulders.

Sixth. Boulders, infiltrated with sand and gravel to variable depths, extending down to the sandrock in places.

The inclination of the several strata is toward the river, but when the same has been cut away by the river at a former higher level, the boulders appear very profusely on the surface. These boulders are quite peculiar in their character; they consist of large granite, gneiss, greenstone, porphyritic trap, and other azoic water-worn masses, weighing in many instances more than 30 tons, with smaller rocks closely intervening, and the interstices filled with loose sand and gravel. Their general lithological characters would indicate that they had been transported from the north shore of Lake Superior by glacial action, and that they had been subjected to very great attrition.

The shores of the lake and river exhibit terraces corresponding to the different water levels of past periods. There are four of these on the river below the rapids and three above, which correspond with the terraces on the lake shore. The business part of the village of Sault Ste. Marie is built on the first, counting from the river. Fort Brady stands on the second river terrace, with an elevation above the first of from 10 to 12 feet. The boulder ridge constitutes the second lake or third river terrace. All along the clay bluffs the last in the series may be distinctly seen. Those terraces may be traced nearly the whole length of the river, and according to Messrs. Foster and Whitney, constitute one of the characteristic features of the Lake Superior shore.

It is altogether probable that at no very remote geological age the great falls of the St. Mary's River were at the Anebish Rapids, which, by a gradual wearing away of the rocks, have been slowly approaching the lake above, at the same time lowering its surface. There is no evidence, however, of any change in the character of waterfall occurring within the historic periods of this country. Though I think, with careful attention to the subject, the law of recession will be found to exist here, which is known to apply to the Falls of Niagara. The water level of this river and the lake above is subject to occasional great fluctuations, but the precise cause of such change is not well determined.

I am informed by E. Ashman, esq., a resident of this place for forty years, that on one occasion, about the year 1832 or 1833, the waters of the lake receded to such an extent that persons could easily walk across the rapids; that himself, with many others, visited the pools thus left exposed, and caught large numbers of fish. This lasted about one hour, when the waters returned with great force, barely giving the fishermen time to retreat to the shore.

There were no prevailing high winds or other natural causes observed at the place sufficient to account for the extraordinary phenomenon. It is possible that it arose from some subterraneous convulsion, analogous to the earthquakes that disturbed the whole of the southern Canadian counties in 1863, at short intervals, for one entire summer, and that from a similar cause the angular sandstone boulders which line the shores of the river below the rapids became detached from their original position, and were carried by the rushing waters down the stream. I have seen none of these rocks more than three feet above the water level, and manifestly they have no connection with the azoic boulders heretofore mentioned, which are found from 20 to 30 feet above the present surface of the river, and constitute the third river or second lake terrace. In consequence, however, of the gradual cutting down of the river channel by the waters, and removal of the sand and fine gravel, the azoic boulders and sandstones are found intermixed in the bed of the stream, and in many places become sources of great danger to vessels. Indeed, it is rare that a month passes during the period of navigation without a casualty occurring, and

what is more interesting these masses are changing their positions, so that in places the channels, which for years previously have been regarded as entirely safe, are now dangerous. The chief cause, probably, of this shifting of the boulders is due to changes in the channel banks by the undermining of the currents so that the boulders roll toward the middle of the stream as the earthy bed is carried away. Ice, also, has a very decided influence in shifting their positions, and even within two or three years past large masses weighing, perhaps, ten tons, have been carried from their original places into the channel some distance below.

The general plan and arrangement of the post is shown in Plate No. 2.

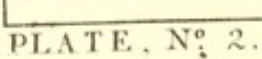
The barrack is a two-story building, 120 by 24 feet. The lower floor is divided into six rooms, which were originally designed for company kitchens and mess-rooms. They are now occupied as commandant's office, company officers' office, quartermaster's and commissary's office, commissary store-room, court-martial and amusement room, and post library reading and school-room. This story is 10 feet high. The second story, which is also 10 feet high, is designed for men's quarters, and is divided into six rooms; four being adapted to company quarters for two companies, and two for their respective first sergeants. A recess from the main part was converted into a wash-room; before this arrangement was made the men were compelled to perform their ablutions on the porch in all weather. This building taken as a whole is a most signal failure in everything pertaining to barrack accommodations. It was intended to quarter two full companies of 100 men each, at an allowance of 117.3 cubic feet air space per man. For the minimum strength of 68 men the rate would be 173 cubic feet air space *per capita*, thus allowing a cube of air of a fraction over $5\frac{1}{2}$ feet to sustain a night's respiration. To make the matter worse, the two middle rooms are 27 by 23 by 10 feet, with but two windows and two doors, and designed to quarter 36 men. The result is foul air both in winter and summer. The end rooms have six windows each, and are generally in good condition, but the windows are so arranged that the bunks have to be placed directly against some of these openings, and consequently the men often contract colds by the atmospheric currents blowing over them when asleep. The whole building is badly constructed; and a special defect is in the laying of the upper floor. Originally the flooring was soft pine one inch thick, but this became worn out so that last season it had to be relaid, which was done with but partially seasoned oak. This has shrunk so that it is now impracticable to scrub the floor in any manner without wetting the ceiling and floors below. Indeed, in many places the cracks between the floor boards are one-half to three-fourths of an inch wide. It is in contemplation to relay it the second time the ensuing summer. In addition to the other defects the men are supplied with double bunks $4\frac{1}{2}$ by $6\frac{1}{2}$ feet, two tiers high, and designed to accommodate four men each. These occupy so much of the interior that the men have but little space in which to perform their ordinary duties and have comfortable places to rest. The quarters are reached by two flights of stairs in the rear of the building, under the porch.

The building is surrounded on all sides by a veranda 6 feet wide, and extending to the roof. Back of the main building, at a distance of 10 feet from the veranda, are the company kitchens, the two being connected by a covered passage way, 6 feet wide. At a distance of 12 feet from the rear of the kitchens the company store and commissary rooms are located, being temporary structures of frame-work, weather-boarded. Still farther to the rear is the bakery, an old building erected in 1822 for a guard-house, constructed of hewn logs and weather-boarded. It is in a dilapidated condition, and should be replaced by a suitable structure, planned so as to be convenient and cleanly, and located where it will not endanger the other buildings in case of fire.

The guard-house is a small building one story high, situated to the west of the barracks at a distance of 160 feet. It is divided into four apartments, the front half being in one room, and occupied by the guard, and the rear being divided into a prison-room and two small cells. It was erected in 1867; size $24\frac{1}{2}$ by $20\frac{1}{2}$ feet, with a porch, 4 feet wide, in front. During the winter months this porch is boarded up and three small windows introduced at the respective sides and ends, so as to shield the sentinel from the cold, and yet allow a watchful care of the grounds and buildings.

The present hospital was erected in 1822 for officers' quarters. It was built of hewn logs, weather-boarded on the outside, and plastered on the inner side. It is in a dilapidated condition, and should be replaced by a suitable structure.

The ward, the largest room in the building, is 20 by $13\frac{1}{2}$ by $8\frac{1}{2}$ feet, and ventilated by two small windows. The interior wood-work has been very badly used, and the whole structure, outside and

French, Langran & Ogilvie, Lith. Wash.ⁿ

in, is dilapidated and obnoxious to every sense of propriety and comfort. In the event of any severe contagious or epidemic disease prevailing at the post it would be wholly inadequate to meet the requirements of the hospital department.

The commanding officer's quarters is a building 32 by 42 $\frac{3}{4}$ feet on the ground, and one and a half stories high, and contains four rooms, a hall and two closets; having a porch, 6 feet wide, extending along the front and half of the north end. The second or attic story has but two rooms. To the rear, at a distance of 10 feet, is the kitchen, 12 by 20 feet, one story high. The building is situated near the bluff at the northwest part of the inclosure, and has a beautiful view of the river and Canadian shore.

South of the commanding officer's quarters, at a distance of 88 feet, is the building for the line and staff officers' quarters. It consists of a one and a half story building, 52 by 56 feet on the ground, with a porch, 6 feet wide, on the front.

It is divided through the middle, from front to rear, by a partition extending from the ground floor to the attic, whereby the house is separated into two distinct parts, and on either side of which is a long hall extending the whole length. The first floor of each side is divided into three rooms. To the rear, at a distance of 12 feet, is a covered passage way leading to the kitchens, the latter being one story high, and 15 by 15 feet each, and under one roof, but separated by a hall, 4 feet wide, leading to the water-closet in the rear. The building was intended to accommodate two families, but at present it is crowded so as to accommodate, after a fashion, the families of three married and one unmarried officers—a total of sixteen, who are stowed away in the building; one assistant surgeon and one lieutenant occupy the lower floor, and two lieutenants the attic. There are cellars under the kitchens only. The foundations of the main parts are sunk but little below the surface of the ground, and hence during the winter months the buildings, more especially the line officers' quarters, are subject to being raised by the upheaval of the earth by the frost, whereby they are more or less damaged every season. They were erected only three years since, that is, in 1866, but the walls are now badly damaged, and will soon have to be repaired to make them habitable and look decent. Already the south end of the porch of the officers' quarters has become detached from the main building by the frost, and considerably injured. In consequence of the drifting of the snow the foundations receive but very little protection during the winter, and hence are subject to the direct action of the frost.

The sinks of the officers' buildings, hospital, and barracks are all in bad condition for want of proper drainage and ventilation. They have had to be disinfected repeatedly during the past season to make them tolerable. In the spring they are nearly filled with water, which, as the warm weather comes on, drains away until the contents of the vaults become in some degree inspissated. Besides this, they are quite shallow, and rapidly filling up. Last fall the men's sink had to be removed from its position in the angle of the inclosure near the convent to its present position, 100 feet toward the river. The building is 16 by 8 feet on the ground, and divided longitudinally by a board partition. On either side of this partition are pieces of scantling at the proper height for a rest, which are boarded down to the floor, leaving the space on the top entirely open, so that all the exhalations from below find a ready escape upward into the interior of the building. To make the place bearable, therefore, the doors are kept constantly open, and even then it is most intolerably obnoxious, not only to those who have to visit it, but to every one in that section of the garrison grounds, as well as to persons living outside the military limits. There is a small ventilating flue reaching from the floor to about two feet above the roof, but this effects comparatively nothing in the way of efficient ventilation. From a careful investigation of this subject, both in civil and military life, I am thoroughly satisfied that too little attention is generally given to the construction of private water-closets and public sinks; that as a result of this inattention, habits of constipation and all the train of evils arising therefrom—colds, and, with the more delicate and sensitive, neuralgia and rheumatism, particularly of the lumbar regions—are often induced.

The garrison grounds are very inadequately drained. Nowhere within the government reservation, except in the immediate vicinity of the commanding officer's quarters, can a cellar be excavated to the depth of three feet without having water stand in it more than two-thirds of the year. The cellar of the officers' quarters has not been dry for months, although it purports to be drained

by a small conduit about two inches square, in sections, put in at the erection of the building, three years since. The garrison fields to the rear of the cemetery were cultivated in vegetables the past season, and, although an unusually dry one for this region, when the fall rains commenced it was found difficult to secure the crop because of the grounds being covered with water.

At the Baptist Mission a well has been dug to the depth of twelve feet, with an unfailing supply of water, coming to within nine feet of the surface, or about two feet above the grounds in front of the officers' quarters. This indicates about the height of the surface water of the swamp. Last spring the water stood to the depth of two feet for two months on the surface between the officers' quarters and the corner of the inclosure containing the springs. Underneath the hospital a cellar has been excavated to the depth of three feet, yet it is practically useless, for, in the first place, it is not deep enough to be of any service, and, in the next place, it is always wet.

Heretofore the slops from the company kitchens have been drained by an open ditch less than two feet deep, round by the rear of the hospital toward the river, and those from the hospital take the same direction. In warm weather the stench arising from this ditch is intolerable, and in more southern localities would be productive of the greatest harm.

What is required, therefore, is a proper system of drainage, and it seems strange that a government post like this should be occupied so long without any attention being given to this very important matter. A large sewer, sufficient to carry off all the kitchen slops of the barracks, the hospital, and the water falling from the roofs of the buildings and surface water, as well as to drain the garrison privies, seems imperatively demanded.

The history of the post, as shown by Dr. McDougall's report in 1837-'38 to the Surgeon General, (see Meteorological and Medical Statistics, 2d part, page 72,) establishes beyond controversy that want of attention to sanitary science cannot be allowed even in this northern region, except at the most imminent risks.

Another sewer is required to drain the officers' cellars and grounds, and a system of open ditches is needed to drain the garrison fields, if they are to be cultivated properly. This matter cannot be urged too strongly, in view of this being occupied as one of the permanent frontier posts, and the consequent steady accumulation of effete matter which in the end must be productive of much disease. The ground is seldom frozen during the coldest winters; the heavy body of snow affording such a protection that potatoes have remained unhurt in the ground as they were raised, during the winter, and have sprouted again the next year most vigorously.

With the peculiar obstacles in the underlying strata to drainage below, the soil inevitably becomes permeated with noxious elements, until ultimately some disastrous results must appear, unless prevented by proper sanitary precautions, and of these more complete drainage is the chief. During a long winter a certain amount of the slops, waste-water and garbage, and other matters will inevitably be thrown out upon the snow, there to remain until warm weather, when much of them goes into the soil, however thoroughly the ground may be policed. An effective sewer, therefore, is imperatively demanded, alike as a sanitary measure and as a saving of labor in keeping the grounds in order.

Water is furnished to the garrison by water-carts. It is obtained from the river below the landing, where the slope of the river is such as to allow the carts to be driven into the stream about 150 feet, near the verge of the channel. The supply thus obtained is excellent. What is needed, however, is a more abundant supply kept in reservoirs near the places where it is to be used for cooking and police purposes, and where in the event of fires breaking out it can be made available in their extinguishment. As the matter now stands, there is no adequate means of saving the garrison from a general conflagration if any one of the permanent buildings should take fire when the wind is in a favorable direction for the spreading of the flames. Lake water can be obtained and conducted to all the garrison grounds by a conduit not exceeding 4,300 feet in length; the fall would be approximately between two and three feet, and with suitable reservoirs the garrison could be abundantly supplied with pure water for all purposes at a moderate expense. With force-pumps or water-rams it could then be made available for any emergency. This subject needs special attention, for in four instances, within a short time, the post has been in danger of being burned out, from causes arising within the military limits; and in addition to this, the garrison is so near the middle of the village of Sault Ste. Marie, which is built in a shabby manner, and with none but the simplest means of arresting fires, that it is at all times in danger of a general conflagration.

The subsistence stores furnished for both officers and men of this post are of the best quality and in abundance. They are principally obtained from the purchasing commissary at Chicago. The variety furnished for officers' consumption is very satisfactory. Extra vegetables and other articles of food are raised on the grounds assigned to the company commanders for the benefit of their commands. There are no special post gardens, nor is any ground set apart for the use of the hospital.

The present command did not arrive here until the 10th of May, 1867, and there was so much to be done to get the buildings in a decent condition for occupation and in clearing the inclosure of rubbish, that comparatively nothing was accomplished in the cultivation of the garrison fields. As a result of this, in the following winter the men were destitute of the necessary supply of fresh vegetables, and in the month of March last there were some of the preliminary symptoms of scurvy exhibited in about a dozen cases among the troops.

To meet the requirements of the men a diet table was prepared, (see which, annexed to the end of this subject,) which the commanding officer directed to be strictly followed in regard to variety and daily changes. As will be seen, the table is a modification of that furnished from the Surgeon General's Office for use in hospitals. The changes in the dietary arrangement thus effected produced beneficial results. Under this system there is a decided gain in the company savings, and little additional articles in the way of relishes, and a very creditable supply of white ware and good cutlery for table use, were purchased. The course pursued in relation to slaughtering beef is very reprehensible. Under instructions of the commissary department, to economize in forage and feed, several head have been slaughtered at once, the product in the aggregate amounting to three or four thousand pounds, which is placed where it will be frozen, and kept in that condition until issued. Last year the animals slaughtered in the latter part of December and first of January were sufficient for the wants of the garrison until the 1st of May. At the present time the quantity on hand will last to nearly the same time. In other words, the beef is killed nearly four months in advance of its ultimate consumption. The result of this course is, the beef becomes dry, tough, tasteless, and subjected to great loss in weight. It is neither fresh beef, dried beef, nor corned beef, but possesses a sort of combination of qualities that makes it particularly undesirable if anything else could be obtained as a substitute. For at least a half or three-fourths of an inch on the outside the meat is dry and tough; the fatty parts, which are generally juicy, palatable, and well flavored, become tasteless and repulsive, possessing more of the qualities of a tallow candle than anything else, the juiciness and peculiar flavor of good fresh beef being entirely destroyed. The loss is not less than ten per cent of the serviceable part of the animal as regards actual weight, and the deterioration in quality is vastly more.

In answer to protests against this system, it was claimed that it was cheaper for the government to sustain the loss in weight by desiccation than to feed the animals until required for issue. So considerations of economy, having the ascendancy, prevailed.

DIET TABLE.

Sunday.	Monday.	Tuesday.	Wednesday.	Thursday.	Friday.	Saturday.
Breakfast: Coffee. Bread. Hominy, with gravy. Cold boiled or roast pork.	Breakfast: Coffee. Bread. Meat hash.	Breakfast: Coffee. Bread. Succotash, with pork gravy. Cold boiled pork.	Breakfast: Coffee. Bread. Meat hash.	Breakfast: Coffee. Bread. Hominy, with gravy. Cold boiled pork.	Breakfast: Coffee. Bread. Fried fish or meat hash.	Breakfast: Coffee. Bread. Hominy, with gravy. Cold boiled or baked pork.
Dinner: Roast beef. Bread. Rice pudding. Potatoes.	Dinner: Baked pork and beans. Bread. Potatoes.	Dinner: Beef soup. Meat or baked fish. Bread. Potatoes.	Dinner: Beef stew. Bread. Potatoes. Rice pudding.	Dinner: Baked pork and beans. Bread. Potatoes.	Dinner: Baked fish or boiled pork. Bread. Potatoes.	Dinner: Beef stew or roast stew. Bread. Potatoes. Rice pudding.
Supper: Tea. Bread. Beef gravy.	Supper: Coffee. Bread. Pork gravy.	Supper: Tea. Bread. Cold boiled pork.	Supper: Coffee. Bread. Beef gravy.	Supper: Tea. Bread. Cold pork and beans.	Supper: Coffee. Bread. Gravy.	Supper: Tea. Bread. Cold meat.

It has been said, and apparently sanctioned by the highest medical authority, that at this post and at Fort Mackinac, malarial diseases were unknown among the native inhabitants, and that only imported cases were ever seen in these regions; but it has been discovered that such statements are incorrect. Indeed, the prevalence among the native population of intermittent fevers and intermittent neuralgia is quite equal to the same in many southern latitudes that are supposed to be particularly liable in that direction. The first case coming to notice was a half-breed woman, born and brought up here and who had never been away, who resided below the fort about one mile on the Portage road. It was a well-marked and severe case of tertian intermittent. Soon after that another, in a three-fourths Indian, aged over seventy years. He was born on the south shore of Lake Superior, but had been a resident for fifty years in this vicinity. This was a tertian facial neuralgia, and very severe. About a dozen cases from Churchville have called at the post for advice within the year, four of whom were native Indians, and two Indians born near Hudson's Bay, and who had never been south of this place. At Fort William, province of Ontario, Canada, on the north shore of the lake, in the middle of last September, there was seen a well-marked case of intermittent fever which had been running from the 1st of June, in a native Scotch girl, aged about twelve years, brought up at that post. She had all the characteristics of chronic malarial poisoning—chronic enlargement of the liver and spleen; and the paroxysms the while had been occasionally quartian, tertian, or quotidian, presenting the usual capriciousness in this respect that the disease exhibits along the banks of the Mississippi north of St. Louis.

Furthermore, since this report has been commenced, twenty cases have occurred in native Indians, half-breeds, and native Canadian-French inhabitants residing along the river, in all of which quinine had to be given to obtain relief, although it is mid-winter, a season of the year when such maladies are rarely seen in any latitude north of 40°. These cases have been accompanied with hepatic and splenic enlargements, tenderness on pressure over these organs, and sympathetic neuralgia in various parts of the chest, head, and upper extremities. Upon investigating the antecedents of each individual for the purpose of determining, so far as practicable, the prevalence of malarious disorders, it is believed that this northern section is no exception to the usual law of paludal exhalations and consequent diseases.

Statement showing mean strength, number of sick, and principal diseases at Fort Brady, Michigan, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	107.41	201	2	20	15	4	1	.....	19	1	47	1
1869.....	106.66	194	1	42	21	7	.....	10	14	1	33	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT MACKINAC, MACKINAC, MICHIGAN.

REPORT OF ACTING ASSISTANT SURGEON H. R. MILLS, UNITED STATES ARMY.

Fort Mackinac is situated on a bluff on the southeastern portion of the island of Mackinac, near the straits of the same name which connect Lakes Huron and Michigan, latitude 45° 51' 22" north, longitude 84° 41' 22" west. Height above the lake, 155 feet; above the sea, 728 feet. The nearest post is Fort Brady, 60 miles to the northeast. The only town of importance near the post is Sheboygan, on the mainland, 18 miles south. Its population is about 2,000. The nearest railroad station is at Saginaw, 150 miles distant. The island was first occupied by the English as a military post, soon after the destruction of old Fort Mackinac and its garrison on the mainland by the French in 1763, on account of its security from attacks from Indians. About 1795, it was turned

over to the United States government by treaty, as a part of the result of the revolutionary war, but in 1812 it was again occupied by the English. The island is about nine miles in circumference, and rises on its eastern and southern shore in abrupt rocky cliffs, the highest point being 250 feet above the water, Fort Mackinac being situated on the south side near the lake. Situated on the highest point of the island and about half a mile to the rear of the fort is "Fort Holmes," which was built by the English during their occupancy of the island in 1812-'13-'14, and called by them "Fort George." It was upon this point that the United States forces were making an attack when Major Holmes, of the United States Army, was killed, which circumstance subsequently gave the present name to the work.

Geologically the island is made up of the Onondaga salt group of the upper silurian system, and the upper Helderberg limestone group of the devonian system. The former is 25 feet in thickness, forming the base, and the latter is about 275 feet in depth, forming the body and cap. The face of the south end of the island is most plainly terraced. Beginning with the top of Fort Holmes, more than 200 feet above the present level of the lake, there are four distinctly marked tables or terraces before we come to the water, each bearing the undulating line of aqueous formation. Another proof of the existence of wave action, which must have been in process for a long period of time, is the fact that from the base of Fort Holmes to the present beach, worn, rounded pebbles, similar to those on the beach, are found upon digging two or three feet into the earth at any point on the line indicated; all arranged and sorted according to size, just as they are on the beach at the present time. The existence of the island is therefore evidently due to no sudden uplift, but to the gradual subsidence of the waters of the lakes, consuming thousands of years of time.

The timber on the island is mostly small, probably owing to its having been cut down at not a very remote period. It is composed of beach, maple, oak, and poplar, principally, with a liberal supply of the *conifera*, viz: pine, spruce, hemlock, cedar, juniper, tamarack, &c. *Conium maculatum* is found in abundance.

The reservation contains a little over two square miles. The surface is regular, but there is very little soil covering the underlying rock.

The climate is agreeable, the presence of a large body of water preventing extremes of temperature. The extremes are 90° F., and 23° F., the average about 39° F.

The fort consists of stone and earthworks, inclosing about half an acre of ground.

The barrack is a two-story frame building, 112 by 29 feet, and intended to accommodate one company. The dormitories are fitted with two-story double-bunks, and allow 377 cubic feet of air space per man. There are no special arrangements for ventilation.

Two buildings are used as officers' quarters. One, the oldest building at the post, is of stone; the other is a one-story frame house. These allow about four rooms to each officer. The buildings are very plainly finished, and have none of the modern conveniences. They are warmed by wood stoves.

The hospital is a comparatively new frame building outside the fort, measuring 46 by 30½ feet. There are two wards, one for six beds, air space per bed 739 feet; the other, for four beds, air space per bed 650 feet. It is heated by wood stoves.

There is a post library of 200 volumes.

The water supply is from the lake by water-carts, and from five cisterns. The natural drainage is good, and is the only form in use.

The general sanitary condition of the post is good, and there are no prevailing diseases.

Statement showing mean strength, number of sick, and principal diseases at Fort Mackinac, Michigan, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fevers.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarhal affections.*	No. of deaths.
1868	55.16	54	.....	4	9	.....	9	1	.....	.....
1869	65.16	99	1	25	8	2	14	1	9	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF THE SOUTH.

POSTS DESCRIBED.

Newport Barracks, Newport, Kentucky.
Taylor Barracks, Louisville, Kentucky.
Charleston, South Carolina.
Savannah, (Oglethorpe Barracks,) Georgia.
Atlanta, (McPherson Barracks,) Georgia.

Fort Pulaski, Georgia.
Key West, Florida.
Fort Jefferson, Florida.
Fort Barrancas, Florida.
Mobile, Alabama.

NEWPORT BARRACKS, KENTUCKY.

REPORT OF SURGEON GLOVER PERIN, UNITED STATES ARMY.

This post is in latitude $39^{\circ} 5'$ north, longitude $7^{\circ} 29' 4''$ west from Washington, and at an elevation of 588 feet above the sea. It is situated on the left bank of the Ohio River, at its junction with the Licking, and constitutes a part of the town of Newport, Kentucky. On the opposite shore of the Ohio River is the city of Cincinnati, and on the left bank of the Licking, at its junction with the Ohio, the city of Covington. The three cities are said to contain nearly 250,000 inhabitants.

The first purchase at this point was made in the year 1803. The deed sets forth that the land was for the purpose of having erected thereon an arsenal, magazine, &c. Two additions to the site were made by purchase, in the year 1806, giving a total area of about six acres. The ground is about five feet higher on the Ohio River front, sloping gradually to Taylor street, and has about the same descent from the northeastern line to the Licking River. The mean elevation above extreme low water in the Ohio River is nearly 55.8 feet.

The southeastern, or Taylor street front, is inundated once in from five to seven years, and the whole ground once in fifteen years. From an inspection of the retained copies of sick reports I have been unable to discover that these inundations had any effect upon the health of the command.

The post has been occupied mainly as a depot for recruits. The temporary barracks erected at an early period have been replaced by structures built of brick; this change was made, with few exceptions, between the years 1843 and 1848.

The geological formation at this point is that of the lower silurian. The blue limestone containing the trilobite and other characteristic organic remains of this period is about sixty feet below the surface, and is covered by alluvium, sand, and gravel.

The primitive forest growth in the neighboring country is beech, walnut, hickory, sugar-tree, white oak, &c.

The climate may be classed among the temperate, and the seasons are tolerably well defined. By inspection of the accompanying abstract of meteorological observations taken from the register kept at this post, embracing a period of fourteen years, from 1856 to 1869, inclusive, it will be perceived that the seasons change by quite a regular gradation.

The greatest extremes of temperature registered during this period were 97° and 20° F. Average mean temperature during the winter was 33.24° ; spring, 53.12° ; summer, 71.25° ; autumn, 55.23° ; average annual rain-fall, 43.89 inches. The prevailing winds are the south, southwest, north and northwest.

The summer season is the longest, as the temperature of the months of May and September would point to their classification with that season, rather than with spring and autumn respectively. The mean temperature of the month of May for fourteen years was 63.07° , and of September, 67.42° .

Figure 17 shows the general arrangement of the post.

A, hospital; B, laundry and store-rooms; C, church; D, officers' quarters; E, general headquarters; F, headquarters; H, stables; I, commissary and carpenter; K, magazine; L, guard-house; M, men's sinks and wash-house; N, wood-yard; P, barracks; L R, Licking River; R, road; S, parade ground; T, tents.

Two sets of officers' quarters, the headquarters building, and the stable, front on the Ohio River. On the side overlooking the Licking River are the various shops, magazine, and guard-house; on the south, three blocks of barracks and the hospital; on the east, the chapel and officers' quarters.

The two buildings occupied by troops are on the south side of the garrison, 14 feet from Taylor street. They are three stories in height, built of brick, with porches on the side overlooking the parade in one, and on both sides in the other.

The two upper floors are used as dormitories, and the basements as kitchens and dining-rooms. The barracks are warmed by two stoves in each room, lighted by candles and ventilated by windows. The dimensions of two dormitories are $83\frac{1}{2}$ by 25 by 12 feet, and of the other two $58\frac{1}{2}$ by 28 by 12 feet. The average occupancy for the year 1869 was 228 men, giving about 471 cubic feet of air space per man. Two story double iron bunks are used, with the customary bedding.

Temporary wash-rooms have recently been added to three of the dormitories, but the scanty supply of water lessens their usefulness materially. There are no arrangements for water-closets connected with the barracks, the only sink for enlisted men being the one over the sewer, at the southwest angle of the garrison. The barracks for the soldiers are satisfactory when not crowded to excess. The kitchens and mess-rooms are in the basements of the barracks; the kitchens are supplied with excellent ranges, of capacity to cook for about 500 men.

Quarters for laundresses and married soldiers are in a three-story block at the southwest angle of the garrison. This block is built of brick, with porches on the north side; access to the second and third floors is by means of stairways on the porches. The stories are divided in such manner as to give six rooms on each floor. The upper rooms are $13\frac{1}{2}$ by 15 by 12 feet, the basements $13\frac{1}{2}$ by 15 by 8 feet. Five families, who have two rooms each, reside in this building.

There are two sets of officers' quarters at the northeast angle of the garrison, fronting the Ohio River. These have a hall and nine rooms each. They are so arranged as to be assignable only to field officers. They are built of brick, with a porch in front.

There are two sets of officers' quarters on the east side of the garrison fronting the parade. These sets have four rooms and basements to each.

All the quarters are heated by open fires, and scantily supplied with water hauled in carts. They have cisterns, but these do not afford sufficient quantity. There are neither water-closets nor bath-rooms in the officers' quarters. Each set is supplied with a sink in the yard. These sinks have vaults, varying in depth from six to fifteen feet.

The arsenal building is a two-story brick structure, $84\frac{1}{2}$ by 36 feet, occupied as store-rooms and offices.

The guard-house, on the west side of the parade ground, is a two-story brick building, the upper story being partly occupied by the prisoners, and the lower as a guard-room and place for storage of fuel. The capacity of the upper floor is 56 by 39 by 14 feet. One room, 12 by 15 feet, is taken

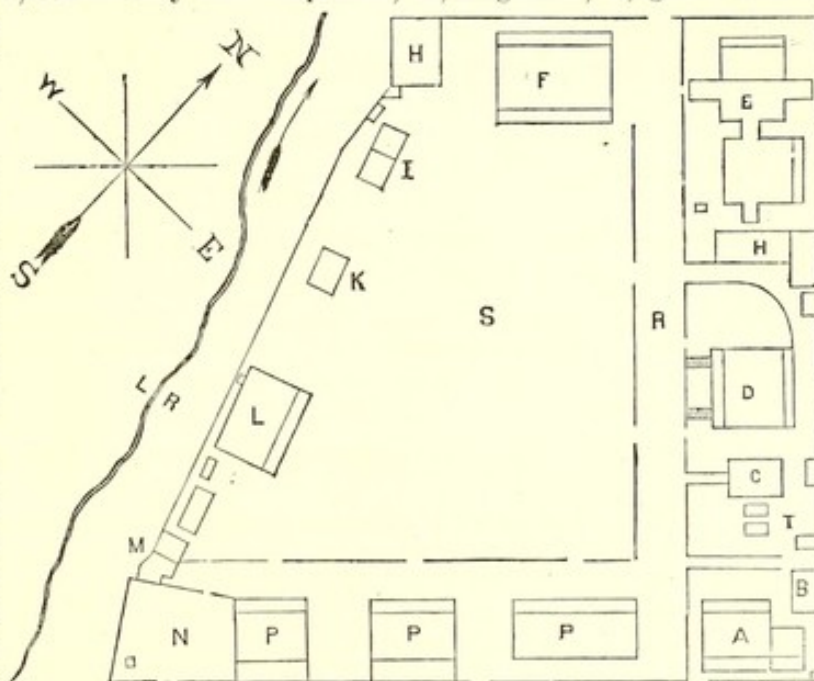


Figure 17.—Scale, 150 feet to 1 inch.

from this floor for the officer of the guard, and the remainder is allotted to the prisoners. Of this space one room, 19 by 30 by 14 feet, has been added recently. The guard-house is now ample, and well adapted for the purpose. It is ventilated by windows on all sides, and warmed by stoves.

The hospital is situated at the southeast angle of the garrison. It is a two-story brick structure, 50 by 25 feet, erected in the year 1843. A one-story brick addition, 18 by 24 feet, for a dining-room, and a frame kitchen, 18 by 24 feet, have been erected since. The lower, or basement story, is divided into rooms for office, dispensary, store-room, and apartments for the steward. The upper floor is divided into two wards, with folding doors between, and two small rooms for attendants.

The two wards measure $35\frac{1}{2}$ by 23 by $10\frac{1}{2}$ feet, in the aggregate, and contain eight beds, which would give about 1,054 cubic feet of air space per bed.

The wards are ventilated by three windows, and doors toward the north and south. The building is warmed by open fires, except the dining-room, which is heated by a stove, and lighted at present by candles. The dispensary is provided with a counter, chest of drawers, and shelves. One wall tent is used as a bath-room, and one as a dead-house. The baggage of patients is stored in a wardrobe. The hospital is too small to answer the requirements of a depot like this. It is defective in construction, badly ventilated, deficient in bathing facilities, and has no water-closets. The daily average number of sick requiring treatment in hospital during the years 1868 and 1869 was 11.9; and as only eight could be provided for in the wards of the hospital the others were placed in tents. Wards were constructed by erecting hospital tents on a small vacant space to the north of the hospital. Two of these tents were placed with the ends together, floored and warmed by a large wood stove, placed in one, with pipes passing through and out of the door of the other. At times, during the last four years, as many as four of such wards have been required.

The post bakery is in the basement of the block occupied as quarters for the families of soldiers.

There is no place that could be denominated a laundry.

The chapel is a frame structure, 45 by 28 by $13\frac{2}{3}$ feet, between the officers' quarters and the hospital, on the east side of the parade. It is also occupied as a school-house.

The stable is at the northwest angle of the garrison, 49 by 28 feet, built of brick, and is one story and a half high.

There is no post library.

Water is mainly supplied from the Ohio River by means of carts. There are seven cisterns. One at the hospital has a capacity of 19,950 gallons. The others contain 16,500 gallons each, and are distributed as follows: One to each set of officers' quarters in front; one at the arsenal building; one at the officers' quarters on the east side of the parade; one at the guard-house, and one between the block occupied by the permanent company and the quarters of the soldiers' families.

The quantity of water supplied the post is necessarily small. The project of sinking a well to the depth of the bed of the Ohio River has been favorably considered, and I have no doubt but the work will soon be commenced. Such a well would give an abundant supply of filtered water. The quality of the Ohio River water, which is that chiefly used, is exhibited in the subjoined statement of analyses performed by Professor Edward S. Wayne, of Cincinnati, Ohio.

There is no organized system for extinguishing fire.

The drainage of the grounds is surface. As the Ohio River front of the garrison is several feet higher than the southern front, and the eastern side much higher than the west, these inequalities are made available in the arrangement of surface drains. An underground sewer, traversing the parade from east to west, emptying into the Licking River, and communicating with the vaults of the sinks on the east side of the garrison, is now being laid down.

The sanitary condition of the post at present is satisfactory. The prevailing diseases last year were febrile intermittents, diarrhœa, and syphilis. It would not be correct, however, to ascribe the prevailing diseases to this locality, as the men received at this depot are usually affected by the diseases incident to the place where they have been living. They do not remain here long enough to exhibit the operation of local causes.

The men composing the permanent party are very healthy. Their duties being purely military, such as drill and guard, they are not exposed to the same causes of disease as soldiers belonging to regiments.

Statement showing mean strength, number of sick, and principal diseases at Newport Barracks, Kentucky, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	321.58	615	6	120	142	63	64	25	3	33	7
1869.....	234.	415	2	90	63	.....	59	13	2	52	4

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Abstract of average temperatures and rain fall at Newport Barracks, Kentucky, for the period from 1856 to 1869, inclusive.

Months.	Monthly average temperature.	Monthly average range of temperature.		Monthly average rain-fall.
		Maximum.	Minimum.	
	Degrees.	Degrees.	Degrees.	Inches.
January.....	30.23	52	5	2.84
February.....	35.35	60	4	2.04
March.....	42.50	68	17	3.39
April.....	53.79	76	32	3.97
May.....	63.07	75	44	5.27
June.....	72.69	88	62	3.78
July.....	76.42	91	61	4.43
August.....	74.64	88	58	3.80
September.....	67.42	85	46	3.81
October.....	54.92	77	35	2.46
November.....	43.35	68	20	3.48
December.....	34.14	60	11	4.52

Analyses of the water of the Ohio River, performed by Professor Edward S. Wayne, of Cincinnati, Ohio.

Water taken from the river when there was a depth of thirty-four feet in the channel, contains—

Carbonate of lime.....	grs. 3.41
Sulphate of lime.....	" .31
Chloride of calcium.....	" .47
Chloride of magnesium.....	" .10
Chloride of sodium.....	" .17
Oxide of iron.....	" .05
Organic matter.....	" .43

Total in a wine gallon..... " 4.94

When there was a depth of eight feet in the channel—

Carbonate of lime.....	grs. 4.71
Sulphate of lime.....	" .30
Chloride of calcium.....	" .49
Chloride of magnesium.....	" .19
Chloride of sodium.....	" .21
Oxide of iron.....	" .11
Organic matter.....	" .23

Total in a wine gallon..... " 6.24

When there was a depth of four feet in the channel—

Carbonate of lime	grs. 5.63
Sulphate of lime	" .24
Chloride of calcium	" .84
Chloride of magnesium	" .20
Chloride of sodium	" .34
Oxide of iron	" .29
Organic matter	" .29
<hr/>	
Total in a wine gallon	" 7.83
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TAYLOR BARRACKS, LOUISVILLE, KENTUCKY.

REPORT OF ASSISTANT SURGEON C. R. GREENLEAF, UNITED STATES ARMY.

The post of Taylor Barracks is located in the southern outskirts of the city of Louisville, Kentucky, and covers an area of four squares, being bounded on the south by Ormsby avenue, east by First street, north by St. Catharine street, and on the west by Third street. Latitude $38^{\circ} 3'$ north, longitude $8^{\circ} 27' 1''$ west from Washington.

Within a radius of about a mile from the barracks is a range of low hills, skirted on the south and east by the head of Beargrass Creek, which flows into the Ohio River, and on the south and west by the head of a creek which flows into Salt River and thence into the Ohio. Between the city and these hills the original growth of timber, which was very heavy, has been cut down, and the country presents a level, flat surface, cut up by anticipated streets, pastures, &c., and through which numerous little streams run to the creeks above mentioned.

From the date of the erection of the barracks until June, 1866, the station was used successively as a rendezvous for drafted men, a depot for deserters, and a depot for the reception of troops to be mustered out at the close of the war.

The post is almost completely encircled by marshy ground, which is, however, being rapidly filled up by debris from the city, and upon which it is proposed to erect many of the finest dwelling-houses.

The soil is a rich alluvium, with a substratum of sand, beneath which is a layer of boulders. Water is found at a depth of 25 feet. As the city limits are extended drains are dug, which carry off a large quantity of the surface water and leave but little material for the development of disease.

The average temperature for the year 1869 was 55° F. The prevailing winds are from the southwest.

Taylor Barracks consist of a series of poorly constructed wooden pavilions arranged in the form of a square, and inclosing an area of about sixteen acres of ground. The walls of the buildings are battened, the roofs shingled, and, with the exception of the officers' quarters, the ceilings are open.

The building forming the north side of the barracks is 540 by 24 by 16 feet, and occupied as quarters for four companies. From the center of each company quarters, an "L," 18 feet long, 20 feet wide, and 16 feet high, projects at right angles, which is used as quarters for the first sergeant of the company. In rear of the company quarters an "L," 20 by 20 feet, and 16 feet high, projects, for use as the company kitchens. Fifty feet in the rear, and detached from the buildings, are latrines, 23 by 12 by 16 feet, placed over dry wells, 30 feet deep.

Two buildings, 180 by 24 feet, form the east side of the barracks; one of them is occupied as company quarters, and is arranged like the north building, having "L's" in front and rear; the other is used as a fire-engine room, and quarters for the non-commissioned staff.

The south side is formed by a building corresponding in all dimensions (except length, which is 400 feet) to the north side, and is intended for use as company quarters.

The west side is formed by three buildings, each measuring 184 by 24 feet, and occupied as quarters for officers and their families,

The company quarters are warmed by coal stoves, lighted at night by candles, and ventilated through the ridge. The dormitories give 524 cubic feet of air space per man. The bunks are of wood, each frame making four berths, two above and two below. All cracks, nail-holes, &c., are closed by putty to exclude bugs, but the success is small, the walls, roofs, and ceilings of the buildings being full of them. The bedding of the men is good in quality and abundant in quantity.

The sinks are very well constructed, and from the nature of the soil do not for a long time fill up. They are dug until the stratum of boulders is reached, through which and the sand all the fluids percolate, leaving only the solid residue. One sink is used in common by two companies.

The kitchens, one for each company, are furnished with hydrants, and large cooking stoves or galleys. They are also abundantly supplied with delf ware and other conveniences.

Quarters for laundresses and married soldiers consist of six cottages, built of wood, each 49 by 18 feet, and divided into three rooms, furnishing accommodations for three families. Between the buildings is a yard about 30 feet wide. Water is supplied in abundance from hydrants. The rooms are lathed and plastered, and the walls of the cottages battened outside. Heating is done by stoves, and ventilation effected by windows and doors.

The buildings occupied as officers' quarters are old, like the rest; the walls and ceilings are, however, lathed and plastered, and by partitioning rooms to suit the convenience of the officers have been made comfortable. Each set of quarters has a small plot of ground in front for a garden, and one in the rear for a yard. The buildings are warmed by large drum stoves, burning coal. Ventilation is obtained principally through cracks and crevices in the walls, and at the doors and windows.

The store-houses are rooms partitioned off from the south building.

The guard-house is located in the southern end of the pavilion, forming the eastern boundary of the garrison; 70 feet of this pavilion have been partitioned off, double lined, &c., for safety, and divided into one large guard-room, 38 by 24 feet, and another, 36 by 24 feet, which is further subdivided into six cells, 6 by 9 feet each, on one side, and on the other (separated by a hall, 5 feet wide) a large cell extending the length of the room. These rooms are ventilated through the ridge, warmed by stoves, and lighted through grated windows.

The hospital is constructed of wood, 32 by 56 feet, and two stories high. The plan was made by General Thomas Swords, Deputy Quartermaster General, and is a condensation of the plan recommended by the Surgeon General in Circular No. 4. A hall, 8 feet wide, divides it in the center. The lower floor is appropriated for the kitchen, bath-room, dining-room, steward's quarters, attendants' quarters, dead-room, store-room, dispensary, and surgeon's office. A stairway, 4 feet wide, leads to the second story, which is divided by the hall into two rooms used as wards.

Figure 18 represents the general arrangement of the hospital.

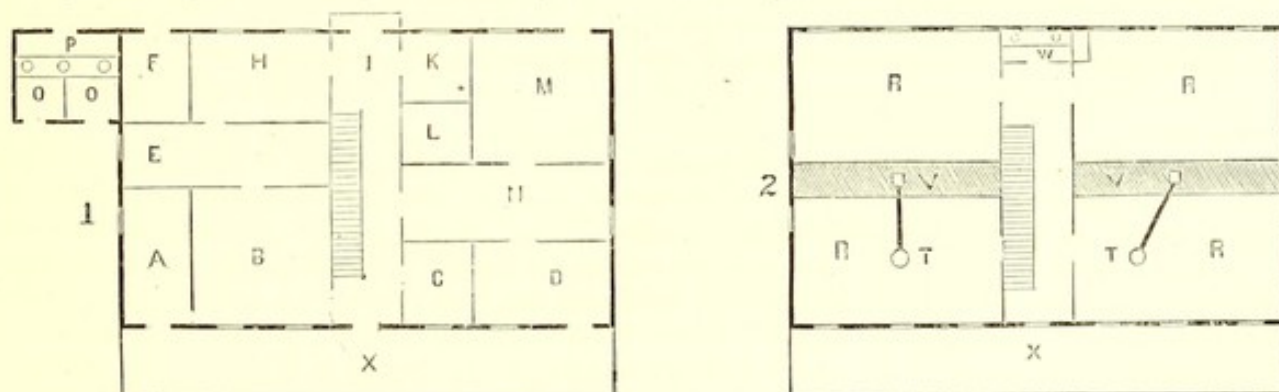


Figure 18.—Scale 24 feet to one inch.

1, first floor; 2, second floor.

A, office; B, dispensary; C, steward's room; D, matron's room; E, store-room; F, dead-room; G, attendant's room; H, hall or passage; K, bath-room; L, pantry; M, kitchen; N, dining-room; O, medical officers' water-closet; P, water-closet for men; R, wards; T, stove; W, water-closet; V, lattice opening to communicate with ridge ventilation; X, porch.

The wards have a capacity of 24 beds, giving to each 768 cubic feet of air space. At the head of the stairway is the water-closet, containing two sinks, (Carr's patent.) The privy outside is

similar in arrangement to those already described. In the west ward are the wash-stands. The bath-room is furnished with tin bathing-tubs, with hot and cold water. There are iron sinks in the kitchen, dispensary, and dead-room, with large earthen drainage pipes leading to the eastern corner of the building, and discharge into the dry well, which is also used as a privy.

All the rooms are lathed and plastered, and heated by stoves. The ventilation of the wards is accomplished by ridge ventilators, as recommended in the Surgeon General's plan. Along the north side of the building is a double porch, 8 feet wide, for use of the patients.

The bakery is located on the west front of the parade, and is a wooden structure, 32 by 24 feet, containing brick ovens.

The southeast corner of the ground is occupied by the quartermaster for stables, wood-house, and workshops. The stable, a new wooden building, measures 24 by 100 feet, with a dirt floor, and accommodates 20 animals. A hydrant is placed at the entrance, with a trough for watering the animals.

The post library is placed in a room in the north building, and contains a good selection of books.

The post is supplied with water from the Ohio River, conducted through pipes of the city water works. The water is of good quality and abundant. Its main impurity is mud, which can be separated either by being allowed to settle or by filtration. Sand and charcoal are the materials used for this purpose at the post. The color of the water during freshets is yellow, from red clay and sand, which deposit freely on standing. The water contains but little lime. Its color, when the river is low, and when seen in a body, is a dark green, but when observed in a glass, is almost colorless.

A fire-plug, hand-engine, ladders, and buckets constitute means of extinguishing fire at the post.

The natural drainage of the garrison is very defective; the surface of the ground is so little undulated as to make it almost impossible to carry off water except by artificial drains. Advantage has been taken of such slight declivities as exist to construct drains of wood, and where an elevation is met with it is cut through. Nearly all the drains center at the southwest corner of the garrison, and from thence a covered drain carries the water along the west side to the second square north, where it empties into one of the city drains. The eastern portion of the ground is drained into a well dug to the boulders. This well is an experiment, having been but recently sunk, and thus far it fully answers the purpose for which it was intended. It is in contemplation to sink a number of these wells at different points through the garrison, into which the whole of the drainage is to be turned.

Débris of the post is removed daily outside the garrison limits.

The dead are buried at the National Cemetery at Cave Hill. There are no gardens at the post.

The diseases endemic in this locality are remittent, intermittent, and typhoid fevers, rheumatism, and dysentery.

Statement showing mean strength, number of sick, and principal diseases at Taylor Barracks, Louisville, Kentucky, white troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	301.75	841	494	75	1	1	27	.....	19	3	42	3
1869.....	193.25	451	183	54	21	.....	46	1	11	.....	67	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Statement showing mean strength, number of sick, and principal diseases at Taylor Barracks, Louisville, Kentucky, colored troops, for the year 1868.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Venereal diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (4 months)	22	23	1	1	3	10	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CHARLESTON, SOUTH CAROLINA.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEON T. C. SKRINE, UNITED STATES ARMY.

The military post or citadel of Charleston is situated near the center of the city, on a ridge about 35 feet above sea level. Latitude $32^{\circ} 45'$ north, longitude $79^{\circ} 50'$ west.

The city of Charleston is on a neck of land between the Cooper and Ashley Rivers, and now includes an area of three miles in length by two in breadth at the widest part. The soil is alluvium, and a large part of the present city was formerly subject to inundation, and was cultivated as rice fields. The neighboring country is low and swampy, and is prolific in malaria. The climate is mild. The temperature in summer seldom exceeds 90° or falls below 76° , the average being about 83° from May to October. The range of temperature in winter is between 68° and 35° .

The citadel was originally built for a State military academy, and also, probably, for defense in case of servile insurrection. The central portion was completed in 1827, the wings two or three years later. The western wing was destroyed by fire in October, 1869.

It was first occupied by the United States in 1865. It forms a hollow parallelogram, constructed of brick and stone, two stories and a basement in height, for the general plan of which see Figure 19.

1, basement; 2, first floor; 3, second floor.

A, quarters of enlisted men; B, gate and sally-port; C, guard-room; D, guard-house; E, dining-room; G, kitchen; H, yard; L, engine-house; M, privies; N, commissary; P, quarters of officers; S, dispensary.

There are no special arrangements for ventilation in any of the rooms.

The dormitories are fitted up with double bunks in two tiers, and allow about 850 cubic feet of air space per man.

The water supply of the building is from cisterns, and is sufficient in quantity and of good quality. A room in the basement is fitted up as a bath-room for the enlisted men.

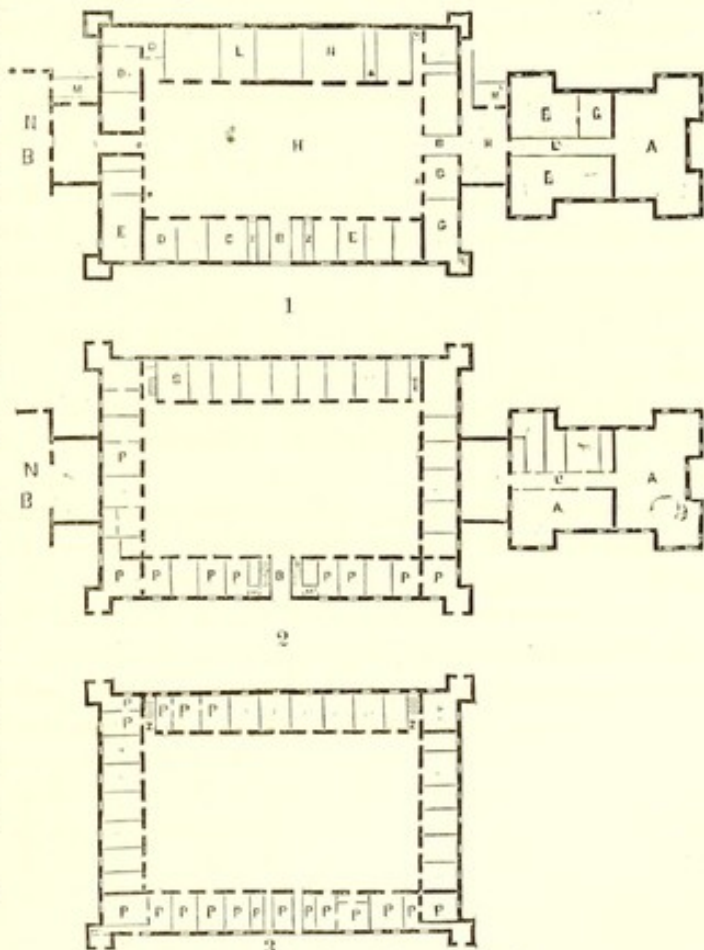


Figure 19.—Scale 120 feet to 1 inch.

The present hospital, a plain wooden pavilion, is situated about 80 yards from the citadel, and was formerly the eastern ward of the Tradd Street Hospital, now occupied by the quartermaster's department. It measures 90 by 25 feet, has a capacity of 14 beds, allowing 1,243 cubic feet air space to each, is well lighted, and has ridge ventilation. It has no water-closet or bath-room, and no piazzas, and is not well adapted to its purpose.

The drainage of the post is good, being connected with the city system of sewerage.

The general sanitary condition of the post is good, and few of the cases of disease are supposed to be due to local causes.

Statement showing mean strength, number of sick, and principal diseases at Charleston, South Carolina, white troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	426.08	892	12	205	88	18	146	63	1	88	3
1869.....	272.58	432	1	74	59	2	76	25	.....	34	2

Statement showing mean strength, number of sick, and principal diseases at Charleston, South Carolina, colored troops, for the year 1868.

Year.	Mean strength.	Whole number taken sick.*	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (three months).....	162.66	158	1	27	11	4	3	18	15	1	27	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

OGLETHORPE BARRACKS, SAVANNAH, GEORGIA.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEON E. F. BAKER, UNITED STATES ARMY.

This military post is in the central part of the city of Savannah, Georgia, latitude $32^{\circ} 5'$ north, longitude $81^{\circ} 7'$ west, and elevated about 40 feet above low-water mark. Situated upon a sandy plateau, this city stands upon the southern side of the river of the same name. This ridge extends upwards of a mile along the river, terminating abruptly. At the depth of twenty or thirty feet, fine water is obtained. The city is bounded on the east and west by tide swamps, which are subject to inundations by the ordinary spring tides, and are consequently well adapted to the cultivation of rice.

The site originally chosen for the post was situated in the outskirts of the town, and in the vicinity of low swampy lands just mentioned, where it was found to be so unhealthy that the camp could not be occupied during the summer; it was therefore necessary to move the command into the more central part of the city. Accordingly, in the year 1833 the present site of Oglethorpe Barracks, situated in the most elevated part of the city, was purchased from the city government, and in 1839 the buildings of the post were completed. The city, being divided by numerous and wide streets intersecting each other at right angles, is open and spacious, and being planted with the Pride of India, (*Melia azedarach*), the long-continued heats of summer, moderated by the sea-breeze, prove less oppressive than in some more northern towns. The maximum temperature is

99° F.; minimum, 31° F.: average of hygrometer, 65.2. In the summer the prevailing winds are east and southeast; in winter, north, northeast, and west.

The post occupies a lot of about three-fourths of an acre in extent, fronting upon Bull street, and bounded on the south by Harris street, on the east by Drayton street, and on the north by Liberty street. The lot is inclosed by a brick wall, 10 feet high; the buildings of the barracks are placed along the four respective sides of the square, facing inwardly, and having a large open space within for a parade ground.

The troops are quartered in a two-story brick building, with heavy walls, slate roof, and galleries extending along the front above and below. The galleries are supported by circular pillars, and the upper gallery is protected by an iron railing, about one yard in height, extending between each pillar. The sally-port, opening to the rear, upon Drayton street, divides this building into two sets of quarters, each calculated for one company, and arranged as follows: A company office and three rooms for laundresses' quarters in the lower story, and one large room for men's quarters in the upper story; in the basement are the kitchen and dining-room; over the sally-port is a small room which separates the two dormitories on the second floor, and is used as a store-room. With the present small command the dormitories give 1,039 cubic feet of air space per man. Wooden bunks, painted and in good repair, are used. The bath-room for the use of the men is conveniently arranged, and contains five bath-tubs; near it is a sink containing a number of hand-basins. Ordinary vaults are situated conveniently to the quarters, and are cleaned out when required. A much better arrangement would be to connect the water-closets with the city sewers. The kitchen and mess-room are well furnished. The principal building occupied as quarters for officers, located on the west side of the square, is similar to that just described as soldiers' quarters, and divided below by the front sally-port opening into Bull street; built of brick, two stories high, with basement, the latter containing the kitchens and dining-rooms. The upper floors are each divided by a hall into two large rooms, used as quarters. The other building for officers' quarters has no basement; the lower story consists of one large and undivided room, used as a general lumber room and carpenter shop; the second story contains three sets of quarters of two rooms each, with kitchens and dining-rooms in the attic. This is the only building at the post which has attic rooms.

Water-pipes are introduced into each set of officers' quarters, and bath-rooms and water-closets are constructed in the principal building. A bath-house is also situated near the officers' quarters, and waste-pipes connect with the city sewers. All the quarters are supplied with fireplaces, which, with windows, afford the only means of ventilation.

The only special buildings for offices are those for the quartermaster's and adjutant's offices. The first is 25 by 14 feet, and contains two rooms, equal in size. The adjutant's office is in a small brick building adjoining the preceding. Both buildings are located on the north side of the parade, between the smaller set of officers' quarters and the stables. The only general store-room is in the lower story of the smaller set of officers' quarters; length, 60 feet; breadth, 30 feet; height, 10 feet.

The guard-house is a two-story frame building, located on the south side of the parade. It has been erected since the war, and is ample in size and well adapted for a two-company post; warmed by two fireplaces; the cells are lighted by grated windows; ventilation is adequate. The average occupancy of the guard-house is 5.11.

The hospital is situated upon the same side with the guard-house. The lower story is built of brick, the upper story of wood. Its dimensions are 59 by 24 feet. A veranda, 10 feet wide, extends around the building above and below; it is warmed by fireplaces, artificially lighted by kerosene oil, and well ventilated when not crowded. The ground floor contains the dispensary, store-room, kitchen, and dining-room. The upper story is divided into two wards of equal size; and each corner of the veranda above is inclosed, making four small rooms for the accommodation of attendants. A small two-story building connects with one end of the hospital by a covered way. The upper story contains a bath-room and water-closet combined, being furnished with a bath-tub, hydrant, and stool. The lower part of the building contains the hospital privy. The dispensary is ample in size and well furnished. Each ward measures 26 feet 9 inches by 23 by 13 feet, and contains eight beds, giving to each 999 cubic feet air space. The laundry is a small house furnished with a stove, a 20-gallon caldron set in masonry, tubs, and other conveniences for washing. There being no dead-house, one of the small rooms in the second story of the hospital building is used for that

purpose when required, though it is ill adapted for that use. The store-room is fitted up with boxes for the storage of baggage.

The stable, situated in the northwest angle of the lot, is a substantial brick building, 43 by 22 feet, and one and a half stories high. The lower floor is used for the accommodation of public animals, and the loft for the storage of forage.

The post library is kept in the adjutant's office, a soldier being detailed as librarian. The collection includes about 200 volumes, principally popular novels, travels, and the class of books comprised in "Harper's Select Library."

The water supplied to the garrison is obtained from the Savannah River, and is first drawn off into a reservoir, where some of the impurities subside. It is then pumped into an elevated tank, from which it is distributed to the city. The amount of organic matter in the unfiltered water is objectionable; but as the water used for drinking purposes throughout the garrison is filtered through charcoal and gravel, this defect is in a great measure removed. The following tabular statement will show the result of an examination of the water both before and after filtration:

Physical character of the water.	Reaction.	Solids per gallon, filtered water.				Solids per gallon, unfiltered water.				Hardness—Clark's scale.	
		Total solids, (by evaporation.)	Organic matter by permanganate.	Oxygen required for oxidation of organic matter.	Chlorine.	Total solids, (by evaporation.)	Organic matter by permanganate.	Oxygen required for oxidation of organic matter.	Chlorine.	Before boiling.	After boiling.
Usually clear, but is turbid after heavy rain. Tasteless; no odor.	Neutral	Grains. $1\frac{1}{16}$	Grains. .686	Grains. .0343	Grains. .27	Grains. $1\frac{1}{16}$	Grains. 2.89	Grains. .1445	Grains. .37	.70	.70

In addition to the above specified substances, traces of the following were discovered by testing the water concentrated, viz: lime, chlorine, sulphuric acid or sulphates, nitrous acid, ammonia, phosphoric acid. Excepting chlorine, no results were obtained by testing the water before it was concentrated. A few drops of the perchloride of gold colored the unfiltered water purple, but did not produce much if any change in the filtered water.

The amount of inorganic substances, with the exception of silica, is very small, so small that they probably cannot produce any injurious effects. The solids obtained by evaporation appeared to consist principally of silica, as a large residue, which was undissolved in nitro-hydrochloric acid, dissolved readily in a hot solution of potash.

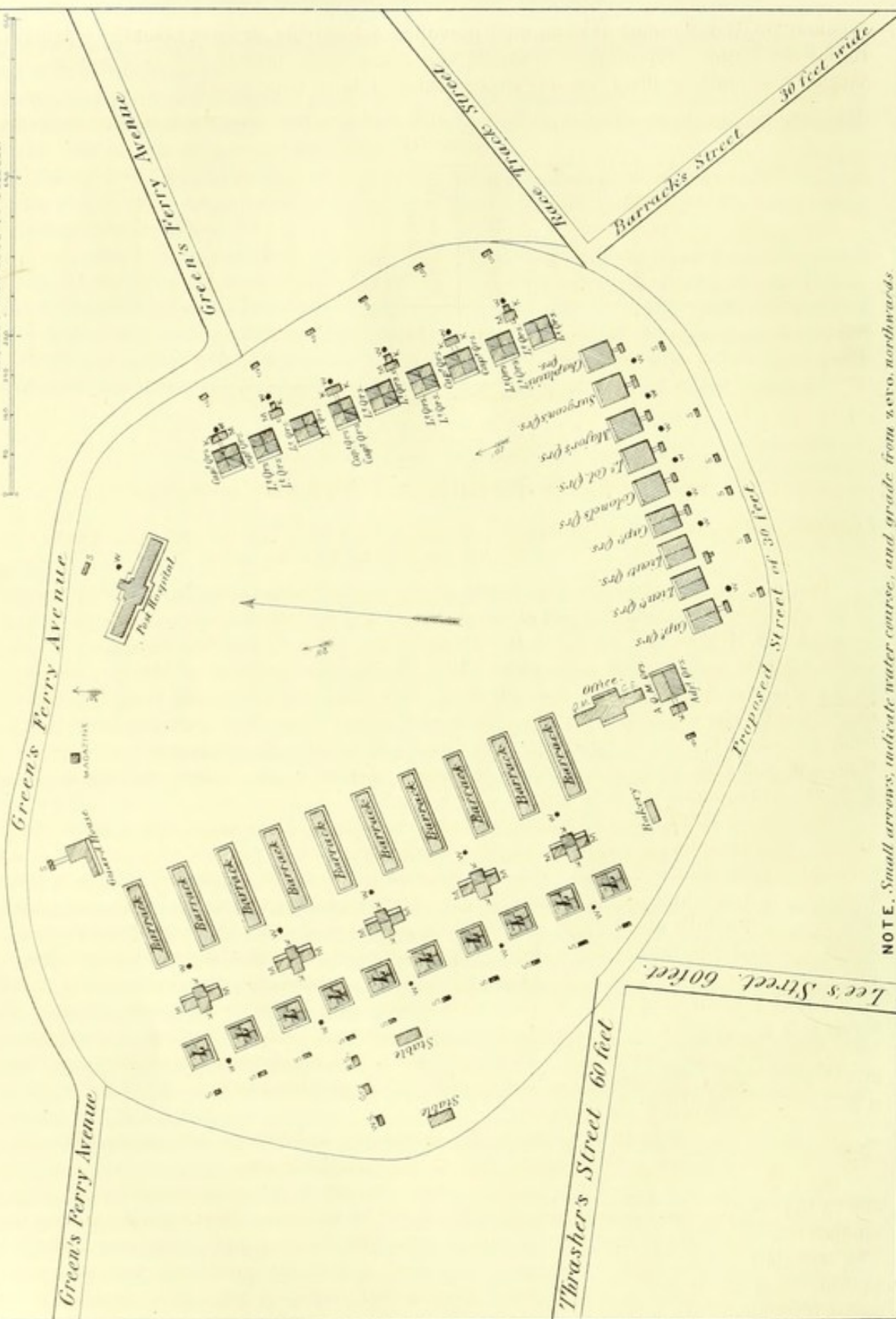
Means of extinguishing fire at the post consists of a fire-plug in the center of the parade, and sufficient hose to reach all parts of the buildings.

The drainage of the grounds is inadequate, there being no convenient way of connecting drains with the city sewers, owing to their distance from the post. The defect has been remedied in a measure by having four large pits dug, one at each corner of the parade, which pits are covered over, leaving an opening about two feet square, which is guarded by an iron grating, to receive the water. The pits are unlined, and as the soil is light and sandy the water soon oozes away. During moderate rains the pits are sufficient to carry away all the water, but during severe storms water sometimes accumulates and remains upon the surface for several hours after the storm has ceased.

The general sanitary condition of the post has been very good during the past year. The prevailing diseases have been malarial fevers, diarrhœa, catarrh, venereal diseases, with a few cases of

MC'PHERSON BARRACKS ATLANTA GEORGIA.

Scale, 320 feet to inch.



rheumatism, though none of them have prevailed extensively, or have assumed a dangerous aspect. By far the larger proportion of diseases has arisen from imprudence or excesses, and, with the exception of malarial fever, cannot be considered to be of local origin.

Statement showing mean strength, number of sick, and principal diseases at Savannah, Georgia, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	76.83	254	131	26	2	12	.....	8	1	6	2
1869.....	61.33	106	23	9	3	9	2	6	1	4	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

McPHERSON BARRACKS, ATLANTA, GEORGIA.

INFORMATION FURNISHED BY SURGEON A. K. SMITH, UNITED STATES ARMY, AND ASSISTANT SURGEON J. W. WILLIAMS, UNITED STATES ARMY.

This post is located within the limits of the city of Atlanta, latitude 33° 54' north, longitude 7° 28' west from Washington, and at an elevation of 1,084 feet above low-water mark at Savannah, Georgia. It is said, also, to be on the divide of the great watershed, the waters of which, on the one hand, find their way through the Chattahoochee into the Gulf of Mexico; and, on the other, empty into the Atlantic Ocean through Proctor's Creek, the South and Ocmulgee Rivers. About fifty miles to the northeast the Blue Ridge Mountains form their terminal spur, and bifurcating from this range toward the west are seen Sweet's Mountain, the Allatoona Range, Great and Little Kenesaw, and Lost Mountains. Stone Mountain, sixteen miles southeast of Atlanta, is an isolated peak of granite some 800 feet high.

The site of McPherson Barracks comprises an area of 53.84 acres, and resembles an ellipse in figure. The grounds are leased by the government for a term of years, with a view to purchase should permanent possession be desired. The site consists of two knolls, separated from each other by an intervening ravine, which affords excellent natural drainage of the grounds. The surrounding country is broken up into hills and valleys, and was formerly wooded with pine, oak, chestnut, and gum trees, but is now under imperfect cultivation. The geological features of the site are as follows: Top soil, fine, round sand, mixed with clay, mica, and feldspar; subsoil, red clay, evidently of granitic origin, mixed with a small proportion of calcareous matter, and largely with quartz gravel. The subsoil stratum is from twelve to twenty-five feet thick, underneath which lie strata of unctuous clay resembling halloysite, and green sand. The azoic rocks, which approach the surface and form the substrata of the above formations, are hornblende, schist, granite, and syenite. Pure water is found at a moderate depth below the surface.

Sanguinaria, eupatorium, ginseng, symplocarpus, and senega are among the more common medicinal plants found in this vicinity during their proper season.

As a general rule the climate may be called temperate, the thermometer rarely falling below 25° in the winter, and seldom rises over 92° or 93° in summer. The winters and the early spring months are somewhat remarkable for cloudy and rainy weather, and consequent difficult traveling. The snow-fall is very slight. The prevailing wind is from the northwest, excepting during a wet season, when the direction is from the south and southwest. What may be termed the cold season exists from about the middle of November to the 1st of April; occasional frosts, however, are seen later than this.

The buildings of the posts were erected in 1867 and 1868, constructed of pine lumber, and occupy three sides of a parallelogram, the fourth side remaining open. For general arrangement, see Plate No. 3.

The company barracks are ten in number. Their general plan is that of a "pavilion" ward, elevated from the ground on brick piers and surrounded by a veranda. Each barrack is 156 by 27 by 13 feet, interior measurement, which gives a superficial area of 4,225 feet; deducting two small rooms for sergeants' quarters and store-room, the ward contains a cubic air space of 48,753 feet. The companies present average 67 men; each man, therefore, enjoys an air space of 727 cubic feet. Both iron and wooden single bunks are provided, each furnished with a straw tick. There are neither wash nor bath-rooms; but as each barrack at its rear is elevated several feet from the ground, long troughs, on supports, are constructed underneath for the purpose of washing. The only bathing facilities are found in the creeks and ponds near the post. The barracks are warmed by wood stoves, and artificially illuminated by candles and fixed oil. Ventilation is secured by thirty-two windows, four doors, and three central apertures in the ridge. These apertures are hooded.

The company kitchens are five in number, and placed sixty feet in rear of the barracks. They are built cottage style, and resemble, externally, the figure of a cross. Internally, they are divided into two kitchens and two mess-rooms for the accommodation of a like number of companies.

The laundresses' quarters are placed 45 feet in rear of the company kitchens, and are ten in number. They are square cottages, 36 by 36 feet, exterior measurement, and divided internally into four equal rooms for the reception of as many laundresses. A veranda surrounds each building.

The officers' quarters are eighteen frame buildings, 55 feet by 35 feet 5 inches, two stories high, elevated on brick piers, with a veranda in front. Interiorly they are divided as follows: Colonel's quarters, four rooms to the story; lieutenant colonel's, major's, surgeon's, and chaplain's quarters, three rooms to the story; captain's and lieutenant's quarters, which are double houses, two rooms to the story; kitchens are placed immediately in rear. There is no especial ventilation in the officers' quarters; they are heated by fireplaces and lighted by coal oil.

The commissary and quartermaster building consists of a main building two stories high, divided into eight rooms for offices, and two wings, each 50 by 28 by 14 feet, used for storage purposes. The whole structure is elevated from the ground on brick piers, and the main building has a veranda in front and rear.

The guard-house, 55 feet distant from the last company barracks, consists of a main building, 33 by 46 feet, and one story high, and a wing, 44 feet by 8 feet 5 inches. The main portion contains two rooms, 20 feet 5 inches by 14 feet by 10 feet 7 inches, and 12 feet 5 inches by 14 feet by 10 feet 7 inches for the guard; a jail-room, 17 feet by 32 feet by 10 feet 7 inches, and five cells, each 6 feet 5 inches by 10 feet by 10 feet 7 inches. The jail-room has a cubic air space of 5,820.8 feet; cells 647.85 feet. The wing is divided into ten cells, 4 feet by 8 feet 5 inches by 9 feet 3 inches, having a cubic capacity of 316.20 feet each. Ventilation is effected by six grated windows in the jail-room, and one in each of the cells, 2 feet by 2 feet 3 inches. In the cells of the wing the doors contain, in addition, a grated aperture, 3 by 6 inches. The guard-house is warmed by a wood stove, which, for this climate, is sufficient.

The hospital is a two-story main building, with two wings for wards, and is constructed on the plan issued from the Surgeon General's Office in Circular No. 4, 1867, for a post hospital of forty-eight beds. It is elevated from the ground and surrounded by a veranda. The building is warmed by coal stoves, and artificially lighted by oil. Each ward contains twenty-four beds, giving to each an air space of 1,031.25 cubic feet. Ventilation is effected by twelve windows, six on each side, 3 feet by 6 feet 5 inches, four doors, two with movable sashes, 3 feet 5 inches by 9 feet, and ten apertures in the ceiling, 2 by 3 feet, communicating with the ridge ventilator. These apertures can be closed at will by means of blinds. But one chimney shaft is furnished each ward, under the absurd idea that one stove, burning one or two bushels of coal per day, will maintain a constant temperature of 55° F. in a cubic air space of 24,750 feet.

The main building is divided as in the plan of Circular No. 4, with the exception that the space intended for a closet has been converted into a passage into which the adjacent rooms open, instead of the main passage. A considerable improvement might be made in lighting the passage of entrance by a sash above the door and by side transoms.

There are three portable bath-tubs in the hospital for use of the patients. The only water closet

is the privy in the rear, close stools being kept in one of the small rooms, which is also used as a bath-room. The privy has no vault, but is provided with boxes sliding under the seats, and into which dry earth is daily thrown. These boxes are carried away every night and emptied. The dead-house, or dead-room, is most inconveniently arranged, it being in one of the small upstairs rooms in the main building, and reached only by a narrow, winding stairway; it is exceedingly difficult to carry a coffin up to or down from it. One of the wards being unoccupied, it is at present used as a school-room for the few children who attend instruction.

The post bakery is a brick building, 18 by 45 feet, and one story high. The stables, two in number, are 27 by 56 by 17 feet each, and intended to accommodate thirty-two animals. Two work-shops are placed in rear of the stables.

The sinks are ten in number for company and laundresses' quarters, and placed fifty feet in rear of the latter, occupying the space lying between the laundresses' quarters and the stables. They are arranged with sliding boxes under the seats, into which dry earth is thrown daily, and which are removed and thoroughly cleaned every night. The officers', hospital, and guard-house sinks are similarly arranged. The system works admirably, and scarcely any odor is perceptible in or about the privies.

The post library is kept in the hospital, and contains 550 volumes, mostly novels; but there are also several series of histories and biographies.

Pure water is obtained for the garrison from twenty-two wells, one of which is located to the rear of every kitchen belonging to the barracks and officers' quarters and the hospital. They average in depth 27 feet, with a diameter of 4.318 feet.

The water of these wells, upon examination, is found to be soft and very desirable for drinking and washing purposes.

Several springs in this vicinity contain iron in sufficient quantity to render their waters available for medicinal purposes. Chief among these is the "Atlanta Mineral Spring," situated near the Macon and Western Railroad depot, in the city of Atlanta. The iron of this water is said to be in the form of a carbonate of the protoxide by Professor A. Means, of the Atlanta Medical College, whose complete analysis is here appended.

Analysis of water of the Atlanta Mineral Spring by Professor Means, estimate made upon one gallon imperial measure.

Specific gravity, (distilled water being 1).....	1.0005
Temperature.....	66° F.
Quantity per hour.....	32½ gallons.
Gaseous contents—	
Carbonic acid.....	9.96 cubic inches.
Hydrosulphuric acid	2.33 cubic inches.
Atmospheric air	About 1½ per cent.
Solid contents—	
Iron, as a protocarbonate, suspended in carbonic acid gas.....	13.34 grains.
Sulphate of magnesia	11.84 grains.
Carbonate of magnesia	4.15 grains.
Magnesia as base in both	6.01 grains.
Sulphate of soda.....	8.82 grains.
Chloride of sodium.....	16.06 grains.
Lime.....	A trace.
Silica, (not estimated.)	
Entire solid contents	55.11 grains.

This analysis was made some years ago. The spring now yields from sixty to seventy gallons of water per hour.

There are two large brick underground cisterns, containing severally 45,000 and 90,000 gallons, which are kept well filled with water forced from a small artificial pond about a quarter of a mile distant by the steam-engine belonging to the post. This engine has attached 2,000 feet of hose.

There is no artificial drainage, with the exception of a small brick gutter around each company barrack; nor is any needed, surplus water being removed beyond the limits of the camp by the slopes of the site.

The post garden is changed from time to time, as it is rented for one year only, and available but for a portion of that time. The hospital garden is in the rear of the hospital, and is about an acre in extent. Some of the officers' quarters have small gardens attached in rear. Owing to the heavy, clayey nature of the soil, vegetation will not do well except under constant manuring and admixture with lime and richer earth; where this has been done the success has amply repaid the labor of cultivation. The post garden is cultivated by details. Fair crops of cabbage, peas, onions, potatoes, melons, squashes, tomatoes, cucumbers, and radishes are obtained.

The prevailing diseases during the past year have been the different forms of malarial fever, diarrhœa, dysentery, syphilis, and gonorrhœa. Some few well-marked cases of typhoid fever have occurred. The troops have been much exposed to miasmatic influences by the frequent calls for detachments for temporary duty in unhealthy localities. One case of cerebro-spinal meningitis has occurred in the garrison, at a time when there was a transient epidemic of the disease in the city of Atlanta. Pulmonary diseases have been rare in garrison, with the exception of mild cases of bronchitis. This, however, is a bad location for young children. Bowel diseases are very rife among them during the summer, and though at first apparently easily checked, are extremely apt to recur, each time with more force.

The sickness among the infant population in Atlanta during the warm weather of 1869 was startling, and in the garrison the same condition prevailed. When the disease had continued any length of time, removal to a distance appeared to offer the only hope of cure, and the beneficial effect of the change would be apparent in even twenty-four hours. To a certain extent the same obstinate trouble obtains already this year. Rheumatism is not a frequent complaint—that is, original cases are rare; when, however, a person previously attacked comes to Atlanta with a rheumatic diathesis, the locality seems to be a very unfortunate one.

The population of Atlanta, as estimated by the taker of the census for 1870, will not be far from 22,500 souls.

Statement showing mean strength, number of sick, and principal diseases at McPherson Barracks, Atlanta, Georgia, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	307.90	627	9	227	93	8	78	20	3	17	4
1869.....	416.25	321	8	90	46	8	33	8	2	33	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT PULASKI, GEORGIA.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS T. N. ROBERTS AND JOHN N. NILES,
UNITED STATES ARMY.

Fort Pulaski, Georgia, is located on Cockspur Island, at the head of the Tybee Roads, commanding both channels of the Savannah River. Latitude, 32° 2' north; longitude, 3° 51' west from Washington. The city of Savannah is 16 miles distant. The fort was named after Count Pulaski, a Polish patriot who fought in the war of the American Revolution, and died in consequence of a wound received in the attack on Savannah, in October, 1779.

The fort was commenced in 1829-'30, under the supervision of Major Samuel Babcock, Corps of

Engineers, and consists of a brick-work of five sides, or faces, including the gorge, casemated on all sides, with walls 25 feet high above high water, and surrounded by a wet ditch. The work was seized by State troops by order of the governor of Georgia, January 31, 1861, and retaken by the United States forces April 11, 1862, under command of Brigadier General Q. A. Gilmore, United States volunteers, captain of engineers.

Cockspur Island is an isolated portion of marshy land, one mile wide and two miles long, and separated by a small creek on the west from a long sweep of marshes, called islands, extending up the river. Salt marshes, surrounding the island in every direction, except a limited portion of the sea front, are daily left uncovered by the reflux of tides.

The soil is essentially alluvial, and sufficiently characterized by an admixture of the siliceous and clayey elements and mingled detritus, brought down and deposited by the current of a large river draining an area of a diversified geological character. The amount of organic matter contained in the soil is large, in part derived by deposit from the river, and in part by the local growth and decay of marsh, marine grasses, stunted trees, &c. In a word, the geological features of this island are such as generally characterize formations near the mouth of large rivers opening into the sea.

The buildings at this station are few, and all located outside the fort. There are 51 casemates in the gun fronts of the work, and 14 in the gorge, the latter being designed as quarters. The general dimensions of the casemates are as follows: Length, from scarp to parade, 26 feet; width, 15 feet; height to the springing, $6\frac{1}{2}$ feet, and to the crown of arches, 14 feet. A modification of the entire work is contemplated.

The garrison quarters are in twenty casemates, each affording accommodation for 10 men, giving 675 cubic feet of air space per man. These quarters are warmed by open fireplaces, and ventilated by means of one chimney in each, aided by an outlet tube, two windows and four embrasures. Candles are used for artificial illumination. Beds consist of single bunks, straw mattresses and blankets. The sinks are well arranged, being located outside of the fort. Excrement is washed away by the sea. The kitchens and mess-rooms for the men are capacious and well ventilated.

Quarters for officers are also constructed in casemates, and consist of seven sets of two rooms each. The ventilation and air space of these casemates are the same as of those described. A few officers occupy frame buildings outside of the fort, and those casemates not occupied by officers are assigned as quarters for married soldiers. The dwelling-houses referred to are three in number, with kitchens, sinks, &c., attached. One building contains seven rooms; the others five rooms each.

Three casemates are used as store-rooms by the quartermaster, commissary, and ordnance departments.

The guard-house consists of three casemates, each containing 14,272 cubic feet, with ventilation the same as the others described. The rooms are warmed by large stoves and open fireplaces. The guard-house at present contains 42 general court-martial prisoners.

The hospital is a one-story wooden structure, 40 by 20 feet, with piazza front and back. The building was formerly occupied as offices for clerks in the engineer department. It is built on a brick foundation, and the partitions between the rooms having been removed, it is converted into one large room or ward, with thorough ventilation beneath. The ward is provided with two fireplaces, and illuminated at night by candles. The building is small and inadequate for hospital purposes. There is no office; a small room connected with the hospital is used as a dispensary. The ward contains 10 beds, allowing 469 cubic feet of air space to each. There are no lavatories; a bath-tub is used in the ward. The kitchen is a small detached building. Meals are served to the patients in the ward.

The bakery is adequate to the command. The library, numbering 107 volumes, is kept in a casemate occupied as a post school-room. The books are selections from the general literature of the day.

The troops bathe regularly in the Savannah River during the summer months; in winter the sponge-bath is used in quarters.

Communication with Savannah City is very irregular, being by a small open boat.

The chief source of the water supply at this station is from the rain-fall, with the addition of a certain amount by distillation, (condensed water,) all stored in large cisterns. The amount of water obtained from the rain-fall—400,000 gallons per year—is received into eight large double-connecting cisterns built beneath the fort. In addition to the above supply there are outside of the fort, on the island, four cisterns of an aggregate capacity of 40,000 gallons, and estimating their receiving surfaces and the annual rain-fall, they ought to be twice filled per year. Thus the total amount of water obtainable by the rain-fall (supposing all the cisterns in the fort to be in good order) would be about 440,000 gallons annually. However, very large deductions must be made from the latter amount, on account of the defective condition of six of the cisterns under the fort, leaving only two out of the entire number in good order, (fit to hold drinkable water.) All the others are so defective that they admit sewerage and brackish water from the surrounding moat to flow into them.

The other source of supply is condensed (distilled) water, which, though useful for general cleaning and many other purposes, cannot be included in the estimate of the drinking-water, being not altogether free from certain impurities. The condenser in its present condition yields about 1,000 gallons of water per day.

The supply of water is large in the defective cisterns under the fort. The amount of the impurity (chiefly organic and saline) varies somewhat in the different cisterns; in some so large as to render the water useless, in others within such limits that it may be applied to the coarser cleansing purposes, &c. A serious defect in all these cisterns is, that the overflow pipes are on too low a level, allowing a danger of the absorption of gaseous effluvia, and in very high tides of the passage of sea water into the cisterns.

The water of the two cisterns in good order, at the fort, and of those outside, is tasteless and without odor. The condensed water is quite transparent, almost tasteless, and without smell. The impure water of the defective cisterns has a disagreeable and saline taste, and, during the hot season, a somewhat fetid odor.

There is no engine at the post for the purpose of extinguishing fire; buckets are at hand.

A brief glance at the topography of this island will facilitate the understanding of the drainage question. This island is situated on a low plane, the large part of its extent being on a level below the high-water mark. Its surface is not of a uniform grade, but is dotted over with low marshy spots, or depressions of the general level, varying from a small size to an area of an acre or more. The island on a casual inspection would appear to be quite level, as the low spots above described are more or less completely hidden by the high marsh weeds and grasses which grow in rank profusion all over it.

A system of dikes or levees protect the island from the ordinary overflow of the tides. They run parallel with the general outline of the island, and include an area of about one square mile. These dikes, if in good order, would in a great measure prevent the overflow of the tides, except during the prevalence of easterly gales, which, driving large masses of water from the sea into the mouth of the river, would pass over them and submerge the island. To be effectual against such inundations, the levees would have to be raised several feet above their present height. The present levees are broken at many points, and consequently do not even protect from the ordinary tidal overflow parts of the island.

There is nothing to deserve the name of drainage on this island. The water in the moat surrounding the fort is daily removed by the reflux of the tides, through a large open sewer which deposits its contents into the river. It was doubtless the intention that this large sewer should also drain the portions of the island adjacent to it, but the difference of level on account of the inequalities of the surface above described never having been properly removed by grading, no water flows from the low ground into the sewer, and the only purpose it answers is to permit the daily reflux of the tides into and out of the moat.

In its present condition the island is constantly overflowed, in a large part of its extent, by the tides, while the water from the rain-fall settles into the low spots of marshy ground and becomes stagnant. There is an abundant generation of malaria in these low places, which causes the different forms of paludal fever prevailing here during the hot season. This cause (malaria) would operate here with much greater intensity were the miasma not carried off or greatly diluted by the breezes from the sea.

As related to this question in a sanitary point of view, it may be mentioned that the water of the river in this vicinity is generally brackish. This condition is modified by the state of the river and the tides, being almost fresh when the former is overflowed by rains from the up country, and quite salt at high tides and a low state of the river. This evidently affects the evolution of malaria, the freshened current, in a high state of the river, saturating the soil almost to the surface, which, upon the subsiding of the water, is left exposed to the heat of the sun, producing the forms of paludal fever more incidental to interior fresh-water streams and swamps.

On the other hand, at low states of the river and high tides occurring for a period of several weeks, the soil is then impregnated with water quite salt or brackish, and, exposed to a high temperature, evolves malaria copiously, and produces a form of fever of a peculiar hybrid type, much less amenable to quinine and other anti-periodics than ordinary intermittent fever.

During the hot season and the occurrence of a calm and moist air there is given off from the salt marshes an odor perceptibly sulphurous. In fact, the presence of sulphureted hydrogen has been detected in the exhalations from the marshes. The known antagonism between the existence of low forms of animal and vegetable life and the presence of sulphureted hydrogen, would seem to favor the opinion that the exhalations from the marshes would tend to repress and destroy these forms of life, and perhaps concurrently somewhat prevent the development of the germs of malaria and the fever now known to result from them. But this hypothesis, though theoretically plausible, receives no support from the actual facts of the case, which rather encourage the belief that the effluvia of the marsh (tainted with sulphureted hydrogen) and the active, noxious principle (germs) of malaria mingled together, are more toxic than the latter agent alone.

Attention is drawn to this point, viz: the influence of the salt marshes, and especially when inundated by the occasional overflow of fresh water, in the production of paludal fever, because, with some, it is still regarded as a mooted point. A previous experience in low coast regions long since convinced me that salt marshes, even in situations where no fresh water was to be found, and the full saline strength of the sea water prevailed, were productive of a peculiar form of fever, resembling in type the so-called malarious yellow fever.

The prevailing diseases at Fort Pulaski, Georgia, during the past year have been rheumatism, dysentery, diarrhoea, intermittent fever, bilious remittent fever, and other miasmatic diseases.

Statement showing mean strength, number of sick, and principal diseases at Fort Pulaski, Georgia, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	66.83	215	84	48	.....	14	5	.....	13	.....
1869.....	67.83	229	25	70	3	26	17	1	31	1

Statement showing mean strength, number of sick, and principal diseases at Fort Pulaski, Georgia, prisoners, for the year 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (nine months)	36.55	163	25	66	6	9	12	9	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

KEY WEST, FLORIDA.

REPORT OF ACTING ASSISTANT SURGEON WILLIAM F. CORNICK, UNITED STATES ARMY.

This post is situated on Key West or Thompson's Island, about 40 miles southwest of Cape Sable, in latitude $24^{\circ} 30'$ north, longitude $80^{\circ} 40' 1''$ west. The island is about 7 miles long, and from 1 to $1\frac{1}{2}$ miles wide, the highest point being about 10 feet above the sea level.

The whole island, one-fourth of which is government reservation, is a rocky formation of coral, with no fertility of soil nor mineral products, with the exception of salt, of which a fine quality is made by natural evaporation. The Palma Christi plant grows here wild, but it is not cultivated to any extent.

Of reptiles we have the rattlesnake, moccasin, black snake, and also scorpions and centipedes. All kinds of birds which frequent a tropical clime are found here.

Previous to 1820 the island was, on account of its peculiar situation, a rendezvous of pirates and other wild characters, who at that time made their homes in these waters. It was first permanently settled by a few emigrants from New York, and some fishermen of the Bahama Islands, and at present the inhabitants are mostly fishermen and sea-faring men from the latter place.

It was occupied by troops in 1831. The only water on the island fit for use is rain water. There are a few wells dug into the rock, but the water therefrom is very brackish and only fit for washing purposes. On the northeast side of the island there are a few ponds, which dry up in the summer. The climate is very mild during the months of November, December, January, February, and March. During the other months in the year it is extremely hot. The yearly mean of temperature during the past year was 79.29° ; hygrometer, 73.78° , with a rain fall of $29\frac{4}{5}$ inches.

The prevailing winds are southeast in summer—occasionally southwest; in winter, or during the five milder months, from the northeast. The highest point of the thermometer during the past year was 96° ; hygrometer 90° , with a perfect calm. There are only two seasons here, spring and summer; the length of the latter is about seven or eight months.

The post consists of Fort Taylor and the United States Barracks. The former is situated on the extreme southwestern part of the island, is surrounded by water, and connected with the land by a wooden bridge about 300 feet long. The quarters in Fort Taylor were intended for four companies, but have never been completed, and are not in good condition. The fort is occupied only by a guard. The barracks are on the northwest side of the island, about one mile from the fort. The quarters for enlisted men are two wooden buildings, each 90 by 34 feet, and one story high, well lighted and ventilated. The dormitories are furnished with single iron bedsteads for one company, the remainder of the troops occupying double wooden bunks in two tiers. The sinks are wooden buildings placed over the water's edge, all refuse being carried into the Gulf.

Quarters for laundresses and married soldiers are contained in one wooden building, eight rooms, each 10 by 12 by 10 feet.

Officers' quarters consist of five wooden buildings, each 34 by 24 feet, and two stories high. They are neatly finished, and each contains four rooms for parlor and bed-rooms, besides kitchen, dining-room, laundry, and servant's room. The buildings are divided in two sets of quarters each. The arrangement of water-closets and bath-rooms is good, and the ventilation excellent. The climate at this post is such that the quarters of the officers and men require no artificial heating.

The commissary and quartermaster store-house is a stone building, 90 by 34 feet, very strong and secure, and in good condition.

The guard-house is on the south side of the parade ground, a stone building, 34 by 24 by 20 feet, well ventilated and adapted for its purpose.

The hospital is located on the extreme northwestern point of the barracks ground. It is a two-story wooden building, 90 by 34 feet, for the general arrangement of which see Figure 20.

1, first floor; 2, second floor; A, A, wards, 33 by 34 feet; Cm, cisterns; D, dispensary, 13 feet 6 inches by 15 feet; E, E, stewards' rooms, 15 by 15 feet; K, stewards' and attendants' kitchen, 15

feet by 30 feet 9 inches; K, hospital kitchen, 15 feet by 30 feet 9 inches; M, mess-room, 13 feet 6 inches by 30 feet 9 inches; O, office, 18 feet by 18 feet 6 inches; P, porch; R, attendants' room, 15 feet by 30 feet 9 inches; W, W, W, wash-rooms.

The building is well ventilated, and for reasons given above requires none other than natural heating. The wards contain fourteen beds, giving to each 905 cubic feet of air space.

The post bakery is a wooden building well adapted.

The stable is a large wooden building with sheds attached.

There being no post library the men at this post have access to a regimental library, which consists of 69 volumes of a very good character.

The water supply of the post is obtained from the rain-fall which is collected from the roofs of the various buildings and contained in cisterns attached to every building in the barracks. The water is of good quality and the supply ample, the cisterns having a capacity (aggregate) to keep 2,000 men. There are no special means at the post for subduing fire.

Owing to the elevation of the barrack grounds above high-water mark the natural drainage at the post is sufficient without the aid of artificial drains and sewers. Slops, offal, and excreta of the post are daily carried into the Gulf by the police party.

The bath-house is built over the water, where the men can bathe in the sea all the year round.

The post cemetery is located on the extreme southwestern side of the barracks ground—contains an area of about three acres, with 279 graves.

The average price of milk is \$1 per gallon; butter 60 cents per pound; eggs from 75 cents to \$1 per dozen; chickens from \$5 to \$10 per dozen; potatoes from \$3 to 10 per barrel. The commissary department is supplied from New Orleans, Louisiana, and the length of time it takes to get the stores from there makes it impossible to have the necessary fresh vegetables. Very many of the stores are always spoiled before they are received at this post.

The quarters and barracks are well furnished with good and substantial furniture, which can be procured on the island.

Medical supplies are obtained once a year. About a year's supply is now on hand. Communication with the nearest city is by water or telegraph; the former is very irregular, being liable to interruption from heavy winds. The mails are, therefore, sent once a week, sometimes once a month. In winter time we nearly always get one mail a week, but in summer we have to wait sometimes a month or six weeks, which delay also regulates the length of time required to transmit communications to department headquarters and to Washington.

There is at the post a schooner, the property of the quartermaster's department, of about 160 tons burden.

There are about 2,000 regular inhabitants, and about 1,200 Cuban refugees on the island. The people are mostly fishermen, spongers, and wreckers. The Cubans are mostly employed in the manufacture of cigars.

The general sanitary condition of the post is good, and this is as healthy a station as there is on this coast. With the exception of yellow fever there is no special disease at the post. Yellow fever prevailed here last summer, but neither the water nor climate, &c., had any influence in producing it, and I am confident it was brought by the Cuban refugees who flocked to this island in the early part of last summer. Notwithstanding the excellent quarantine regulations of the island several cases of this disease have been permitted to land during the past year, by order of the civil authorities, who have control of this matter. It may also be remarked that the sanitary condition of Key West is anything but favorable. Key West barracks is as clean and sweet as possible, but being only one-quarter of a mile from the city, with more or less intercourse, it is almost impossible to keep disease away.

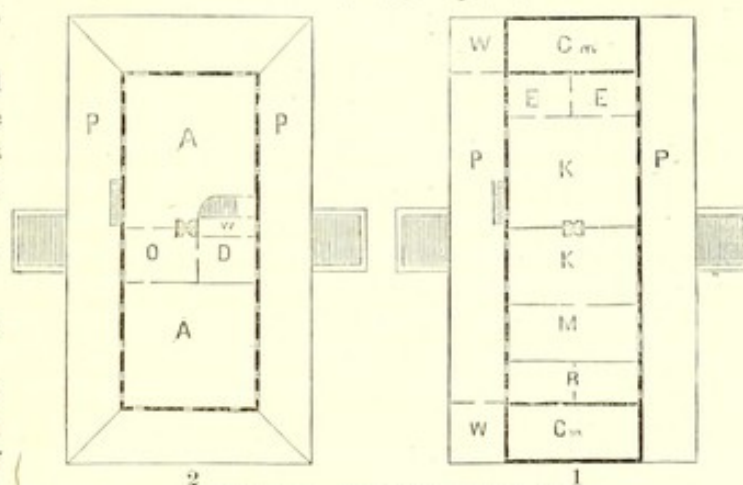


Figure 20.—Scale, 52 feet to 1 inch.

Statement showing mean strength, number of sick, and principal diseases, at Key West, Florida, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fevers.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	76.58	195	1	17	65	17	10	6	1
1869.....	85.5	396	1	11	104	6	22	24	19

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT JEFFERSON, FLORIDA.

REPORTS OF ASSISTANT SURGEON S. A. STORROW, UNITED STATES ARMY, AND ACTING ASSISTANT SURGEON W. E. DAY, UNITED STATES ARMY.

Fort Jefferson is situated on Garden Key, one of the Tortugas group of islets, being the most southwestern part of the so-called Florida reefs. The latitude is $24^{\circ} 37' 47''$ north, longitude $82^{\circ} 52' 53''$ west, and the post is about five hundred miles southeast of Fort Barrancas and seventy-five miles west-northwest from Key West. The light-house on Garden Key was built in 1825, and the building of the fort was commenced in 1846. The post was garrisoned for the first time during the winter of 1860-'61, at which time the fort was still incomplete and hardly defensible. During the war this island was used as a military prison, having in 1864 about 1,000 prisoners confined upon it.

The Key contains seven acres, five of which are within the walls of the fort, the remainder being a narrow spit of sand and coral.

The average height above the sea is three and a half feet, but an excavation over two and a half feet in depth develops the primitive coral and the salt water of the Gulf. The soil consists of pulverized coral and sand.

The fort is a double-casemated, hexagonal structure of brick. The quarters for enlisted men are in a three-story brick building, 350 by 45 feet, which is not finished, and is but partially occupied. Part of the men are quartered in casemates, four men to each casemate, giving an air space of 1,000 cubic feet per man. The men have iron bedsteads, and the bedding is aired at least twice a week. The kitchens are in brick buildings in rear of the barracks, and there is a good bakery in one of the bastion casemates.

The married soldiers' quarters are in casemates, which are not well adapted for the purpose, being constantly damp from percolation from the parapet.

The officers' quarters are contained in a brick building, 272 by 42 feet, and three stories in height. It contains seventy-two rooms, averaging 15 by 18 feet, and 14 feet in height. The quarters are well finished and conveniently arranged. All buildings at the post are heated when necessary by open fireplaces.

There is no bath-room at the post, either for officers or men. The temperature of the sea rarely falls below 70° F., hence it is almost always available for bathing purposes.

The casemates on each side of the sally-port are used as a guard-house.

Part of the material for the erection of a temporary hospital has been on hand at this post for nearly two years; the site has been selected outside the fort, but the necessary authority has not been obtained.

Previous to 1870 the hospital consisted of two unfinished and unplastered rooms in one of the barracks, with a small wooden shanty for a dispensary, and a small, damp, and inconvenient store-room, originally intended for a kitchen.

The hospital now occupies five rooms in one of the barracks. The space is considered ample, and the general arrangement satisfactory.

The post library contains about 500 volumes of a miscellaneous character.

The water supply is from three sources: first, a steam condensing apparatus; second, cisterns within the fort which receive the drainage from the various buildings; and third, cisterns outside the fort. The condensed water is sweet and pure. The water in the cisterns under the casemates, which receive the drainage from the terre-plein, is so contaminated with lime salts as to be nearly unfit for use.

The main sewer follows the internal circumference of the fort, forming the same outline, having exits at the alternate bastions by lateral sewers which open into the moat without, below low-water mark. The depression of the exits below the main sewer is not sufficient to secure a ready transit of débris. The vaults of the privies are of little less depth than the sewer. The opening between is trapped, but this does not prevent the return of offensive gases into the water-closets.

It will be seen at once how imperfect must be the sewerage where the entrance and exit are so nearly on a level. To obviate this difficulty the sewers are flushed from the privies by a stream of water thrown through hose by steam power. This partially remedies the evil, but at all times a sheet of paper saturated with a solution of acetate of lead will blacken if suspended above the privy seat.

There are no gardens at the post except a small one in the center, which is kept up more as a curiosity than for any practical benefit.

This post is in direct communication only with Key West, Florida, the means being a small schooner. It is intended that this vessel shall make one round trip per week, but at times, from stress of weather or calms, double this time is required.

Few or no fresh vegetables are to be had at the post, and for those exorbitant prices are charged.

If a small steamer could be substituted for the schooner above referred to, it could occasionally run over to the mainland, where vegetables, fruits, &c., could be procured at prices from fifty to one hundred per cent. lower than at Key West.

Interments are made on Bird Key, three-fourths of a mile from the post. This place is unfit for the purpose, in consequence of the encroachment of the ocean upon the shifting coral sands of which it is composed. There were recently, after a storm, twelve coffins exposed and liable at any moment to be washed out to sea, and, as matters now stand, the dead at this post cannot be so buried as to insure their being subsequently found by inquiring relatives or friends.

The prevalent diseases are malarial fevers, usually mild, and catarrhal affections.

Statement showing mean strength, number of sick, and principal diseases of troops at Fort Jefferson, Florida, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	210.41	573	101	153	8	50	11	47	1
1869.....	239.75	487	79	83	15	38	2	74	1

Statement showing mean strength, number of sick, and principal diseases of prisoners at Fort Jefferson, Florida, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	43.58	306	78	67	2	39	.....	26	1
1869.....	33.33	132	35	27	.....	16	1	17	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT SAN CARLOS DE BARRANCAS, FLORIDA.

REPORT OF ACTING ASSISTANT SURGEON T. ARTAUD, UNITED STATES ARMY, AUGUST 12, 1870.

The ground occupied by Fort San Carlos de Barrancas and the military reservation in Florida is situated in latitude $30^{\circ} 19'$ north, and longitude $87^{\circ} 16'$ west, thirty feet above the level of the sea, and directly opposite the extreme end of Santa Rosa Island. It is bounded north by the Grand Bayou, which is six miles long, two hundred yards wide, and from three to twelve feet deep, running east and west, and opening into the bay four miles east of the fort. The Grand Bayou has some branches, which are from one to two miles long, running north and south. On the south is the Bay of Pensacola; on the east, the national cemetery, marine hospital, Warrington, and the navy yard reservation; on the west, the light-house and Gulf of Mexico.

Warrington is a small village, inhabited by pilots and government employés, containing a post office connected with that of Pensacola. Woolsey is a small village on the north and east of the navy yard, and is a continuation of Warrington. The city of Pensacola is about nine miles north and east, and from it a railroad connects with the Mobile and Montgomery railroad, five miles south of Pollard, Florida. There is, also, a line of steamers running from New Orleans to Havana weekly, which stop at Pensacola and carry the United States mail.

This is an important point on the Gulf of Mexico, being well fortified, and defending the entrance of Pensacola Harbor. Its occupation dates from the 24th day of October, 1820, when it was ceded by Spain to the United States.

Fort San Carlos de Barrancas, in shape a semicircle, was the only one commanding the harbor at that time; but a new and more formidable one has since been built behind it without interfering with the old fortification.

The military reservation contains about thirty square miles of land, partly timbered, not fertile, being incapable of raising good grass. There are but few trees in the immediate vicinity of the fort, although the surrounding country is woody. Indigenous trees are the pine, magnolia, azedarach, and oak. Trees furnishing edible fruits are the pomegranate, persimmon, fig, and plum.

Wild animals and birds are the black bear, deer, fox, opossum, squirrel, coon, turkey-buzzard, chicken and hen hawks, mocking birds, cedar birds, turtle doves, woodpeckers, and robins.

Reptiles of almost every description are found. Of fish, the shark, cat, snapper, red and blue mullet, and Spanish mackerel, are the most abundant.

Water is obtained from eight wells, distributed about the garrison, which are from thirty to fifty feet deep, and from three to four feet in diameter.

The climate is mild, the mean temperature being 49° in the winter, and 85° in the summer.

The prevailing winds are in summer south-southwest; in winter north-northeast and south-west, and, except those of the equinoctial season, are moderate. The summer, or warm season, is quite long, leaving the cold season but two or three months' duration.

The fort, in shape a parallelogram, is situated on the southwest side of Pensacola Bay, and one-quarter of a mile west of Barrancas Barracks; it is built upon a sand bluff, thirty feet above the level of the sea, and four hundred and forty yards from the edge of the bay.

The inclosure contains about ten acres. Fort Barrancas has not been occupied since the war, except for target-firing, &c., as a means of instruction to troops stationed at this post.

Barrancas Barracks is a large three-story fire-proof building of brick, unfinished, measuring 196 by 36 feet. The building contains fifteen rooms, 32 by 26 by 16 feet, all well lighted and ventilated, and warmed by open fireplaces. Part of the upper floor, and two rooms on the lower floor, are occupied by the men; also, two rooms on the lower floor as kitchens and mess-rooms. In the whole building seven rooms are occupied, and eight rooms are unfinished and vacant. The air space per bed is about 1,100 cubic feet. The bunks consist of combined iron and wooden single bedsteads, furnished with blankets and mosquito bars, and the bedsacks filled with straw. There are no wash or bath-rooms in the building. Sinks are built in the rear of the barracks.

The quarters for laundresses and married soldiers are very poor. There are four two-story

brick buildings, five feet in the rear of the barracks; two buildings are divided into twelve rooms, four for kitchen and wash-rooms, and eight as sleeping apartments. The dimensions are, of wash-rooms, 18 by 19 by 9 feet; of sleeping rooms, 8 by 10 by 8 feet; and one building is divided into six rooms, but unfinished and cannot be occupied. The remaining house is occupied as a guard-house. These quarters are not sufficiently ventilated, and are unfit for the purpose for which they were made.

The officers' quarters are five wooden buildings with verandas in front, and raised from one to two feet above the ground; they are lathed and plastered, but some are insecure from rain. The building occupied by the commanding officer contains five rooms and an attic; the dimensions are 47 by 36 feet. There are also two out-houses, one used as kitchen and the other as a sleeping apartment for servants.

The western wing of the building is occupied as headquarters. The building occupied by the post surgeon contains two rooms, and a kitchen adjoining; the dimensions of the rooms are 24 by 20 feet; of the building, 52 by 23 by 20 feet. It is situated about one hundred and fifty yards north of the commanding officer's quarters.

The building occupied by the quartermaster is the only one fit for permanent use, being new, one story high, and containing two rooms, with a closet; it is two feet above ground, with a veranda running around the whole building, eight feet wide. Dimensions, 55 by 48 feet. It is located about forty yards northwest of the surgeon's quarters. The remaining two buildings are similar to the post surgeon's quarters in size. Water is supplied in barrels in such quantity as is required daily. There are no water-closets or bath-rooms in the quarters for any officer at the post.

The quartermaster's office, a new building located one hundred yards south of the barracks, contains two rooms, 14 by 16 feet, with a veranda in front, eight feet wide.

There are two store-houses, one on the wharf, a plain pine building for hay and straw, 60 by 36 by 36 feet, which is also used as a boat-house. The other is used as a quartermaster and commissary store-house; its dimensions are 100 by 40 by 36 feet. It is situated four hundred yards from the bay at the upper extremity of the wharf, and stands four feet above the ground. Opposite this is another building of the same dimensions, used as a carpenter's shop. There is a car-track running from the lower part of the wharf to the upper extremity; belonging to this is a car on which all stores, &c., are drawn up to the store-house; but the track and car are now in a dilapidated condition, and nearly useless.

The guard-house, like the laundresses' quarters, is situated five feet in the rear of the barracks. It is an unfinished building of brick, containing a guard-room, 18 by 19 by 10 feet, a dark cell, 6 by 8½ by 10 feet, and in my opinion answers very well for the purpose for which it is used; it is warmed by large fireplaces of brick.

The hospital is situated 100 yards northeast of Fort Barrancas, and consists of two frame buildings of yellow pine; one measures 90 by 20 by 20 feet, the other 150 by 22 by 20 feet. The last-named building is warmed by four large brick fireplaces, and well ventilated, having 22 windows, 3½ by 6 feet, and 6 doors, 4 by 8 feet, with ventilators running through the whole building, 3½ by 3½ feet. This building contains two wards, 50 by 22 by 12 feet and 30 by 22 by 12 feet, respectively, an examination room, 20 by 22 by 12 feet, an office, 15 by 22 by 12 feet, a hall, 8 by 22 by 12 feet, a dispensary, 15 by 22 by 12 feet, and two store-rooms, 9 by 12 by 12 feet. The other building contains a kitchen, a mess-room, sleeping apartments for the cook, and two store-rooms.

The wards contain twenty-five beds, with accommodations for fifty, and ward furniture belonging thereto; the air space per bed is 840 cubic feet. There are no bath or wash-rooms in the hospital building. A sink is built 100 yards north of the hospital.

The dead-house is a yellow pine building located 100 yards north of the hospital, the dimensions of which are 10 by 12 by 14 feet, well ventilated; it has 2 windows, 2 by 4 feet, and a door, 3 by 8 feet; also a ventilator in the floor and ceiling. It has all the accommodations necessary for a *post-mortem* examination.

The baggage of patients is stored in the linen-room, there being no other room for the purpose, as the store-room intended for baggage, &c., is occupied by the hospital steward and his family, he having no other quarters at present.

The post bakery is a pine building containing three brick ovens, which are capable of baking

five hundred loaves of bread at one time, when in good order; two of them, however, are totally useless, but could be repaired. The remaining oven is also very much out of repair, an occasional brick falling upon the bread. It is located 150 yards southwest of the barracks, directly in front of a marsh which is full of reptiles. Its dimensions, inside measurement, are 36 by 14 by 10 feet.

There is neither laundry, school-house, nor chapel at the post.

There are two stables, one 40 by 40 by 16 feet, capable of stabling five horses and forage; the other, 40 by 40 by 16 feet, has accommodations for 10 animals. Both are fine buildings, well ventilated.

The library contains twenty-five novels, which are kept in the first sergeant's room.

The general water supply is good. Water is obtained from eight wells, and distributed in barrels by prisoners in any quantity desired.

The natural drainage is very good, as the white sand will immediately absorb any liquid thrown upon it; and I have often noticed the surface to be quite dry a few minutes after the hardest rain. Slops, offal, and excreta of the post are carried two hundred yards away. There are no sewers at the post.

There are no arrangements made for bathing at this post; there is a beautiful sandy beach, and clear water, but the numerous sharks render this healthy exercise dangerous.

The national cemetery is situated about half a mile northeast of the barracks, and occupies a space on the naval reserve of about 7 acres, surrounded by a brick wall 10 feet high; it contains 1,038 graves of soldiers, 95 graves of mariners, &c., and 224 graves of unknown soldiers.

There is but one garden, situated about three-quarters of a mile directly north of the post hospital. It belongs to the company at this post, has an area of about ten acres, and is cultivated by two men daily employed on extra duty; the product is small in quantity and inferior in quality. The hospital receives a share daily. The soil is very poor, (white sand,) yet they have managed to raise some cucumbers, carrots, string and butter beans, watermelons, tomatoes, and sweet potatoes; but nearly all have dried up from the intense heat of the sun and an insufficient supply of water. It is the intention of the surgeon to cultivate a garden next spring for the hospital.

Food of almost every kind can be purchased at the post commissary, but fresh vegetables can rarely be procured, except those which come from the post garden, as the inhabitants do not cultivate more vegetables than they require themselves; however, venders now and then come from Bayou Grand, a distance of six miles, and dispose of their vegetables at an enormous price. The fresh beef supplied at this post is of a very inferior quality. Fresh milk cannot be purchased. Butter, eggs, and other articles of food are imported monthly from New Orleans. The price of butter is from 55 to 75 cents per pound, and of eggs 40 to 75 cents per dozen.

The furniture of the barracks are pine tables and benches in sufficient quantity; but that of the officers' quarters is very poor and scantily supplied. None can be procured at a nearer place than Pensacola or Mobile. The first is nine miles by boat, and the second is one hundred and twenty-six miles by boat and railroad. Medical supplies are obtained yearly from New Orleans.

Communication with the nearest city, Pensacola, is made by the post yacht. From thence railroad connections are regular and uninterrupted. Three days are required for a letter to reach department headquarters, and five days to Washington.

The inhabitants of the vicinity of the post are chiefly employed in the navy yard; some occasionally in the quartermaster's department, and, except those who are pilots, have no other means of support.

The general character of the inhabitants, both white and black, is good. Many are leaving Warrington and Woolsey, as the work in the navy yard has stopped. There are at present no civilians employed in the quartermaster's department.

The sanitary condition of the post is good. The prevailing diseases of the past year were intermittent and remittent fevers, acute diarrhœa and dysentery, conjunctivitis, constipation, and cholera morbus.

Statement showing mean strength, number of sick, and principal diseases at Fort Barrancas, Florida, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Catarhal affections.*	No. of deaths.
1868	75.25	261	34	53	15	3	67	.....
1869	58.75	265	19	58	24	20	46	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

MOBILE, ALABAMA.

REPORT OF ASSISTANT SURGEON R. H. WHITE, UNITED STATES ARMY.

The post of Mobile is situated within the limits of the city of Mobile, on the west bank of the Mobile River, at its entrance into Mobile Bay; latitude $30^{\circ} 42'$ north, longitude $88^{\circ} 1'$ west. The site is little elevated above the level of the river, but sufficiently so for the purpose of drainage, as the dikes that connect the barracks with Mobile River are about a mile long.

Immediately above the post, on the north, is a swamp extending on either bank of the river for 36 miles, and covered by the white, black, and Spanish oak, *Quercus alba*, *Quercus tinctoria*, and *Quercus falcata*, and by the bald and black cypress.

The post is surrounded on the northwest, west, and south by sand-hills, the characteristic growth on which is the long-leaved yellow pine, (*Pinus australis*.)

The first fortified settlement on Mobile Bay was made by the French in 1702, on the western side, about four miles below the present site of Mobile, and was called "Fort St. Louis de la Mobile." This post was retained by the French as headquarters of Louisiana until 1711, when a wooden fort named "Fort Condé" was built on the present location of Mobile.

Fort Condé was in good condition and in actual possession of the Spanish in 1813, when the United States government took possession of the territory purchased from France in 1802.

The post and its vicinity in southern Alabama belong geologically among the deposits of the tertiary period, which extends from the post to latitude 32° . Eight artesian wells have been bored at various points in the barrack inclosure, to an average depth of 50 feet, and have passed through the various deposits characteristic of this period, such as clay, sand, and marl. In the immediate vicinity of the barracks the surface soil is apparently loose, dark sand, and not rich in organic matter. At a greater distance, where vegetation is uncontrolled, the reverse is the case. The amount of heat absorbed by soil of this character may be inferred by the observation that the reading of a thermometer whose bulb was placed on the surface of the ground on June 30, 1868, was 129° F., when its reading under the usual circumstances was 98° F. The color of the soil implies considerable reflection of light and heat, which has been the obvious cause of hemeralopia in certain cases.

The long-leaved yellow pine, (*Pinus australis*,) the live oak, (*Quercus virens*,) the bald and black cypresses, (*Taxodium distichum* and *Cupressus thyoides*,) and the magnolia, (*Magnolia grandiflora*,) are the characteristic trees; and the drop seed and wire grasses (*Muhlenbergia tri-cophodus* and *Aristida speciformis*) are important items on the list of herbs.

Although the post is situated on the northern limit of the northeast trade-wind, its climate is mainly influenced by the land and sea breezes. The mean annual temperature is 67.16° F. Observations of the thermometer have not been made for a sufficient number of years to definitely fix the amplitude of the fluctuation in its yearly reading. August is the hottest month, and Decem-

ber the coldest. The mean daily temperature of August is 85.58° F., that of December is 45.12° F. The rain-fall is frequent, and gives a mean annual amount of 66.29 inches.

The barrack inclosure, bounded by a picket fence, is a parallelogram, the longer sides of which are 8 chains and 95 links in length, and run due north and south, the shorter sides being 4 chains and 50 links in length, and running due east and west. Its level, having an altitude of 30 feet, and belongs to a plain upon which the elevation nearest the barracks is five miles distant. Numerous depressions, with corresponding drainage and bodies of stagnant water, appear in every direction upon the plain which stretches northward, as a marsh, for 36 miles along either bank of the Mobile River.

The post consists of fourteen detached wooden buildings, distributed over an area of 644 square rods, with the windows facing north and south. The buildings containing quarters for the men are two in number, each 85 by 50 feet, two stories high, with verandas in front, and situated on the north side of the parade ground. To the rear of these buildings are quarters for married soldiers, the store-house, hospital, shops, stable, &c. The south side of the inclosure is occupied by the officers' quarters. The adjutant's office is the only building on the east side, and the guard-house stands alone on the west side of the inclosure.

The ventilation of the men's barracks is effected by windows and ventilating tubes; additional ventilation is supplied in the second stories of the buildings by ridge openings at the apex of the slanting roof. The warming is by stoves, burning wood; the lighting, by oil and candles at night. The dormitories are four in number, each $42\frac{1}{2}$ by 50 feet, allowing 779 cubic feet of air space per man. Bunks are of wood, measure 6 feet by 27 inches, and are single. The bedding consists of straw mattresses and blankets. The privies are made with boxes, zinc-lined, in which the night soil is collected, to be daily emptied by fatigue parties. There are four kitchens belonging to the barracks, each measuring 23 by 11 feet, and containing a range with sufficient apparatus for cooking; each kitchen opens into a mess-room, 20 by 23 feet.

There are twelve rooms, contained in two long buildings directly to the rear of the men's quarters, for the use of married soldiers; their dimensions are $14\frac{1}{2}$ by 15 feet. Each family is entitled to two rooms.

The officers are quartered in three detached buildings that are forty-one feet distant from each other, and seventeen rods from the barracks on the opposite side of the parade ground. Each building is two stories high, with veranda in front, and contains four sets of quarters of two rooms each, exclusive of the halls and kitchens. The buildings are 51 by 46 feet; the rooms are 15 feet square, and are warmed, lighted, and ventilated as are the men's quarters.

There is one store-house of the assistant commissary of subsistence, situated on the north side of the inclosure. It is 42 by 40 feet, and two stories high, with a veranda in front. This building is also occupied by the quartermasters' department for the storage of property.

The guard-house, situated on the west side of the parade ground, is in a line with the bakery and stable. It is $27\frac{1}{2}$ by 18 feet, has a veranda, and contains the guard-room and four rooms opening into it for prisoners of various grades. Ventilation, warming, and lighting are the same as in the barrack rooms.

The hospital building is situated in the northeast corner of the inclosure, and in rear of those occupied as quarters for married soldiers. It is 80 by 60 feet in dimensions, and, like the other buildings of the post, is constructed of wood. Verandas extend the full length of the building on every side. It is warmed by stoves and open fireplaces, lighted artificially by candles, and ventilated by cross currents. Each of the two wards was designed to accommodate 25 patients, giving to each man 496 cubic feet of air space. The bath-room contains two bath-tubs, with towels, &c. There are also two lavatories, made of wood, lined with zinc, and accommodating at one time six patients. There is one hospital privy, at which the soil is collected in boxes, to be daily emptied.

The bakery is $17\frac{1}{2}$ feet by 14 feet, and contains an oven whose capacity is 280 loaves.

Water in large quantity is supplied by cisterns and artesian wells—drove—both of which are furnished to each of the detached buildings that is inhabited. Besides these a well 25 feet deep has been dug near the center of the inclosure.

The well water is of acid reaction, (slight,) and when one drop of a standard solution of permanganate of potash (four grains to one drachm) is added to one-half pint of water, a pink color,

permanent, is imparted. As, however, the water contains the salts of the protoxide of iron, the permanganate test is not regarded as conclusive of the quality of organic matter held in solution.

A white precipitate (carbonate of lime) is given by *liquor calcis*. A slight white precipitate is thrown down when nitrate of silver is added.

This water, exposed in a shallow basin, is soon covered by an iridescent pellicle that soon falls to the bottom as peroxide of iron. The water is colorless, without odor, and slightly saline to the taste. The quantity of chlorides and of salts of iron held in solution by it does not forbid its use.

The quality of the soil implies dryness and permeability for water, for which there is a good outfall to the east, that conducts to the Mobile River. A system of sewers is, however, not in use by the city, and, as the character of the soil prevents the opening of large and permanent trenches of proper slope on either side of the streets, the water, during heavy rains, runs off too slowly for health.

The barrack inclosure is drained by dikes, five feet in depth, running parallel to the sides that extend east and west. The surface water is conducted to these by shallow drains running north and south. These trenches convey their contents directly to Mobile Bay. Slops, offal, and excreta of the post are conveyed in carts a mile distant from the post, and buried.

The post garden contains three acres, and is cultivated by enlisted men.

Fresh bread is issued daily, and fresh beef tri-weekly. Fresh vegetables (potatoes, onions, &c.) are purchased in large quantities. Other elements of the army rations are issued in sufficient quantities.

Medical supplies are obtained from the medical storekeeper at New Orleans, Louisiana; received and kept in good condition.

The City of Mobile contains 50,000 inhabitants, of which 75 per cent. are Caucasians, and 25 per cent. negroes. A small number of Choctaw Indians still remains.

The register of the city gives no summary or tabulated list of diseases. I am, however, credibly informed, by the most skillful practitioners of medicine in Mobile, that malaria is the cause of one-half the cases occurring in practice. In 1850 the population had reached the number of 20,000, and in it there was a mortality, from all causes, of 611, *i. e.*, 30.55 per 1,000; in 1865 the total number of deaths was 1,042 in a population of 50,000, or 20.84 per 1,000; in 1866 the mortuary record gave the sum of 1,310; in 1867 there were 1,182 deaths; in 1868, in a population of 50,000, there were 1,064 deaths.

Statement showing mean strength, number of sick, and principal diseases at Mobile, Alabama, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	143, 83	442	1	221	67	2	42	3	1	16	7
1869	165.	315	4	69	51	18	86	5	3	12	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF TEXAS.

POSTS DESCRIBED.

Jackson Barracks, New Orleans, Louisiana.
Fort Pike, Louisiana.
Forts Jackson and St. Philip, Louisiana.
Baton Rouge, Louisiana.
Shreveport, Louisiana.
Jefferson, Texas.
Austin, Texas.
San Antonio, Texas.
Fort Richardson, Texas.
Fort Griffin, Texas.
Fort Concho, Texas.

Fort McKavett, Texas.
Fort Brown, Brownsville, Texas.
Ringgold Barracks, Texas.
Fort McIntosh, Texas.
Fort Duncan, Texas.
Fort Clark, Texas.
Fort Stockton, Texas.
Fort Davis, Texas.
Fort Quitman, Texas.
Fort Bliss, Texas.

JACKSON BARRACKS, LOUISIANA.

REPORT OF SURGEON B. A. CLEMENTS, UNITED STATES ARMY.

The post of Jackson Barracks is situated on the left bank of the Mississippi River, three miles below the center of the city of New Orleans, Louisiana, in latitude $29^{\circ} 57'$ north; longitude, 90° west; altitude, 10 feet. The land was purchased in 1833, and the buildings erected in 1834-'35, the purpose probably being that of the defense of the people of New Orleans and vicinity in the event of a servile insurrection. Surgeon W. J. Sloan, United States Army, furnishes the following memoranda relative to this post during the Mexican war: "I was assigned to duty at New Orleans Barracks early in 1847. The post hospital was then a small, two-story brick building, with two wards on the second floor. The garrison was withdrawn, and the hospital gradually enlarged by the occupancy of the vacant barrack and the admission of sick men from the regiments encamped in the vicinity *en route* to Mexico. During that year it became gradually a general hospital. An officer remained with a small guard, but all the soldiers' barracks and the unoccupied soldiers' quarters were fitted up for hospital purposes, and during the years 1847-'48 were filled with sick and wounded from the army in Mexico. In the fall of 1848 additional accommodations became necessary. Adjacent ground was purchased, and a general hospital erected, which was finished at the close of the war in season to accommodate the returning sick and wounded. This hospital is the present post hospital."

The mean temperature of this post during the year 1869 was 66° F.; the extremes being 39° and 88° . The post occupies a rectangular plot of ground about 300 by 900 feet, surrounded by a high brick wall, and distant from the river 40 yards.

The buildings are well constructed of brick and granite. The quarters for enlisted men consist of four separate buildings, two stories high, each 53 by 32 feet, and surrounded with a spacious veranda. They are heated by open fireplaces, and lighted and ventilated by large windows. The dormitories are all on the second floor. Each contains 20,187 cubic feet of air space, with an average occupancy of about 45 men, giving 440 cubic feet of air space per man. The doors and windows are large, and during a great part of the year the majority of the men sleep on the veranda. The dormitories are fitted up with double bunks in two tiers; but it is believed that the upper tier is generally unoccupied, and no ill effects are known to have arisen from want of air space.

The post is designed to accommodate four companies of infantry, and its arrangement, including that of the hospital, is shown in Figure 21.

A, headquarters; B, chaplain's quarters; C C, officers' quarters; D, quartermaster's quarters; E, surgeon's quarters; F, assistant surgeon's quarters; H H H H H, barracks; I, prison; K, commissary store-house; L, barrack bakery; M, engine-house; N N N, hospital; O, tower; P, dining-room; R, kitchens; S, hospital bakery; T, ordnance sergeant and hospital steward's quarters; V V, privies; W, laundry.

There are no wash or bath-rooms, and the men wash near the cisterns. There are two large sinks, built of brick, about 8 feet deep, sloping on all sides toward the bottom, and lined with cement; they are cleaned through a trap opening from the level of the ground into the sink. They are disinfected twice daily; are provided with two urinals each, and are good and convenient.

The kitchens and mess-rooms are all on the first floor of the buildings, well adapted and furnished with the usual furniture.

Quarters for married soldiers are in a building similar to those occupied by the troops, 45 by 21 feet, and two stories high.

The officers' quarters are contained in seven two-story buildings, two of which measure 42 by 21 feet, and five 82 by 21 feet, divided into rooms about 18 feet square. They are very substantially built, though now somewhat out of repair. There are forty-eight rooms in all, of which one-half are on the first floor, and one-half on the second, the former being used for kitchens and dining-rooms, and the latter for living apartments.

The building designed for quarters of commanding officer fronts the river, and has four rooms on the second floor and four on the lower. The buildings for other officers' quarters are on the long sides of the post, opposite, and similar to each other. The two nearest the commanding officer's quarters contain each two rooms up stairs and two down, with a small yard adjacent. There are two more buildings on each side of the post, each containing four rooms on the upper and lower floors, with small yards at each end.

As the main wall of the post forms one of the sides of the rooms in the lower stories of the officers' quarters, and appears to have been made with a view to defense alone, there are no windows except at the front in these lower rooms; hence they are deficient in ventilation, and generally dark. River water is supplied to the rooms, both up and down stairs, through pipes leading from the large tank in the tower at the southwest angle of the post. There is one cistern to each building. Water-closets are situated in the yards; they are brick sinks, cleaned through a trap in the floor. The want of natural drainage of course prevents the use of water in them.

The quartermaster and commissary store-house is a two-story building, 42 by 32 feet, constructed of granite and brick. A similar building, 32 by 14 feet, is used as an engine-house, and another, 42 by 21 feet, is occupied as quarters by the band. In addition, at each of the four angles of the main wall surrounding the post, there is a circular brick tower, 29 feet in diameter, and used as store-houses, &c.

The guard-house is a building 65 by 21 feet, and similar in construction to those described.

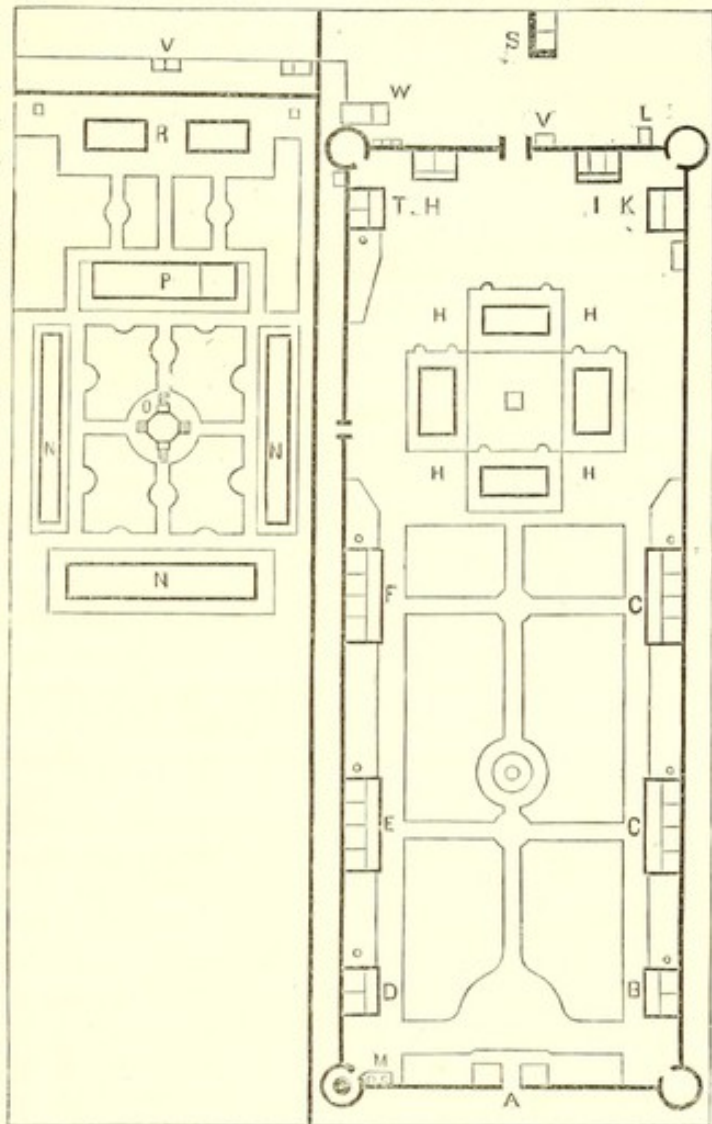


Figure 21.—Scale, 195 feet to 1 inch.

Only the lower story of the building is used for guard purposes, and the cells consist of three of the following dimensions, viz: One, $20\frac{3}{4}$ feet long, 17 feet wide, and $11\frac{2}{3}$ feet high; two, $9\frac{2}{3}$ feet long, $8\frac{3}{4}$ feet wide, and $11\frac{2}{3}$ feet high. The ventilation of all is defective, and of the large cell very bad, there being no openings at all on one side of it, and on another only a grating above the door.

It is ascertained that these three cells, affording an aggregate air space of 5,817 cubic feet, have contained for the six months ending with December, 1868, an average of $22\frac{3}{4}$ prisoners daily, which would give but 260 cubic feet of air space per man. But at times there have been as many as 56 men occupying these three cells at one time, thus having but 103 cubic feet of air space per man; the smallest number occupying them at any one time, during the period mentioned, has been 9.

In practice it is found undesirable to treat prisoners, sick with even ordinarily trivial ailments, without removing them to the hospital. And as, in addition to the small space given, the ventilation of the large cell especially is bad, it is evident that nothing but an imperative necessity can justify its being used for so large a number of men. I am informed that prisoners from other commands than the garrison of this post are sent here for confinement, and it certainly is desirable either that this practice should be discontinued, or more ample accommodations be provided. There are two large and well-constructed sinks for the use of the men. They are disinfected daily, and are kept in good order, though they would be much more cleanly were they provided with urinals.

The hospital buildings and grounds are immediately adjacent to the post proper, and occupy about the same space. The buildings were erected in 1849, and are constructed of wood, two stories high, and arranged in the shape of a square, open at the angles. (See Figure 21.) In front and nearest the river is a fine garden, handsomely and thickly shaded with magnolia, cedar, pine and other trees. The buildings are in number and dimensions as follows, viz: Three, 168 by 31 feet; one, 112 by 31 feet; two, 50 by 25 feet. They are all at present in bad repair. The first three mentioned are intended for wards, the second for mess-rooms, quarters of nurses, &c., and the last mentioned for kitchens and quarters. The wards are divided on the second floor into two separate rooms, while on the first floor they are in one large room. The buildings are all surrounded by spacious verandas, and the ventilation of all is excellent. In the center of the square formed by the four principal buildings is an octagonal structure, 27 feet in diameter, intended and used for a dispensary and office. At present only one of the buildings is used as a ward; they each afford accommodation for twenty beds, with 1,554 cubic feet of air space per bed. The buildings could accommodate 240 patients, together with the necessary kitchens, mess-rooms, &c. There are no permanent bath-rooms, however, and no water-closets in the buildings. At present, in one ward there is an inclosed space, 9 feet square, containing one tin bath-tub only; the water is drawn from the pipe supplied from the main tank above mentioned. Washing is done on the veranda, a wooden zinc-lined trough, supplied with basins, being used. The quartermaster intends, very soon, to construct a proper bath and wash-room in each ward. There is also on the veranda a temporary inclosed space, 6 by 8 feet, used for the purpose of water-closet for the more seriously sick, being provided with close stools.

The hospital sink is distant some 75 yards from the main buildings.

The dead-house is a temporary board hut, 13 by 8 by 10 feet in size, provided with table and buckets. During the course of the repairs to the hospital buildings, now going on, an effort will be made to have a more permanent one built.

The post bakery and stables are in the rear of the barracks inclosure, on the outside. The former is a small brick building in bad repair; the latter of wood, open in front.

The library is kept in one of the hospital wards; the miscellaneous collection consists of the débris from former general hospitals in the department, and numbers 500 volumes, but few of them being standard works.

There is a large iron reservoir, containing about 40,000 gallons, in the tower at the southwest angle of the post, into which the water is pumped from the river by a steam-engine, and forced through pipes to all the post and hospital buildings; there are numerous fire-plugs throughout the grounds, and recently a better arrangement and larger amount of hose than

formerly. There is one cistern of about 8,000 gallons capacity to each building of the officers' quarters, and two of 8,000 gallons each to each set of company quarters. There are also six cisterns of 12,000 gallons capacity each in the court of the hospital buildings, and three others, capacity 8,000 gallons each, at the sutler's store, bakery, and ordnance sergeant's quarters. The supply of water from the reservoir is only limited by the capacity of the steam-engine, and there is always an abundant supply of cistern water.

The general surface of the whole vicinity is but 10 feet above the level of the sea. The almost inappreciable natural drainage is from the river to the swamps in the rear, and is almost wholly inefficient. The grounds of the post proper, and the immediately adjacent hospital grounds, are elevated artificially about 30 inches at the highest parts. Large brick-lined drains extend through the whole area of the post and hospital grounds, and are very skillfully constructed and adapted to the artificial elevation of the surface. There are no sewers. The drains discharge in the rear of the post, toward the swamps, and are entirely efficient in draining the post proper. Slops, offal, and excreta are dumped into the Mississippi River.

There are no arrangements for bathing, either in summer or winter. Good swimmers bathe after night in the river, in summer, but it is attended with danger.

The post garden has heretofore been neglected, but recently efforts have been made to have a very large garden, and with every prospect of success, the ground being of the richest kind. The area of the ground now being put under cultivation is about 40 acres; it is cultivated by a general detail from the garrison, under the direction of an officer, and is capable of producing almost every kind of vegetables.

The general sanitary condition of the post could scarcely be better, considering its location and the general character of the surrounding country. The prevailing diseases during the past year, 1869, have been malarial and venereal. The slight altitude and marshy character of the entire region is doubtless the productive cause of the large amount of malarial disease. The large number of cases of venereal disease is to be attributed to the unclean habits and salacious disposition of the colored troops, who composed the garrison during nine months of the year.

Statement showing mean strength, number of sick, and principal diseases of white troops at Jackson Barracks, Louisiana, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	301.	1,084	1	442	201	66	32	2	61	7
1869, (3 months).....	340.33	138	.....	48	19	21	11	.....	13	.....

Statement showing mean strength, number of sick, and principal diseases of colored troops at Jackson Barracks, Louisiana, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1869, (9 months).....	293.55	565	1	213	61	116	32	2	42	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT PIKE, LOUISIANA.

REPORT OF ASSISTANT SURGEON A. C. GIRARD, UNITED STATES ARMY.

Fort Pike, Louisiana, is situated on the island Les Petites Coquilles, at the entrance of Lake Pontchartrain from the Gulf of Mexico, latitude $30^{\circ} 1'$ north, longitude $89^{\circ} 1'$ west from Greenwich. It is 23 miles from New Orleans. The natural elevation of the surface of the island nowhere exceeds two feet.

With regard to the history of the post nothing definite can be ascertained. The fort was built some time in the commencement of this century. The original establishment must have been at the present site of the hospital, which still retains the name of "Old Spanish Fort." There are some traces of former fortifications around this latter place. The fort was not occupied by troops before the outbreak of the rebellion, and became an easy prey to the rebels. It fell simultaneously with the capture of New Orleans, and was abandoned without the destruction of property. Since that time it has been occupied successively by the Tenth Louisiana artillery, a detachment of the First United States Infantry, and the Thirty-ninth United States Infantry.

The island is of rhomboid form, about three miles long, and at its greatest breadth two miles. It is bounded west by Lake Pontchartrain; north and northeast by the Rigolets; east, southeast, and south by Lake Catharine; and southwest by an unnamed bayou. The island is a large marsh, overflowed by spring tides, and the only dry ground is artificial, embracing the fort, barrack-ground, a narrow shell road three-quarters of a mile long, and at the end of it a raised shell bank, where stands the hospital.

The island seems to have been originally formed of a congeries of small shells, with an admixture of earthy deposit, based upon a substratum of argillaceous earth, rendered black or blue by the oxide of iron. The botany and zoology of the post are of little interest; no plants grow in the marsh but the marsh grass. The wild cat, raccoon, rat, wild duck, wild goose, snipe, kingfisher, and blackbird, are the only warm-blooded animals inhabiting the swamp. Alligators, water-moccasins, king snakes, and black snakes abound in summer time. The never-tiring, ever-hungry mosquito is the chief plague of this post, and renders its occupation during the hot season almost unendurable.

In summer the prevailing wind is from the Gulf of Mexico; in winter, east, southeast, or north. The south and northwest winds usually bring storms—sometimes with terrific gales. Rain is not very frequent, and rarely of long continuance. It is usually brought by east, southeast, or west winds; the quantity has not been ascertained.

The fort, situated on the Rigolets, one mile from the entrance of the lake, is built on a foundation of cypress logs, sunk in the marsh, over which lies a layer of cemented shell. It is a triangular brick fortification, with a segment of a circle for base. It opens toward the Rigolets, from which it is separated by a breakwater. On the land side it is protected by an inner and outer moat.

The citadel of the fort is a building 70 feet long by 24 feet deep, two stories high; the lower story is casemated, and contains six divisions, used as kitchens; the upper story is occupied as officers' quarters, containing six rooms, each 12 by 24 feet. The three bastions have small frame buildings, used as offices. On the east side of the outer moat are the quarters of the troops, a single-story frame building, 314 by 19 feet, and 11 feet high, running from east to west. At the east end is a part of the commissary store-house; at the west end, a shoemaker's shop. The building is comfortable, well lighted and ventilated, and warmed by two stoves in winter. Air space per man, 400 cubic feet. The men sleep in single, two-story bunks, furnished with bedsack, blankets, and mosquito bars. The company and officers' sinks are built on piles, over the outer moat, and are washed by the tide, except at very low water. The kitchens and mess-rooms are separate buildings, parallel with the quarters on the bank of the outer moat, and separated from them by the parade ground. They are temporary buildings, and poorly adapted to their purpose. On the other side of the quarters, running parallel also, are the carpenter shop, bakery, commissary and

quartermaster's store-house, and the blacksmith shop. The laundresses' quarters are built more toward the west, in the swamp, and are miserable shanties, submerged in high water.

On the wharf is situated the guard-house, a whitewashed frame building, 24 by 16 feet, and 9 feet high. This is the poorest building at the post, and not at all suitable for a guard-house. It is amply ventilated through the cracks and door; warmed by a large open fireplace. From its position the building is an "eyesore" to the post.

On the site known as the "Spanish Fort" is situated the post hospital. It is at a distance of three-quarters of a mile from the fort, and directly on the shore of Lake Pontchartrain. There have been at different intervals hospital buildings at this place, but they were all destroyed by fire or blown down by gales. The present hospital was commenced in 1868, the plan of the same having been previously made by an officer of the quartermaster's department under the directions of the commanding officer. Neither capacious wards nor ventilation were provided for, the largest room of the house being 15 by 16 feet, the average 15 by 10 feet. Upon the suggestion of the medical officer two additional wings were erected, according to the directions laid down in the Surgeon General's Circular No. 4, 1867, retaining the original structure as an administration building. The central building is warmed by fireplaces, the wings being supplied with stoves. The ward is ventilated in summer by eight openings, with movable shutters, near the floor, and a raised ridge capable of being shut on the sides by eight boards, hinged, so as to be opened by pulling a cord, and shut by their own weight. In winter the ward is ventilated as directed in the Surgeon General's circular, by a shaft. The ward contains twelve beds, giving 1,320 cubic feet air space to each. One wing of the building is fitted up as quarters for the medical officer. There is no bath-room or lavatory. The water-closet is a small building placed over the water and cleansed by the tide.

The post bakery is a common frame building, well whitewashed, containing a new oven.

The post library is as yet in its infancy. A good selection of military works, English and American authors, has been recently obtained.

The water supply by cisterns, twenty-two in number, is sufficient, except during the latter part of the summer, when condensed water is required. The means of extinguishing fire are a hose connected with the condenser and water buckets.

The troops are marched twice a week by companies to the bathing ground on Lake Pontchartrain, a mile from the fort. The bathing hour is 2 p. m.

There are no post gardens. Attempts have been made to raise vegetables, as the soil appears fertile and well adapted to cultivation, but without success.

The only inhabitants of the island besides the military are the custom-house inspector and the quarantine officer, with their crews.

The hygienic condition of the troops is good. On account of the difficulty of obtaining liquor, drunkenness is rare among the soldiers. Venereal diseases are contracted by the men when on furlough in the city of New Orleans. They are more difficult to treat satisfactorily than in white troops, and not unfrequently necessitate discharge. Scurvy made its appearance last year on account of the poor quality of the soldiers' food. Recommendations were made that the company funds be more liberally applied to the purchase of vegetables, and that efforts be made to procure fresh meat more frequently. The locality is healthy, and no diseases of local origin occur, except during a dry season, when there have been a few cases of intermittent fever in the vicinity. The barracks are whitewashed, outside and inside, every three months.

Statement showing mean strength, number of sick, and principal diseases of colored troops, at Fort Pike, Louisiana, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	197.33	456	.....	90	48	9	1	47	5	26	8	58	2
1869.....	94.08	312	1	86	38	5	.....	42	.....	34	4	29	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

POST OF FORTS JACKSON AND SAINT PHILIP, LOUISIANA.

REPORT OF ASSISTANT SURGEON P. F. HARVEY, UNITED STATES ARMY.

Fort Jackson, the more important of the two forts constituting this post, is situated on the right bank of the Mississippi River, 32 nautical miles by river from the Gulf of Mexico, about 22 miles above the light-house at the head of the passes, and 65 miles in a southeast direction below New Orleans. The flag-staff of the fort is located in latitude $29^{\circ} 21' 30.68''$ north, and longitude $89^{\circ} 26' 21.46''$ west. The altitude of the post above the sea is but a few feet.

The quarantine station, for the protection of the State, is distant five miles up the river. Vessels from infected ports are subject to a quarantine of not less than ten days, or longer if deemed necessary, by the board of health. Buras village, a small assemblage of houses opposite quarantine, is the most important settlement in this vicinity, being the post office and telegraph station for the post and vicinity. This site was first occupied for military purposes in the latter part of 1814, and the construction of the fort commenced at that time as a defense against the British, who had invaded Louisiana from the Gulf and were attempting the capture of New Orleans. Prior to that date Fort Bourbon had stood on the river bank, at a point about a mile above this post, but it succumbed to the gradual encroachments of the current, and to-day not a vestige remains. Several years elapsed after the erection of Fort Jackson before permanent barracks or quarters were commenced, tents being the habitations used. In 1840, or thereabouts, a large two-story brick building for use as quarters and offices was commenced by the engineer department. At the outbreak of the rebellion the confederates obtained and held this post in their possession for a period of about one year. On the morning of the 18th of April, 1862, a mortar flotilla, under command of Captain D. D. Porter, commenced the bombardment of Forts Jackson and Saint Philip, which continued until the 24th, failing, however, to break the casemates, or render the works untenable. At 2 o'clock, on the morning of the 24th, the fleet of vessels moved up the river, and with the aid of the gunboats succeeded in passing the forts without serious damage or loss of life. After passing the forts the federal vessels encountered a rebel fleet, and a sharp conflict ensued, ending in the discomfiture of the latter. The fleet then proceeded unmolested to New Orleans. In the meantime the bombardment was continued by Captain Porter, and ended on the 28th in the capitulation of the two forts. The works were found not materially damaged or weakened, with an armament of 80 guns at Fort Jackson and 40 at Fort Saint Philip. Both places have since been garrisoned constantly either by volunteer or regular troops. Additional buildings as quarters, store-rooms, and hospital have been erected within the last six years.

The reservation was made February 9, 1842, and comprises sections 5, 6, 7, 8, and 9, of township 20, range 30 east of the southeastern district of Louisiana. It is composed entirely of swamp lands, and during seasons of high water is almost completely inundated. That portion containing the fort, quarters, and other buildings, is leveed on all sides, but notwithstanding the protection thus afforded, there are times when the water rises so high as to become a source of great inconvenience in going about the garrison. This is especially the case when rain is super-added to the water, which percolates through the levees. At such times the stationary engine used for pumping out the water, although going night and day, is inadequate to the demand. Such, however, is rarely the case. Generally the engine meets all requirements.

The soil is alluvial, and is covered during the greater part of the year with rank tropical vegetation. In the levee inclosure this growth is mown from time to time and burnt. I have observed no arable land on the reservation, although I am told that both rice and potatoes were cultivated on it before the war. The only useful product of the soil which I have noticed is the grass, which furnishes excellent and unfailing pasturage for cattle.

The geological formation is referable to the post-tertiary epoch, and consists mainly of a deposit of loam, sand, infusoria, shell, marl, &c., produced by the ordinary operations of sea and river, resting probably on a cretaceous base.

The soil is fertile, but to render it secure for tillage the greatest possible care is required in the erection and supervision of levees, in which the slightest leak readily becomes a crevasse.

The varieties of indigenous trees flourishing in this locality are numerous, and many of them are of considerable value and importance. The ash, the cypress, and the white oak are esteemed for many purposes. The willow and myrtle constitute the main growth. The oil or wax obtained from the seeds of the latter is much used by the inhabitants of the country for making candles. Buttonwood and hackberry are intermixed, but are not of general growth. Cottonwood and poplar flourish in abundance. The peach, plum, orange, banana, fig, and cherry are cultivated.

The blackberry, strawberry, and dewberry attain great perfection here, and appear in the market as early as April. Watermelons, muskmelons, and canteloupes appear early in June. Tomatoes appear early, but do not last long. Egg-plants, okra, Irish and sweet potatoes, cabbage, lettuce, onions, beets, cauliflowers, &c., are raised with facility, and are of excellent quality. Heads of cabbage weighing 25 pounds are reported to have been raised in this locality, and three crops of potatoes are said to have been produced from one plot of ground in one year. Turnips do not yield well, in consequence, perhaps, of too great moisture of the soil. The reed cane used for making fishing rods grows in thick brakes along the banks of bayous, but I have seen no sugar-cane growing in this vicinity, although it constitutes the staple product of the lower parishes of the State.

The common or Virginia deer, rabbit, gray and black squirrel, mink, raccoon, and opossum, are the only wild animals found in this vicinity.

The fish inhabiting these waters are the sheep-head, red fish, green trout, catfish, mullet, sucker, gar, stingeree, eel, drum, buffalo, plaice, croaker, sunfish, gasper, and porpoise.

Any account of Fort Jackson would be incomplete without an allusion to its alligators. These reptiles constitute one of the principal objects of interest to visitors, and may be seen in numbers floating in the moats or stretched out on the shore basking in the sun. They are from five to fifteen feet in length, and possess great strength. It has been customary to feed them with bread and crackers, from the bridges over the moats, calling them up by whistling, and from frequent repetition they appear to have learned that signal, and generally obey it with as much readiness as so many dogs.

The rattlesnakes of this vicinity are numerous and formidable. One was caught here recently measuring $11\frac{1}{2}$ feet, and having 27 rattles. Black snakes are large, but rare. Moccasins, of which there are two species, attain a large size, and are exceedingly poisonous. Among the harmless snakes are the grass, whip, chicken, and king snakes. Among the reptiles and poisonous insects may be enumerated the chameleon, a black lizard supposed to be poisonous, small flesh-colored scorpion, and centipede.

Rain and river waters are used exclusively. The supply of the former is obtained from wooden reservoirs, built over ground adjoining the officers' quarters, barracks, and hospital. Of these there are seven capable of containing about 5,000 gallons each. During seasons of drought the supply thus obtained is liable to become exhausted, and river water is then the sole dependence. In May last, in consequence of continued dry weather, it became necessary to use rain-water for some weeks. An analysis made at that time of a specimen taken from the surface gave the following result:

Date of examination.	Physical characters.	Grains per gallon.				Reaction.	
		Total solids.	Organic matter by permanganate of potassa.	Chloride of sodium.	Lime.	Before boiling.	After boiling.
May 14, 1870.	Turbid, tasteless, no odor.	128	2.156	12	4	Slightly acid.	Alkaline.

The mosquitoes constitute a serious obstacle to the enjoyment of life at this post, for they not only ply their calling with great diligence during the night, but in summer time are equally zealous

throughout the day. Various expedients are adopted to avoid and drive them away. The smudge is brought into frequent and useful requisition; gloves are worn, and a covering made of mosquito-bar is frequently used to protect the head and face. Kerosene oil, spirits of camphor, essence of pennyroyal, and other pungent substances are rubbed on the skin with good effect. Rags saturated with crude carbohc acid, and waved to and fro in the air, and camphor, volatilized by heat, will drive these pests out of an apartment; but they return soon after in increased numbers. Probably the best course is to endure them as philosophically as possible.

The constituents are subject doubtless to variation, the earthy as well as the organic particles being augmented during high water, and the reverse obtaining during a low stage. The amount of sediment brought down by the Mississippi River is enormous. Forshay and Riddle, of New Orleans, from observations extending over a period of thirty years, have shown it to be between three and four hundred millions of cubic feet annually.

The extremes of temperature are never very great. The mercury seldom, if ever, reaches 100° F. in the shade, and ice has formed but twice in the past three years, and then only temporarily in thin pellicles. A pleasant breeze from the Gulf prevails throughout the day during summer, and the nights are almost always cool enough for comfortable and refreshing sleep. The atmosphere is usually charged with moisture, especially during the warmer seasons, and yields it readily to substances having an affinity therefor. The phosphorus on matches frequently becomes so moist as to be incapable of ignition, and instruments rust with great readiness. Snow is a most unusual event, and only occurs in a few scattered flakes at a time. The prevailing winds are from the south and southwest. Warm weather commonly commences in the early part of April, and continues until the latter part of November.

The fort is located on the bank of the river. The parade inside the fort and the surface of the river have generally a common level. Brick and sod are the materials of which the fort is constructed. It is a bastioned work surrounded by a wet ditch, with a second wet ditch exterior to the covered way. The parade before the rebellion was occupied by a defensive barrack, but either during the time it remained in possession of the rebels, or shortly afterward, this building was removed. A portion of the parapet over the covered way was used during the war, and for some years previous, as a burial ground; but the bodies have since been exhumed and removed to the cemetery at Fort St. Philip.

The quarters, barracks, and hospitals, at both Forts Jackson and St. Philip, are built on brick piles between two and three feet high. The barracks consist of one frame building, lathed and plastered inside. The building is divided in the center by a hall, 24 by 11 feet, into two equal compartments, each measuring 70 by 24 feet, with a general height of 13½ feet. A covered gallery, 11 feet wide, surrounds the building. Ventilation is effected solely by means of windows and doors. There are ten of the former opening into the barrack rooms, each measuring 5½ by 3½ feet, and four of the latter 6½ by 4½ feet. Two rooms, 11 by 8½ feet, at each end of the building, are occupied by non-commissioned officers. A ridge ventilator and registers are great desiderata for all barracks in this climate, and especially for the one in question, as the windows are altogether too small to admit the requisite amount of air. These rooms are at present occupied by about 100 men, giving to each an air space of 453 cubic feet. Double bunks in two tiers are used.

There are no wash or bath-rooms, or water-closets. The men use a sink, built projecting over the water, on the remains of an old gunboat at the bank of the river. Disinfection is thus accomplished by the current.

One kitchen and mess-room are used in common between the two companies. They are built in rear of the barracks, extending back at right angles from the center of the main building.

Two buildings, old and dilapidated, are used as quarters for laundresses and married soldiers. They are built of rough boards, whitewashed outside and inside; contain together about twelve rooms, and stand on the bank of the exterior moat.

Five buildings are used as officers' quarters; No. 1, a large two-story brick building, containing twelve rooms, and belonging to the engineer department, old and condemned, and nearly unfit for occupation. Each room has an average size of 18 by 15 feet. In addition to quarters for two officers, the building also furnishes offices for adjutant and quartermaster. No. 2, a one-story frame building, 82 by 16 feet, yellow washed, and containing four rooms and a kitchen, formerly used as a hospital, is situated on the bank of the river, heated by means of stoves, and ventilated by windows.

The remaining three buildings are built in cottage style, roofed with slate, painted white, and furnished with green window shutters. They are each one story high, 45 feet long by 18 feet wide, with ceiling 14 feet high. The first of this series contains three rooms, each 18 by 14 feet, and hall, 18 by 13 feet; the second, two rooms and hall of same dimensions; the third, three rooms, each about 18 by 14 feet. The latter was formerly intended for use as offices, but has served as quarters ever since it was built. The rooms do not connect. There are no water-closets or bath-rooms. Two sinks, which were built many years ago, and stand facing the row of cottages, are used by officers. They should be removed or inclosed in lattice-work.

One large frame building, 60 by 47½ feet, one story high, divided equally by a partition, is used for commissary and quartermaster store-rooms. It is whitewashed and slate-roofed, and stands between the officers' quarters and barracks.

The guard-house is situated in the fort, with two doors opening into the sally-port and one into the fort. It comprises three rooms, viz: The guard-room, 13½ by 14½ feet; the prison, 17 by 20 feet; and the dungeon, 14½ by 7 feet, all having an average height of eight feet, warmed by means of fire-places, and ventilated by one embrasure, 3 by 2 feet, and three doors, 3½ by 5 feet. For the ordinary uses of a guard-house the prison-room would be entirely suitable; but for the confinement of general prisoners, in such numbers as are at present confined, it is altogether unfit. Fort Jackson has recently been converted into a penal post, and there are at present sixty-five convict prisoners here, undergoing sentence for various offenses, desertion being the principal. Eleven are confined in the prison-room above described, and thirty-two in a casemate of the fort, (29 by 15 feet, and 9 feet high,) and twenty-two in two hospital tents pitched on the parade in the fort. It will be readily seen that the allowance of air to the prisoners in the casemate and prison is quite insufficient. As a remedy for this state of affairs another casemate in the fort is preparing for the reception of a dozen or so, and will be ready for occupation in a few days. The stockade, at present in course of erection, is built of piles, 10 by 10 inches, implanted five feet in the ground and projecting twelve feet above. A space of two inches is left between each pile to secure a little circulation of air inside. This structure will inclose an area 150 by 75 feet, and a building 100 by 25 feet, with ceiling about fourteen feet high, eighteen windows, three doors, fourteen registers, and a ridge ventilator running the entire length of building. It will accommodate about 100 prisoners, and at least two months will be consumed in its completion.

The hospital, situated on the bank of the river, is a new building, 135 by 25 feet, constructed of boards, arranged vertically and battened; the ward, 65 by 24 feet, occupying the center. At one end are two lavatories, 15½ by 13½ and 13½ by 8 feet; kitchen, 15½ by 10 feet; pantry, 10 by 8½ feet, and dining-room, 15 by 24 feet—the dispensary, 15 by 15½ feet; the store-room and steward's quarters occupy the other end. The rooms are all 14 feet high. The building is yellow washed and furnished with green window shutters exteriorly, and is lathed and plastered inside; warmed by means of stoves, lighted and ventilated by windows and doors. The ward contains twenty beds, allowing to each an air space of about 1,100 cubic feet. No water-closet; no dead-house. Baggage of patients stored in store-room. A covered gallery around the hospital is included in the plan of the building, but as yet has not been constructed. I consider it an essential feature to all hospitals in this latitude. A ridge ventilator I regard also as an almost indispensable necessity. Two casemates in the fort are occupied as a post bakery. There is no library.

Accumulations of water in the immediate vicinity of the fort and buildings are conducted by ditches into a reservoir near the edge of the river, where a stationary engine of eight to ten horsepower is worked almost incessantly in rainy seasons discharging into the river. This apparatus was brought here in 1865 upon the recommendation of an inspecting board of surgeons, and answers an excellent purpose. The slops, offal, excreta, &c., are thrown into the river.

The river affords the only means of bathing. The men are obliged to bathe twice a week.

There is no garden, the ground being too wet for cultivation.

There is regular communication with New Orleans twice a week, liable only to interruption by the occurrence of an epidemic.

In the ordinary course of mail a letter will go to department headquarters in about ten days, and to Washington in seven days.

The vicinity is thinly settled by Creoles, Spanish, French, Germans, and Irish. They follow agricultural pursuits chiefly.

The prevailing diseases during the past year were malarial fevers and diarrhœa. While colored troops garrisoned the post intermittent fevers were comparatively rare, but since the advent of white troops there has been a marked increase of these diseases. In many of the latter the disease appears to have been contracted elsewhere; however, there can be no doubt that the conditions of this locality are eminently favorable to the development of that class of complaints. Indeed, in a paludal district such as this, near the delta and embouchures of a large river, covered partially with water and overgrown with exuberant vegetation, which is acted upon by a high degree of temperature during many months of the year, it might reasonably be supposed that miasmatic diseases would constitute the exclusive forms of sickness. They certainly are the most important; but when we take into consideration that the great majority of troops serving here are unacclimated, the ratio is found to be surprisingly small. The immunity is probably due in a measure to the sanitary precautions adopted early in the season and subsequently. Rigid police measures have been enforced, and special attention has been given to the use of disinfectants and the removal of vegetable matter liable to undergo decomposition. The administration of prophylactics was also commenced on the first of this month. The men are much exposed to the night air and direct rays of the sun, which necessarily exert a deleterious influence upon their health, and it is not unreasonable to anticipate an increased amount of sickness during the ensuing summer and fall months. Diarrhœa is rarely serious, and usually yields to appropriate treatment.

Fort St. Philip, opposite and a short distance above Fort Jackson, and a work of less magnitude and importance, is located in latitude $29^{\circ} 21' 52.74''$ north, and longitude $89^{\circ} 26' 55.96''$ west. The fort is on the same general level with Fort Jackson, but the ground immediately surrounding it is somewhat higher. Further beyond the ground again becomes low, marshy, and subject to overflow. Occupied first as a military post by the Spaniards, the main portion of the fort now standing was built during the Spanish occupation of the country, probably some time during the middle of the eighteenth century. During the first year of the war it was held and considerably improved by the rebels. It sustained more damage from the bombardment in 1862 than Fort Jackson. The reservation made in 1842 comprises section 11 of township 19, range 17 east, of the southeastern district of Louisiana. The main work of the fort is built of brick, and in the form of a very irregular polygon, surrounded by a wet ditch.

There are no suitable quarters provided for garrison inside the fort. One wooden building is used for barracks, 88 by 25 feet, with a porch, 9 feet wide, running the length of the building in front and rear. The barrack-room is 74 feet long by 24 feet wide, 14 feet from the floor to the eaves, and about 19 feet from the floor to the ridge. There are two rooms at one end, 12 by 9 feet, with a corridor between them, 12 by $5\frac{1}{2}$ feet. Inclusive there are fifteen windows, each $7\frac{1}{2}$ by $3\frac{1}{2}$ feet, and five doors, 8 by $3\frac{2}{3}$ feet; a ridge ventilator about 50 feet long by $3\frac{1}{2}$ feet in height, and twelve base ventilators, (registers,) afford an ample circulation of air. Warmed by stoves, burning wood.

These barracks were intended for occupation by one full company, (100 men,) but as companies are rarely or never full, that number is seldom quartered in them. For 50 men there is an air space of about 560 cubic feet for each. At present Fort St. Philip is not garrisoned, and there is consequently no bedding in the quarters. There are no water-closets; sinks built over the moat. The kitchen and mess-room are in a detached wooden building about 15 yards from the barracks, 50 by $20\frac{1}{2}$ feet, with a porch in front, 50 by $5\frac{1}{2}$ feet.

The officers' quarters are two new wooden buildings, of equal size, 45 feet in length by 25 feet 3 inches in width, built in cottage style. There are porches in front and rear of the buildings, and of the same length, by 9 feet 7 inches wide. Each building contains four rooms, each 17 feet 10 inches in length by 11 feet 9 inches in width, and 13 feet 9 inches in height. A hall, 24 by 9 feet, divides each building into two equal parts. There are no offices or store-houses. Supplies are obtained from Fort Jackson.

The guard-house is a small frame building, situated on the bank of the river, $18\frac{1}{2}$ by 14 feet, with four windows and one door, and divided into two rooms of nearly equal size.

The hospital is precisely similar in its main details to the one at Fort Jackson.

No bakery, laundry, school-house, or chapel, nor stables.

Water is obtained from four overground cisterns, each capable of holding about 5,000 gallons. No means of extinguishing fire. Natural surface drainage pretty good. No artificial drains or sewers.

The hygiene of the post is perhaps a little better than that of Fort Jackson, in consequence of the higher and dryer ground on which the quarters and barracks stand.

Statement showing mean strength, number of sick, and principal diseases at Fort Jackson, Louisiana, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	136.16	808	233	99	25	18	39	53	11	71	.....
1869.....	98.75	653	97	147	.....	.....	36	48	4	51	1

Statement showing mean strength, number of sick, and principal diseases at Fort St. Philip, Louisiana, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	67.41	379	84	80	7	24	25	18	1	37	1
1869.....	91.18	439	50	101	2	5	36	40	3	47	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

BATON ROUGE, LOUISIANA.

REPORT OF ASSISTANT SURGEON E. A. KÖRPER, UNITED STATES ARMY.

Baton Rouge is situated on the east bank of the Mississippi River, latitude 30° 36' north, longitude 14° 28' west of Washington, and on the first high land or bluff found in ascending the river. This bluff is about 22 feet above high water and 60 feet above the level of the Gulf. The surface of the government reservation is undulating, and has good natural drainage. On the north is a bayou, which empties into the river about 200 yards above the barracks.

The barracks consist of four two-story brick buildings, erected in 1823-'24. There was originally a fifth building forming the river side of the pentagon, but this was removed many years ago. The northeast and southeast wings are used as officers' quarters, the dimensions of each being 182 by 24 feet, and a veranda, 12 feet in width, extends the whole length of the building, both front and rear. Staircases lead from the outside to both galleries. The north and southwest wings, occupied by the enlisted men, are similar to the officers' quarters, except that the dimensions are 184 by 34 feet. The upper stories contain two dormitories, accommodating one company, fitted up with double bunks, and allowing 563 cubic feet air space per man. Fireplaces are the means of warming the quarters; the ventilation is ample. Large sinks are built near the river. Two small rooms at each end of the building, and communicating with the dormitories, are used as offices and store-rooms. The ground floor contains two kitchens, two mess-rooms, and two store-rooms. Each building is adapted for two companies. The northeast and southwest wings have each a sally-port through the center. The sally-port of the north wing has been closed up and is now used as a guard-house. This contains a fireplace and three windows, two in front and one back, which are the only means of ventilation. One of the store-rooms is used as a cell, which is badly ventilated, unless the door is kept open.

The hospital is a new frame building arranged according to the plan laid down in Circular No. 4, Surgeon General's Office, 1867, for twelve beds. Its situation is very unfavorable and much inferior to one on the high bank of the river, where ventilation and drainage would have been easily accomplished. The building is placed on the north side of the barracks; it is weather-boarded on the outside, and plastered and ceiled on the inside. The wards, each 24 by 44 feet, are supplied with ridge ventilators, and shafts inclosing the stove-pipe in winter. The necessary current of air is admitted through an opening in the floor under the stove. Air space per bed, 864 cubic feet. The bath-rooms are well arranged; pipes lead from the cisterns to the bath-tubs, and waste-pipes from thence to the drain. There is a sink apart from the main building. The whole hospital is lighted by thirty gas burners, of which, however, only one-third are in permanent use. The hospital grounds are, as yet, in a primitive condition; fruit and shade trees have been planted—the grounds in the rear of the building are used as a garden.

The post bakery is in good condition and well conducted.

The water supply is obtained from cisterns, which are kept clean, and the water is all that can be desired. The grounds about the post are well drained by artificial surface drains, which are daily disinfected with lime and carbolic acid.

The prevailing diseases at this post are of a malarious origin; quotidian and tertian intermittent fevers make their appearance in May and June; in July and August, they are more of remittent character, and frequently congestive. In September, the fevers are of a severe congestive or typhoid type. Dysentery appears in isolated cases, and is easily controlled if properly attended to in the commencement. There is a swamp situated behind the garrison and arsenal where, probably, most of the malarial agents are formed which render the garrison so unhealthy in summer. During high water or rainy weather, a lake of a half a mile in length, and from 20 to 150 yards in breadth, is formed, which, as soon as the Mississippi falls, or the season becomes fair, dries out, and so gives rise to the formation of malaria. The side of the garrison facing toward the swamp is most unhealthy, and whenever the wind comes from that direction malarious diseases increase in number.

Statement showing mean strength, number of sick, and principal diseases, at Baton Rouge, Louisiana, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Epidemic catarrh.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	226.83	1,518	.....	1,033	132	12	.....	.....	65	16	2	51	7
1869.....	253.25	1,059	2	681	80	8	1	2	45	14	3	50	4

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

SHREVEPORT, LOUISIANA.

INFORMATION FURNISHED BY ASSISTANT SURGEON P. F. HARVEY, AND ACTING ASSISTANT SURGEON MILTON A. ROACH, UNITED STATES ARMY.

This post is located about half a mile northwest of the city of Shreveport, on the right bank of Bayou Cross.

The buildings at the post were erected and used as an arsenal by the rebels during the late war. There were, at the close of the war, about fifty-six buildings, as near as can be learned, upon the ground—three constructed of brick, and evidently designed for the manufacture of ordnance; the remainder, rude unfinished frame buildings, many of them destitute of windows, and all in a state of dilapidation. A number of them have been torn down, others are occupied by troops as quarters, and the remainder are rented by the ordnance department to negroes.

The post is pleasantly situated in a healthful locality, on an eminence surrounded by natural ravines. The ground occupied embraces an area of 73 acres. The climate is mild; average temperature 65.24°; moisture 61.07. Prevailing winds from southeast and north.

An old frame building is used as quarters for the men. It is much out of repair, and badly ventilated and lighted. For the want of window-sash and glass the windows are closed with boards. The building is warmed by open fireplaces. Wooden bunks are used, with the usual bedding. Air space per man 406 cubic feet. The kitchen is a frame building, 13 by 14 by 7½ feet, containing one door and one window; the mess-room measures 24½ by 14 by 7½ feet, and contains two doors, and one window without sash or glass. The sinks are well arranged, being placed over the bayou.

Two unfinished frame buildings, of two rooms each, comprise quarters for as many families of soldiers. The houses are neither lathed nor plastered. Similar buildings, in similar repair, are occupied by the officers as quarters.

The store-houses, two in number, are commodious and well policed. The guard-house, a frame building, 13 by 10 by 7½ feet, is also much out of repair, and ill adapted to the wants of the command. The only means of ventilation is by the door and fireplace. The average occupancy is five.

The hospital building is 60 by 24½ by 9½ feet, partitioned into a ward, dispensary, and kitchen, and, if thoroughly repaired, would be sufficient for the sick of this command. The rooms are warmed by fireplaces, and lighted by windows. The ventilation is bad. The ward contains eight beds, with an air space to each of 812 cubic feet. There is no wash-room nor water-closet; the sink is situated in a ravine to the rear of the building. The stable is a brick building in excellent repair.

The water supply cannot be said to be good, either in quantity or quality, although with straining it answers tolerably well. The supply is obtained from two cisterns which will furnish, during a moderately rainy season, sufficient for the number of men now present.

There is no artificial drainage at the post. After heavy rains the water collects upon the low grounds which partly surround the barracks on the south, rendering it marshy and the source of infectious gases. Vegetation is luxuriant and insect life abundant. The locality is represented to be exceedingly unhealthful during the summer season.

The prevailing diseases at the post and vicinity are intermittent and remittent fevers.

Statement showing mean strength, number of sick, and principal diseases at Shreveport, Louisiana, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	109.08	561	2	349	78	.....	27	4	22	1
1869, (10 months)	72.9	266	3	207	8	2	14	2	10	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

POST OF JEFFERSON, TEXAS.

REPORT OF ASSISTANT SURGEON CARLOS CARVALLO, UNITED STATES ARMY.

Jefferson, Marion County, Texas, the fifth city of Texas, having a population of 8,000 inhabitants, is situated on the border of Big Cypress Bayou, which communicates with the Red River. Latitude, 32° 49' 30" north, and longitude 94° 17' west from Greenwich. It is 59 miles distant from Shreveport Louisiana, whence there is direct water communication to New Orleans, Louisiana, all the year round, and 16 miles distant from Marshall, which is in railroad communication with

Shreveport, Louisiana. Direct communication by water in June, July, and August, to Shreveport, is generally limited to steamboats of light draught.

There is no reservation, the troops being quartered on hired ground in the suburbs of the town. The soil is sandy. No mineral products in the vicinity. The soil is fertile for cotton, tobacco, wheat, and vegetables.

There is plenty of water in the Big and Black Cypress Bayous, which surround the southern limits of the town, and drinking water is obtained from numerous wells and a few cisterns. The climate is mild, a fine breeze blowing even in the middle of the day; the nights in summer are generally cool and pleasant; in winter "cold northers" are frequent and sudden.

Rain falls all the year round, but especially in the winter months. Snow storms are rare and light.

The troops have been quartered in two distinct camps until July 20, 1870, on which date the cavalry were ordered within the limits of the infantry camp. The infantry camp is situated on a slight elevation on the borders of Cypress Bayou, and includes $9\frac{1}{2}$ acres on the southwest outskirt of the town.

The enlisted men's quarters are on a sandy slope of the elevation referred to. It has been occupied since December 13, 1868, and contains the stockade, which was in constant use during the "period of reconstruction."

Tents are used exclusively as quarters for the men, generally in patches of two, three, or four common tents, floored and framed with pine lumber, some with brick chimneys, others provided with sheet or cast iron stoves; they are lighted with candles, and ventilated by raising the sides.

There are generally two or three men in each tent, giving 492 cubic feet air space per man. There are no bath-rooms. Pit sinks are used, disinfected with lime. The kitchens are wooden sheds, with brick floors.

The quarters for laundresses and married soldiers are common tents, framed; some have the addition of one or two wooden sheds.

The officers occupy tents in camp; generally one hospital and wall tent, as quarters for married officers, with two or three wall and common tents as kitchens and servants' quarters, and two wall tents for single officers. They are heated by stoves or open fireplaces with chimneys.

The depot quartermaster and depot and post commissary have hired houses for their store-houses in the center of the town.

The guard-house at the infantry camp is the outer portion of the stockade, under a covered porch, protected on the exposed side by canvas; it is heated by cast-iron stoves, and ventilated by raising the canvas. At the cavalry camp is a guard-house, divided into two rooms, one for the prisoners, about 10 by 10 feet, with small window and door opening into the other room, 7 by 10 feet, for the guard; the fireplace of brick for burning wood, the window and door furnishing ventilation, which would have been imperfect but for the numerous cracks and holes throughout the entire house.

The hospital formerly occupied a two-story frame building, at the head of the main street, but on account of its dilapidated condition was transferred, May 15, 1869, to a fine new two-story house, opposite the cavalry camp, with seventeen rooms, and two large lots, rent \$100 per month for each. On January 24, 1870, it was moved into tents in the cavalry camp, which have since been transferred to the permanent camp. It now consists of three hospital tents as wards, one hospital tent as office, one hospital tent as dispensary, two wall tents as dining-room, one wall tent, two wall-tent flies, and one common tent as kitchen, one wall tent and one common tent as steward's quarters, one wall tent as commissary store-room, three common tents as hospital attendants' quarters, one common tent as laundry, and one common tent as matron's quarters, all floored and framed with pine lumber, and heated with stoves, lighted with candles, and ventilated by raising the tent sides.

The bath and wash-room is in a wall tent, at the back end of the ward, and furnished with wash-tank and a bath-tub.

The library consists of 199 miscellaneous works.

Water for cooking, washing, and bathing purposes is obtained in barrels from the bayou, prisoners hauling it in wagons every day. Drinking water is obtained from one spring and one well in camp, and from neighboring wells, and is of good quality.

The natural drainage is excellent; the ground is very sandy, and absorbs the moisture.

The men bathe in the bayou at pleasure in the summer.

There is no hospital garden. Last year an attempt was made to cultivate a post garden across the bayou, but it proved a failure.

There is communication to New Orleans, Louisiana, by steamboat direct, or by stage to Marshall; thence by railroad to Shreveport, Louisiana; thence direct, by Red River and the Mississippi, to New Orleans. The mails are regular from New Orleans, twice weekly. It requires generally ten days for a letter to reach headquarters, Department of Texas, and from fourteen to seventeen days to Washington.

Intermittent fever is very prevalent, probably due to the large amount of stagnant water around the town. Pulmonary catarrh is prevalent in winter; also, diarrhœa, dysentery, and rheumatism.

The general duties of the garrison during the past year have been those of sheriff and mounted constables, arresting murderers and horse thieves, &c.

Statement showing mean strength, number of sick, and principal diseases at Jefferson, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (seven months) ..	175	315	.....	161	16	5	3	32	9	.....	22	1
1869	401.25	1,440	7	551	323	16	.....	101	36	3	94	10

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

AUSTIN, TEXAS.

REPORT OF ASSISTANT SURGEON J. V. D. MIDDLETON, UNITED STATES ARMY.

Austin, the capital of Texas and county seat of Travis County, is situated on the left bank of the Colorado River, 400 miles from its mouth, and 230 miles from Galveston, in latitude 30° 15' north, and longitude 97° 47' west from Greenwich. Brenham, the present terminus of the railroad in this direction, is 100 miles southeast. San Antonio 80 miles southwest. Between Brenham and Austin there is a daily line of stages, and between San Antonio and Austin a tri-weekly line.

The town is built on a succession of hills, between Waller and Shoal Creeks; the most elevated point, known as Capitol Hill, is 640 feet above the level of the sea, and 150 feet above the bank of the river; the State-house stands upon this hill, commanding an extended view of the surrounding country. The houses are built chiefly of wood and stone, one story high, and, with the exception of those on Main and Pecan streets, are very much scattered. The most prominent buildings in the town are the State-house, governor's mansion, land office, and headquarters fifth military district. There are also many private houses of one and two stories, well built and presenting a handsome appearance.

It is difficult to obtain reliable information in reference to the early occupation of Austin as a military post. One or two companies of the Second United States Dragoons, with regimental headquarters, were stationed here from 1847 to 1852, Colonel Harney, commanding. The ground occupied by these troops is about half a mile north of the State-house, and is known as the Harney Place. It is believed there were no troops here from the latter date above mentioned until the close of the late war in 1865, when General Merritt established his headquarters temporarily at the governor's mansion, the troops being encamped at various points about the town. In October, 1865, the Sixth Regiment of United States Cavalry, Seventh and Twelfth Indiana, and First Iowa

volunteer cavalry, General Sturgis, commanding, arrived here, and went into camp about one mile northwest of the city on Shoal Creek. During the spring of 1866 the volunteers were mustered out, and the Sixth United States Cavalry moved camp to the site now occupied on the left bank of the Colorado, one mile west of the city. This location was well selected for an encampment; the soil is sandy, the drainage naturally good, and an abundant supply of water is always at hand; since its establishment in 1865 this camp has been garrisoned by two companies of either the Fourth or Sixth United States Cavalry, and one or two of the Tenth, Eleventh, or Seventeenth United States Infantry. These companies have been moved on an average once in six months, other companies of the same or another regiment relieving them; three companies always constituting the garrison.

The country surrounding Austin is diversified by hills, valleys and plains, streams and rivulets. The town is surrounded by hills, which are covered with grass, evergreen, chaparral, and live oak, and from many prominent points the view is very picturesque. The valleys and plains are extremely fertile and highly cultivated. The soil consists of a black calcareous loam, admirably adapted for gardening purposes. The hills are composed of limestone, clay, and gravel. The geological formation, in general, belongs to the lower chalk and upper oolite.

No portion of Texas surpasses this for stock-raising. All uncultivated land is covered with rich grass, and is abundantly supplied with water running in streams and rivulets in every direction. The curly mesquite is said to be the most nutritious variety of grass, and grows quite luxuriantly; the common prairie grass is, however, the most abundant. In the spring and early summer beautiful flowers adorn the prairies; among them may be seen the verbena, violet, blue larkspur, coreopsis, and cactus. The principal trees are the live oak, water oak, post oak, black jack, red oak, scrub oak, and white oak; pecan, black walnut, cottonwood, cypress, cedar, slippery elm, hackberry, ash, wild cherry, and mesquite. About six miles northwest of the city there is an extensive cedar brake. The wild plum grows quite abundantly and bears a delicious fruit. Of the plants may be mentioned the woodbine, sumach, milkweed, sunflower, pope weed, poison vine, and lamb lettuce. The lamita, a bush growing to the height of several feet, is quite plentiful, the berries of which are somewhat similar in taste to the currant, and may be used for the same purposes. Several varieties of grape grow in great profusion in the low-lands and will make an excellent quality of wine.

There are but few wild animals in the immediate vicinity of Austin. The hare, rabbit, fox, squirrel, and skunk abound, but the deer, antelope, and bear are rarely, if ever, seen.

Among the birds are the pinnated grouse, quail, white and blue crane; duck, viz., teal, gray, ring-neck, and mallard; chaparral cock, mocking-bird, woodcock, curlew, plover, wild pigeon, dove, robin, blackbird, crow, and buzzard.

There are many fish in the Colorado. The most prominent are the catfish, buffalo, bass, gasper, alligator, gar, and perch.

Many reptiles and insects exist here as in other parts of the State, viz., the rattlesnake, moccasin, copperhead, and adder; tarantula, centipede, scorpion, horned frog, and several varieties of lizard; the black and red ant, sand fly, buffalo gnat, and mosquito. The whole country is sometimes devastated by the grasshoppers, which come in a perfect swarm about the month of August.

The country is abundantly supplied with water, very clear, but holding a large quantity of lime in solution, and thus rendered objectionable for drinking and washing. Nearly every house, however, has a cistern; and as there are several public ones in the town, there is no difficulty in obtaining a bountiful supply of good rain water at all times.

The climate of this section of Texas is quite salubrious. Although the sun is extremely hot in summer, the temperature of the atmosphere is much modified by the southeasterly breeze that blows almost continuously during the twenty-four hours. The summer usually lasts from April to October, about six months. The daily mean of the thermometer during the past year, 1869, was as follows, viz: January, 51.48°; February, 55.3°; March, 62.49°; April, 67.01°; May, 72.79°; June, 74.83°; July, 81.66°; August, 84.27°; September, 75.59°; October, 62.54°; November, 62.66°, and December 46.74°. The highest range of the thermometer was 98° at 2 p. m. on the 8th of August. August was the warmest month, the monthly mean being 94° at 2 p. m., while that for June was 88.26°, and for July 89.45°. A remarkable feature of this climate is the suddenness with which the north wind arises in the winter, constituting "the norther;" the temperature of the atmosphere is

sometimes reduced from 80° to 30° in a few hours, and is very trying to both animal and vegetable life. The coldest day of the year was December 22d; the thermometer indicated 21° at 7 a. m., 42° at 2 p. m., and 30° at 9 p. m. The amount of rain during the past year was 36.12 inches, the greater portion of it falling during the months of May, June, and July. The prevailing wind in summer is southeast; in winter, southeast, north, and northwest.

The military camp, as before stated, is situated one mile west of the city, on the left bank of the Colorado, and is well located as regards drainage, the water running off in every direction and conveyed by a ravine on either side into the river, the bluff being about 40 feet above its surface.

The officers and men are quartered in tents, and with the exception of the guard-house, library, kitchens, and mess-houses, there are no buildings at the camp. Each set of officers' quarters consists of one hospital tent as parlor and sitting-room, two wall tents, one as dining-room, the other as bedroom, and one common tent as kitchen. These sets are so arranged that they are about 10 feet apart and in a line on the east side of the encampment facing the guard-house. They are heated by fireplaces and stoves, and lighted by kerosene oil lamps and candles.

The enlisted men are sheltered by common tents, two of them placed end to end, boarded up and floored, and arranged in a line on each side of the encampment. Four men occupy a set of quarters, each man having his own bunk, bedsack filled with hay, and blanket. These quarters are warmed in winter by stoves and lighted by candles, which assist materially in causing a very vitiated atmosphere. In the rear of each company there is a mess-room, kitchen, and bake-oven. Each married soldier has a wall tent for quarters and common tent for kitchen. The laundresses, who are not soldiers' wives, are similarly quartered.

It is poor economy to continue troops for any length of time under canvas. I have frequently advised the erection of permanent quarters at this post as being much less expensive to the government and more conducive to the health of the garrison than tents. Although lumber is high in this country on account of expensive transportation, yet, when it is remembered that the cost of a hospital tent is \$163 22, including transportation, of a wall tent \$72, and of a common tent \$27 47, and that canvas must be replaced in this climate about once in eight months, it will be seen that the advantages, as regards expense, are decidedly in favor of permanent quarters. Even if the post should be discontinued in the course of a year, the lumber could be sold for almost as much as it originally cost. The hygienic advantages to be derived from commodious and well-ventilated quarters are incalculable, and should be paramount to all other considerations.

The quartermaster and commissary store-houses are in the city, in the first story of the building occupied by district headquarters. They are large, airy store-rooms, well arranged and kept scrupulously clean. Hospital tents are used at camp for company store-houses.

The guard-house is situated on the west side of the square opposite the officers' quarters. It is constructed of heavy lumber, 20 by 30 by 10 feet, with piazza all around it; the front piazza is boarded up and used for guard-room. The building is entirely too small, and is badly ventilated. It is warmed in winter by a stove in the prison-room and fireplace in the guard-room. On an average there are thirty prisoners, white and black, citizens and soldiers, in constant confinement in this house, each man having only about 200 cubic feet of air space. In the winter the apertures for the admission of fresh air are closed, and the room is heated by a stove. The atmosphere is sometimes intolerable, especially at night, as the necessities of nature are performed in the room, and the barrel into which fecal and other refuse matter is thrown remains unemptied until after reveille. The citizen prisoners rarely, if ever, wash themselves or have change of clothing, and the exhalation from their bodies is very offensive. There being only one prison-room, soldiers who are confined for minor offenses, such as absence without leave, drunkenness, &c., are made to associate with murderers and thieves, which is certainly not well calculated either to improve their morals or to elevate the status of the enlisted men of the army. I have time and again recommended that the guard-house be enlarged so that there could be sufficient air space for the number of occupants, with proper ventilation, and a sufficient number of rooms to allow a classification of prisoners; nothing has, however, been done in reference to my suggestions.

The post hospital is located in the city, on Pecan street, one square west of Main. The administration building was formerly occupied as a private residence. The lot attached to it is 200 feet front by 135 feet deep, and it was rented by the Quartermaster's Department in 1868, at \$90 per month, with a proviso that the owner would build a suitable ward and laundry in the yard.

The administration building contains three rooms, 16 feet square, and a hall. It is built of wood, and has a wide piazza in front the whole length of the building. The rooms are used as office, steward's room, and store-room, the dispensary being in the hall. The kitchen and mess-room are immediately in rear, in a small wooden building hardly large enough for the purpose. The ward is about 10 feet in rear of the kitchen and the laundry 10 feet to the left. These buildings were erected by the owner of the property in the summer of 1868, but are not well adapted to the purposes for which they are required. The ward is 40 by 20 by 10 feet, with two doors, one at each end, and ten windows, five on each side. It contains ten beds, is heated by a stove, and ventilated by a small cupola in the roof with openings in it. Air space per bed, 800 cubic feet. It is a rough wooden structure, in which the boards are placed up and down; there is no plastering or lining of any kind, nor is it ceiled; an awning has been placed around it, except on the north side, which shields it from the sun and renders it somewhat more comfortable in summer than it would be otherwise. An old building in very bad repair, situated about 20 feet to the left of the administration building, is used as a convalescent ward, and answers a very good purpose in summer, but is too open for winter use. An old building to the right of the kitchen is used as a bath and wash-room, and is supplied with a bath-tub and basins. The linen-room is fitted up very nicely with shelving, and next to this is the commissary store-room. There are no water-closets, but tolerably well-arranged sinks, kept well cleansed and disinfected, are located about 30 feet from the ward. No dead-house has as yet been erected; post-mortems are made in the dispensary, and the dead are placed in the laundry to await burial. The baggage of patients is stored in the linen-room.

There has not been a post bakery in operation at this post for several years; each company has an oven, and the saving on flour accrues to the company fund. The post school is held in a hospital tent immediately in rear of the library; an educated soldier is employed as teacher, and eight or ten children enjoy the advantages of the school.

The stables are located about a quarter of a mile northwest of the camp, forming three sides of a square; they are 620 feet long, tightly closed on the outside with pickets, but open on the inside all the way around; shed-roof shingled.

The library is hardly worthy of mention—no attention whatever has been paid to it; in fact there has been no post fund out of which to purchase books.

There being no roofing at the camp it is impossible to have cisterns, and the water supply is derived entirely from the river. This contains a large amount of lime, but is much less impregnated than that from wells and springs in the vicinity. The hospital is supplied with drinking water from the cistern at district headquarters, but there is a well in the yard from which water is obtained for other purposes. With the exception of fire buckets, of which there is a sufficient number on hand, there are no means of extinguishing fire; pains are taken to have these placed at suitable distances in the hospital, so as to be in readiness in case they are needed.

As before stated the drainage at camp is naturally good; there are no sewers; refuse is collected in barrels which are emptied every morning in a neighboring ravine. The sinks are situated about 50 feet in rear of the company quarters; they are well policed and disinfected every few days.

No special arrangements have been made with reference to bathing in winter. In summer the men are required to bathe in the river at least once a week.

The full army ration, of good quality and sufficient quantity and variety, is drawn every ten days from the subsistence store-house in Austin. Fresh vegetables, butter, and eggs can be procured in the vicinity at moderate prices, and the company fund allows each company commander to supply his men with these articles as often as two or three times a week. No gardens have been cultivated at the post during the past year.

Medical supplies are obtained from New Orleans, Louisiana, and received in good condition, but there is often great delay in transportation, and it has frequently happened that stores have been three months *en route*. A larger supply of medicines is required at this post than the strength of the command would seem to justify, but when the large number of persons entitled to medicine is taken into consideration, embracing officers and enlisted men at district headquarters, with their families, transient officers and troops, it will be seen that a supply for a permanent garrison would be very inadequate to meet the demands of the service. Frequently, small requisitions for other posts are filled at this hospital, and detachments of troops going out on scout or other duty are furnished with a small supply of medicine.

This is one of the healthiest points in the State, and the true estimate of the amount of sickness will embrace only those cases that were admitted to hospital for treatment, which will reduce the percentage to 23.8. Sick-call is held at the camp dispensary at 7 a. m., and such cases as require hospital treatment are sent to the city by ambulance. During the months of June, July, August, and September, intermittent fever (quotidian and tertian) prevailed to a very great extent, and all other diseases received an impression from, and were much modified by, malarial influences. During the month of May a pond of standing water, located about fifty yards southeast of the camp in the river bottom, was drained successfully, and shortly afterwards intermittent fever began to appear, the sick report increasing from 10 to 40 out of a mean strength of 250. In July an immense overflow occurred, the river rising 30 feet in as many hours. When the water subsided a large amount of alluvial deposit was observed along the river bank, and almost immediately afterwards the sick report was again increased by the addition of a number of cases of malarial fever, in connection with diarrhoea and dysentery. Quinine in 10 or 15-grain doses, three times daily, has usually been thoroughly efficient. Rheumatism seems to prevail very extensively in this climate; perhaps the variation in temperature between the days and nights, amounting to fifteen or twenty degrees, may have some influence in producing it.

The garrison being so near town there is, as may be expected, a great deal of venereal diseases and derangements of the digestive organs, the result of dissipation. As a general rule, however, the sanitary condition of the troops is about as good as that of any other post in Texas.

Statement showing mean strength, number of sick, and principal diseases at Austin, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	265.08	701	4	243	165	46	2	28	4	23	2
1869.....	276.25	650	1	345	111	20	.....	19	1	14	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

SAN ANTONIO, TEXAS.

REPORT OF SURGEON D. BACHE, UNITED STATES ARMY.

The post or town of San Antonio de Bexar is situated in latitude 29° 30' north, and longitude 22° 30' west from Washington, at an altitude of 556 feet above the level of the sea.

The barracks, store-houses, and other buildings in the service of the garrison, being wholly within the corporation limits, any description of the post will of necessity embrace an account of the topography of the town, and such features in its construction, drainage, and general characteristics as may influence the hygiene of the population. Broadly speaking, the town lies upon both banks of the San Antonio River, and stretches across the tongue of land separating that stream from the Arroyo San Pedro, a small creek emptying into the former at the lower limits of the suburbs. The San Antonio River rises three miles above the town, where it springs boldly from the base of the low limestone hills, which are here the outlying spurs of the great cretaceous strata constituting the high table lands of Texas. The valley of the river is shut in by hilly ranges running in a southeasterly direction, the hills having generally an altitude of from 200 to 300 feet above the level plain that lies between. The area occupied by the town is, for the population, quite extensive, extending for two miles in the line of the river, and from a half to three quarters

of a mile upon either side but, except in the central, or business portion, it is not closely built, the houses being widely separated, and for the most part surrounded by gardens.

The population of San Antonio is variously estimated at from 12,000 to 15,000 persons, composed nearly equally as to nationality of Americans, Germans, and Mexicans, or mixed races. There is a difficulty in even making this estimate with approximate correctness which attaches to few other places, due to the large migratory or floating population. As the great freight center for Western and Northwestern Texas, and for Chihuahua, and, indeed, all Northern Mexico, San Antonio is subject during the season of business activity to a large influx of strangers, and to constant fluctuations in this respect from the numbers of those employed as carriers of merchandise in the requirements of their trade.

The old mission of San Antonio de Valero was founded in 1715, the barracks of the garrison and other offices occupying the sides of the quadrangle, in the center of which were the missions—afterwards secularized as parish churches. These quadrangles form the present plazas or squares, the churches and garrison buildings remaining much as they were finished, altered only to suit the demands of present utility. The remainder of the town is modern in architecture, the poorer Mexican population only living in the thatched huts, or jacals, a style of habitation which the general mildness of the climate permits.

Owing to the small average rain-fall in this section of Texas, amounting to but 30 inches in the year, and the danger from protracted droughts, a thorough system of artificial irrigation is necessary to insure any certain return in crops, especially in the smaller articles, such as vegetables. Ditches for this purpose—some of them five or six miles in length—intersect the town in various directions, and from these mains smaller trenches traverse the gardens to every point. As these water channels are not protected or built with masonry, but are simply cut rudely in the earth, they are constantly filling with the washings of the ground under irrigation, and choked with garbage and refuse matter thrown into them for the purpose of removal. The water supply of the town is so defective, and so little a subject of regulation, that the water of these ditches is commonly used both for drinking and cooking by many living on their banks and their vicinity, except when so muddy as to be repulsive. In this I think we may find an easy explanation of the rapid and fatal spread of the various epidemics of cholera that have visited this place. It is fair to ascribe also to this system of irrigation, in which large surfaces of ground are constantly exposed alternately to the action of water and the heat of the sun, much of the increasing prevalence of malarial disease, which, it is affirmed, was almost unknown here not many years ago. To the decay of vegetable matter from this cause must be added also, as an important factor in the production of zymosis, the exhalations from the sluggish streams in the ditches, and the rank growth upon their banks. The other means of water supply are wells and cisterns, though the latter, owing to the cost of construction, are but few. The garrison is wholly supplied for drinking purposes from this source, the cisterns having in all a capacity of over 70,000 gallons, sufficient to serve through a season of unusual drought. The system of drainage, if system it can be called, employed throughout the town is in every way defective and insufficient. Upon only one or two of the principal thoroughfares is any attempt made to carry off artificially even the ordinary rain-fall, which in summer is often sufficient to flood the streets. As the ground is almost level, the surface drainage is reduced to its lowest point of efficiency, leaving for slow removal by evaporation and absorption the water that could readily be carried into either of the larger streams or the irrigating ditches.

The buildings used as barracks, hospital, and store-houses are, with the exception of the Alamo, the property of private citizens, and are rented by the government. They are constructed of both the compact and soft limestone, quarried a few miles from the town, this being the material in almost universal use for building.

The barracks were originally designed as store-houses, in connection with the larger building adjoining them, used by the subsistence department and as offices for post headquarters and the depot quartermaster. The situation of the barracks is bad, bordering upon the low ground in a curve of the river, and subject, during the spring freshets, to sudden inundation. Once during the past year, and once in 1866, the water rose rapidly in the night, attaining a height of several feet above the barracks floor, forcing the soldiers to abandon their quarters. These overflows, besides their danger to life, destroy and damage much public property, and are apt, unless their effects are

neutralized at once, to produce a serious increase of disease. While objectionable in this respect, and faulty in want of adaptation to their present use, the buildings are, however, more suitable for the occupation of troops than any others accessible. The government would certainly gain much in point of economy in the health and discipline of the garrison, were permanent barracks erected upon the higher ground at some distance from the town.

The building occupied as cavalry quarters is 34 by 83 feet; height of wall, $15\frac{1}{2}$ feet; to top, $8\frac{1}{2}$ feet. It is warmed by stoves; lighted naturally by windows, and artificially by candles. The amount of air space in infantry barracks with present occupancy is 830 cubic feet per man; cavalry barracks, 1,058 cubic feet. Ventilation is effected by doors, windows, and shafts. The bunks are of wood, double, in two tiers, containing the usual bedding. The sinks are pits, 8 feet in depth, emptied as occasion requires. The kitchens are well arranged and supplied; the mess-rooms are furnished with good tables, benches, and table furniture.

Quarters for married soldiers are principally in small rented houses in the vicinity of the company barracks.

No special buildings are provided for officers' quarters, which are rented and assigned by the quartermaster.

The Alamo is occupied by the quartermaster's department as a store-house for forage, camp and garrison equipage, and to some extent for workshops. The walls are still in excellent preservation, though dating from 1744, and subjected since then to several sieges and assaults.

The guard-house, in its general features, does not differ materially from buildings of this kind in use throughout the army, at least such has been my experience. The faults and deficiencies are so palpable that it scarcely is necessary to recite them. The building contains a guard-room, 16 feet 4 inches by 26 feet; prison-room, 16 feet 4 inches by 16 feet; and 7 cells. With an occupancy of 15, the air space in the prison-room per man would be 153 cubic feet, with a superficial area of 16 feet per man, or a space little over 5 feet long by 3 feet wide. The construction of the cells is, however, intolerably worse, 7 feet long, 7 feet in height, and 2 feet wide, giving an interior space of 98 feet. It is noticeable, in this connection, that the only deaths (two) occurring at this post during the past year have been in cases of men in confinement in the guard-house, one resulting from typhoid pneumonia, the other a case of congestion of stomach, and meninges of the brain with effusion, in a man who had been confined for six months at this post and elsewhere. Though no direct cause of death can be traced in their confinement, there was evidently a strong devitalizing agency at work in both. There is no means of warming the guard-house, except a stove in the guard-room.

The hospital was a private residence, but from the manner of its construction and from location it is admirably adapted to its present purpose. It is two stories high, with basement, the latter containing the dining-room, kitchen, and store-room. The first story is divided in the center by a hall, 7 feet 9 inches, extending from front to rear, with a staircase leading to a similar hall above. On the right of the hall are the office and dispensary, above which are the steward's room and linen-room. Three wards occupy that portion of the building left of the halls mentioned; the largest ward, extending from front to rear, on the first floor, is 19 feet 9 inches by 34 feet 3 inches, and has a capacity for eight beds, giving to each a cubic air space of 930 feet. Over this ward are two others, the first 19 feet 9 inches by 19 feet 9 inches; the other, 19 feet 9 inches by 14 feet. These rooms are at present unoccupied. There is no bath-room; the lavatory is supplied with ordinary appliances. The hospital sink is located at a distance from the building, and consists of pits which are emptied every three months.

The post bakery will supply 200 loaves daily.

Medical supplies are obtained from New Orleans, and received in good condition and so kept.

The prevailing diseases at the post are intermittent and remittent fevers, and various forms of catarrh.

Statement showing mean strength, number of sick, and principal diseases at San Antonio, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	143.33	151	41	15	17	1	4	1	30	1
1869.....	128.83	154	71	24	11	.....	8	1	1	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT RICHARDSON, TEXAS.

REPORT OF ASSISTANT SURGEON J. H. PATZKI, UNITED STATES ARMY.

The post of Fort Richardson is located in Jack County, Texas, in latitude $33^{\circ} 15'$ north, and longitude $21^{\circ} 15'$ west, upon the south bank of Lost Creek, a tributary of the Trinity River, southwest from and about seven miles above the point at which it empties its waters into the west fork of that stream. The nearest range of hills is that known as "Flat Top Mountain," about 20 miles in a west-northwesterly direction, and which is one of the low ranges of hills that divide the headwaters of the Brazos from those of the Trinity. These hills appear to be detached spurs of the Wichita Mountains, through which the Red River passes at about 60 miles northeast of the post, and which seem to form part of a mountain system from which diverge the lesser tributaries of the Brazos, the Trinity, and the Red Rivers. The village of Jacksboro, the county seat of Jack County, is in the immediate vicinity of the post, being situated on the north bank of Lost Creek, and about one-half mile distant. The nearest settlements are Weatherford, the county seat of Parker County, distant $42\frac{1}{2}$ miles in a southeasterly direction, on the direct mail route to Waco and Austin; Decatur, in Wise County, distant 40 miles east-southeast on the road leading toward Jefferson and towns in eastern Texas, and Montague, in Montague County, distant about 40 miles in a northeasterly direction and on the line of the overland mail route from Fort Concho, in Texas, to Fort Smith, in Arkansas. Calvert, the present terminus of the Texas Central railroad, is the nearest point at which railroad communication can be obtained, and is distant 202 miles from the post, reached via Waco, from which it is 55 miles distant in a southeasterly direction.

The village of Jacksboro, before the war a station of the overland mail route, was occupied as a military post in the summer of 1866. In April, 1867, the place was abandoned, except as a mail station, and the troops moved to Fort Belknap and Buffalo Springs. The latter place, in Clay County, about 28 miles north from Jacksboro, was selected as the site for a permanent post, and the necessary materials and a force of mechanics and laborers sent there in July, 1867, and operations commenced, but owing to a failure in the supply of water, and the distance from timber, it was abandoned, and the material sent to this place, where the present post was commenced in the latter part of November, 1867, the plans originally designed for the post at Buffalo Springs being partially followed in its construction. The reservation on which the post is built is a rectangle of one mile square, located on a high rolling prairie, bounded on the eastern, southern, and western sides by belts of timber, and on the northern side, for nearly its entire length, by Lost Creek, which runs in an easterly direction at that point.

The geological formation of the vicinity consists principally of lime and sandstone, and large masses of rock predominate. The whole region appears to be underlaid with a stratum of rock, which is covered but thinly by soil, or crops out at the surface, except in the "bottoms" or small valleys watered by streams, which sometimes admit of cultivation. The adjacent country for many miles around the post is of the same general formation. Notwithstanding the thinness and barrenness of the soil the grazing in the immediate vicinity is excellent, the grass being prin-

cipally mesquite, a variety superior to ordinary prairie grass. At Fort Belknap, 32 miles west of the post, on the east bank of the Brazos, bituminous coal of a quality resembling that of western Pennsylvania is found, and some small veins which crop out near the surface have been opened. Indications of considerable deposits of copper ore have been seen within about 75 miles, in a northwesterly direction, some specimens of which on being assayed have proved very rich, and contain silver in considerable quantity.

The varieties of timber in the neighborhood are oak, pecan, and mesquite, but generally of a small and stunted growth, and unfit for building purposes, except the construction of picket or stockade houses; the timber used in the building of the post having been procured on the Big Sandy in Wise County, about 38 miles due east from the post, at which point the government saw-mill was located. Within the past month the mill has been removed to a point distant about 18 miles from the post, on a small tributary of the west fork of the Trinity, the supply of timber at its former location having been exhausted.

The mustang grape and chickasaw plum abound, and the pecan nut, which grows upon the tree of that name, may be gathered in great quantities. The wild onion, a wholesome and palatable addition to the soup ration, is found in small quantities on the prairies, and along the banks of the water-courses. Buffalo are found during the winter months within 30 or 40 miles to the northwest of the post, but in the warm season are rarely seen south of Red River. Antelope and deer are numerous, and bear and panther occasionally met with. Of smaller animals raccoons and rabbits are very plentiful. Of the latter the hare, or, as it is popularly known in this State, the mule-ear variety, is the most numerous. Wild turkeys exist along all the water-courses in incredible numbers, and prairie chickens and wild duck are seen at times. Fish cannot be obtained (except some small varieties in Lost Creek) nearer than the Brazos River, the nearest point of which is about 30 miles distant. In that stream they are very abundant, but of little variety, catfish, drum, buffalo, and gaspers, (the latter nearly resembling the catfish,) being about the only kinds found which are fit for food. Turtle abound in all the streams. Tarantulas, centipedes, and scorpions infest this whole region, and chameleons and horned-toads may be frequently met with. The copper-head, moccasin, puff-adder, and rattlesnake are found, the latter very frequently, but generally of small size. Besides these there are several unimportant varieties of harmless serpents found in great numbers, such as the black snake, chicken snake, and common house snake.

The water for culinary purposes is obtained from the creek, and that for drinking from springs, of which several are to be found along the creek in proximity to the post. The supply of water from this source is both good and ample, although containing a slight excess of lime. The creek cuts its course through the rocks and runs between steep banks shaded with fine trees, the narrow seam of which forms a pleasant relief from the monotonous prairie. It is at most places narrow and shallow, but expands at others into pond-like basins with beautifully clear water. To the great depth of some of these expansions the creek is supposed to owe its name, and they contain an ample supply of good water for the post during the dry season when the creek ceases to run. The heavy rains of the wet season swell the creek not unfrequently to the top of its banks.

The heat of the summer months, reflected from the rocky soil, bare of shade trees, would be insupportable if it were not tempered by constant breezes from the southwest or southeast, and close sultry nights are unknown even during the hottest weather. These winds contain but little moisture, owing to the character of the surface over which they sweep before reaching here. The rainfall during this season is but scanty, yet sometimes so heavy as to render the labors of the farmer fruitless. The uncertainty of the climate in this respect, together with the thinness of the soil covering the rocky substratum, form the most serious obstacles to successful agriculture in this portion of Texas. The mean temperature of the summer is 75.52°, and the maximum 100°. From the beginning of November until the end of March "northers" are frequent; and although usually of short duration, yet they sometimes prevail for days, the cold being intense during their continuance. Snow-storms occur but rarely, generally but one or two during the season, and the quantity of snow which falls is so slight that it soon disappears. The mean temperature of the winter is 51.21°, and the minimum 16°. Spring may be said to fairly commence early in April, and no degree of cold is experienced before the end of October. Horses and other domestic animals inured to the climate

are exposed to the weather during the entire winter with impunity, the low temperature incident to the "northerners" above referred to being about all the really cold weather experienced.

No fortified buildings or fort proper has been erected, the fort as described below comprising the garrison and structures contained therein. It is located in the northwestern angle of the reservation, and is about 200 yards distant from the creek, the ground sloping gradually up from its banks, the highest portion (the southern side of the quadrangle on which the officers' quarters are built) being about 30 feet above the level of the stream. It is a parallelogram of 1,400 feet from north to south, and 1,300 feet from east to west. Four buildings for barracks were built by the troops in the summer and autumn of 1869. They run in a line from east to west, with an interval of 50 feet between them, 550 feet from and facing the officers' quarters. They are constructed of pickets, on what is known as the stockade principle, the pickets being cut of a length of 11 feet, and sunk two feet in the ground. Three of these buildings, marked Q on the accompanying Plate (Plate No. IV) are 85 feet in length by 20 feet in width, and one marked R, 100 feet in length and 20 feet in width, all being of a height of 9 feet in the clear (to the eaves) and 15 feet to the ridge. A room of 15 feet is partitioned off at the western end of each building for the use of the first and quartermaster sergeants, the loft above serving as a store-room for company property. Each barrack is warmed by two large wood stoves, the pipes of which pass through the roof. Six windows, three in front and the same number in rear, and two doors, one in front, the other in rear, supply light and ventilation; the latter of which, however ample it may be in summer, is, in the absence of ridge ventilation, very deficient in the winter, when the cold necessitates the closing of windows and doors and the maintaining of fires. The three smaller barracks have a capacity of 28, and the larger one of 34 men, at 600 cubic feet of air space per man. The present average occupancy of the former is about 35, with about 457 cubic feet of air space per man; and of the latter, which is occupied by two companies, 60 men, with 340 cubic feet of air space per man. But while the occupancy of the others has not varied much in the past from the present average, the larger barrack was occupied last winter by more than 100 men, (I Company Twenty-fourth Infantry,) reducing the air space below 200 cubic feet per man. To judge from the number of bunks with which these barracks are furnished, the three smaller (Q) were intended to accommodate 72 men, and the larger one (R) 96 men, which would have given 233 cubic feet of air space in the former and 210 in the latter, per man.* It is to be regretted that these buildings were not erected with a view to proper air space and ventilation, and to be hoped that new barracks, which will be necessary if the present garrison of nine companies is continued, will be free from such grave objections. Some difficulty, however, will be experienced to locate such structures, as there is not room to build four, much less five, of them in a line with the old buildings, without on one side encroaching too much upon or even overlapping the hospital, and on the other side blockading the subsistence and quartermaster's store-rooms. This difficulty would have been obviated if the quarters for the men had been built *en echelon* from north to south, which would have afforded the additional advantage of permitting the prevailing southerly breezes to sweep their whole length, while the present plan prevents to a great extent the current of air in the rear of the barracks and kitchens, where refuse is most apt to collect, and at the same time exposes a large surface to the northerly storms of the winter. The beds are wooden bunks, 4 feet wide and 6½ feet long, each holding four men, two above and two below. The bedding consists of blankets, and double bedsacks filled with hay, which is renewed monthly. There is no provision made for wash and bath-rooms, the men having to wash in the open air. The privies are situated in the rear of each set of quarters, (150 feet distant,) and have movable troughs, lined with zinc, under the seats, the contents of which are required to be emptied daily. Each of the three barracks (Q) has a kitchen and mess-room 25 feet in rear, 50 feet in length, by 17 feet in width, and 8 feet high in the clear, built in the same manner and of the same material as the barracks. A space of sufficient size is partitioned off at one end as a cook-house, the remainder being used for the mess-room. The stoves and cooking utensils are of the description furnished by the Quartermaster's Department, and are suitable for the purpose. The fixtures of the mess-rooms, provided from the company funds of the respective companies, are sufficiently complete.

The mess-rooms are of adequate capacity for the present strength of the companies, but in case

* In the above calculation space occupied by furniture is not deducted.

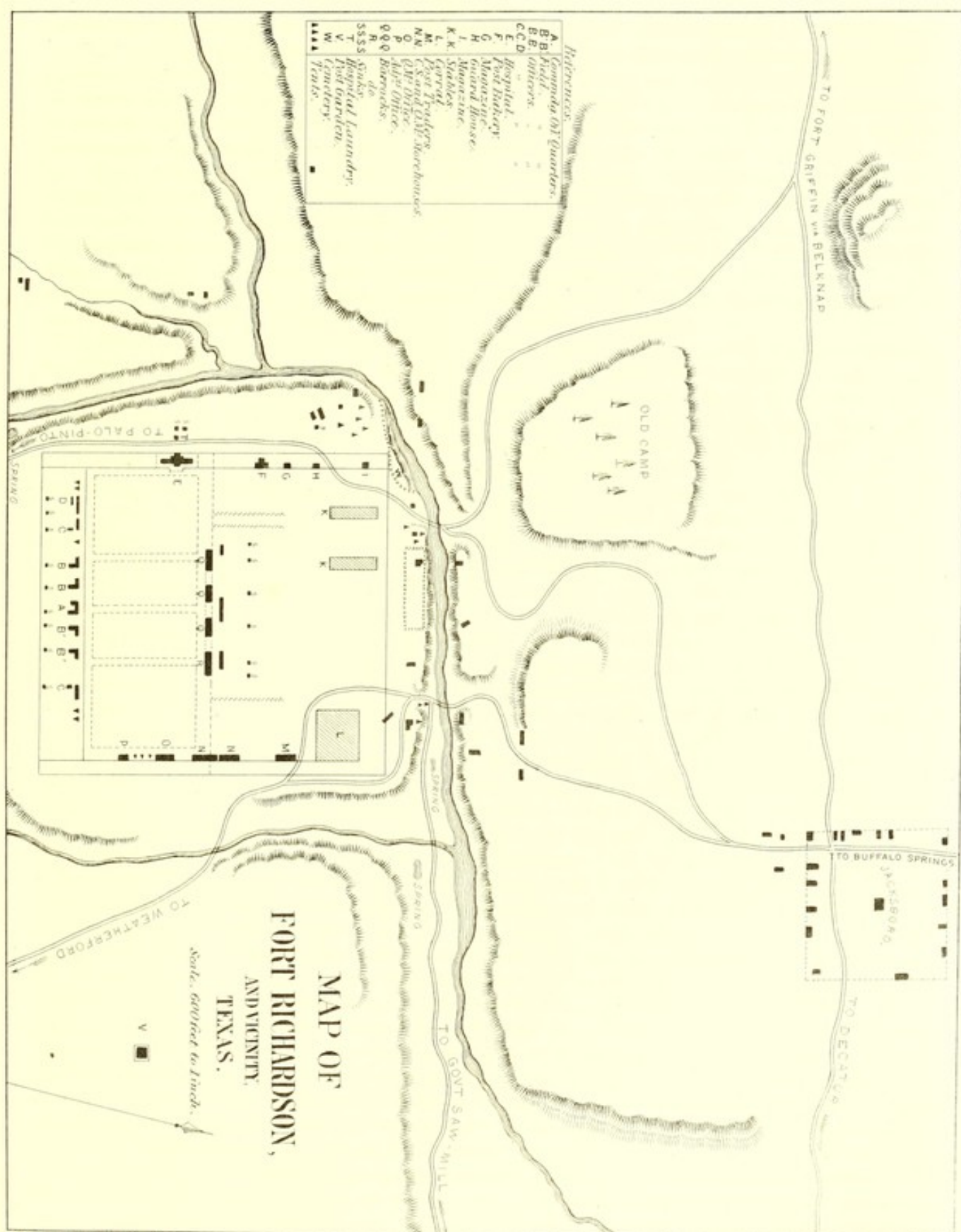


PLATE N^o IV.

they were to approximate to the maximum strength, only one of the barracks (the larger one, and which has a mess-room and kitchen of 75 by 20 feet) would be sufficiently roomy for the purpose designed.

The quarters for laundresses and married soldiers consist of a variety of log huts, frame houses, picket houses, and tents, scattered along the creek in the northwestern angle of the fort, without any system being observed either as to their location, structure, or fitness for the purposes for which they are used. Their location is highly objectionable, as the drainage from this portion of the camp is received into the creek above the point where the water for cooking purposes is obtained, which water is, however, also used by many for drinking. A board of officers has recently been convened to select a proper site for these quarters. Eight buildings have been erected for officers' quarters, located upon the southern side of the fort. Five of these (one marked *a*, two marked *b*, and two *b'* on the plate) are frame buildings; the remainder are stockade or picket-houses. The lumber used in their construction is principally cottonwood, a variety considered utterly worthless for building purposes in regions where any other can be obtained, but the only kind of timber convertible into lumber found in any quantity within 200 miles of the post. These houses are one and a half stories in height, have each two dormer windows in the front roof to light the attic which forms the second story, have porches in front and rear, and being finished uniformly in cottage style with large windows, present a neat appearance, and are quite comfortable, being ceiled and plastered, and the wood-work painted. Four of these (marked *b b*, and *b' b'*) contain four rooms, one large room, 18 by 18 feet, on one side, two smaller rooms, 18 by 15 feet and 15 by 15 feet, on the other side of the hall, and a kitchen, 15 by 15 feet, adjoining the latter and forming an L with the main building. Two of these buildings (*b' b'*) are occupied by the two field officers present. Of the remaining two (*b b*) the continuous sets of two rooms and kitchen are occupied by senior captains, and the single rooms on the other side of the hall by junior captains or subalterns, who contrive to add a dining-room to their quarters by inclosing the back veranda with canvas, using tents in the yard as kitchens. These cottages would accommodate comfortably two families if an additional room had been built to adjoin this single front room as in the central building (marked *a*) occupied by the commanding officer, which, by this arrangement, contains five rooms. The three remaining buildings (marked *c c* and *d*) are picket buildings, one story in height, 9 feet to the eaves and 15 feet to the ridge, two of which (*c c*) are 47 by 16 feet; the third (*d*) 73 by 18 feet in size. The former are divided into three rooms, 15½ by 16 feet, two of which are occupied by captains, the third by subalterns. The third of the picket buildings (*d*) contains four rooms, 16 by 18 feet, and is occupied by two captains. A back building, 33 by 15 feet, containing two kitchens, is in the rear of each of these buildings, completing thus the allowance of the officers occupying them. These picket quarters are decidedly inferior in finish to the frame houses, not being ceiled, the floors consisting of rough boards, the walls being rough logs, the interstices filled with plaster. The absence of verandas, as adding to the discomfort of the occupants, is much complained of. The officers not provided with quarters live in tents. It is intended to erect three more buildings of the description of the one marked *d*. All of these quarters are heated by open fireplaces, and ample light and ventilation are secured by windows.

The post water-wagon supplies the officers with sufficient water for cleansing purposes, while that needed for drinking and culinary uses is obtained from springs near the margin of the creek, a distance of but a few hundred yards from the quarters.

Privies are erected 75 feet in rear of the quarters, having movable troughs, (similar to those in use at the barracks,) which, in accordance with existing regulations at the post, should be emptied and cleaned at an early hour each day.

The adjutant's office is a stockade building of 47 by 16 feet, divided into three rooms, used as offices by the commanding officer, adjutant, and clerical force employed at post headquarters. The quartermaster's office is a stockade building of 77 by 16 feet, and is divided into four rooms, two of them furnishing quarters for the post quartermaster, one used as an office, and the remaining one as quarters for the veterinary surgeon and post quartermaster sergeant. Both of these buildings are of the same height and description as the stockade houses for officers, and are suitable for the purpose to which they are applied.

The quartermaster store-house and commissary building (*n n* on plate) are built of sandstone

each 86 by 29 feet, and of a 19-foot story, with a space between them of 20 feet, which was originally designed to be arched and to form an entrance to the fort, it being the central point of its eastern side. This space has been, however, filled by a frame structure built flush with the two store-houses, making them parts of a continuous building. The lower part is used by the commissary officer as a store-room, and the upper floor as his office and a sleeping room for his subordinates. An upper story or loft in both of the store-houses has recently been added by laying a floor on the joists, thus securing a space where light stores may be kept. These buildings are well constructed, having 18-inch walls, and being sufficiently ventilated. The subsistence store-room is not, however, of sufficient capacity for storing a six months' supply of provisions for six companies, much less

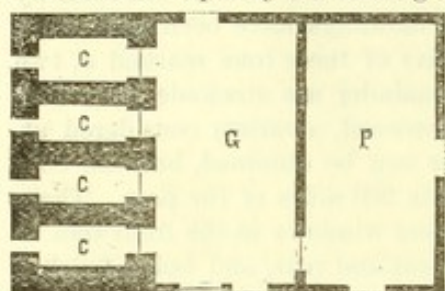


Figure 22.

for nine companies, the present garrison of the post. The guard-house, which is built of sandstone and of pickets, is 37 by 24 feet, and 10 feet in height. Figure 22 shows the general arrangement of the building. C, cells, $4\frac{1}{2}$ by 8 feet, by 8 feet high; G, guard-room, 13 by 24 feet, by 10 feet high; P, prison-room, 12 by 24 feet, by 10 feet high.

The building is warmed by a wood stove placed in the center of the guard-room, the pipe passing through the roof. The only ventilation of the cells consists of a grating in the outer walls, 12 by 18 inches in size, and a few auger holes in the doors. The atmosphere is stifling and unhealthy in the extreme, and there being usually two, and frequently three, prisoners confined in each cell, they have but 96 cubic feet of air each, and that of the most impure description. The prison-room has two windows, (not, however, so arranged as to give cross ventilation,) of about three square feet. As there are frequently 30 inmates* of this room at one time, the allowance of air for each man is reduced to 96 cubic feet. The average occupancy of the guard-house since January 1, 1870, is $23\frac{1}{3}$, and since April 1, at which time the garrison was augmented to its present strength, 28. An open tub in the prison-room used for excreta renders the limited amount of air still more impure and offensive. That such a state of affairs must prove deleterious to the health of the occupants is evident, and it is the imperative duty of the proper authority to take such steps as will prevent confinement from becoming a cruel punishment. Besides the prisoners, the members of the guard, (six upon an average,) also suffer by breathing the foul air diffused through the whole building. Considering that the prisoners are working the greater part of the day in the open air, their allowance of air space may, perhaps, for a limited time, be reduced below that in permanent quarters, but the occupancy of the cells should never exceed one to each, and of the prisoner's room it is thought that, with its deficient ventilation, eight would be the highest number of prisoners it could contain without prejudice to their health.

The hospital is built of the sandstone found in the immediate vicinity of the post, the lumber used in its construction being furnished from the government saw-mill, with the exception of the doors, window sashes, and ceiling boards, which were forwarded from the quartermaster's depot at San Antonio. It is 128 feet in length, from north to south, and consists of a main building of two stories in height of 33 by 35 feet, two wings, 44 by 24 feet, and a kitchen in rear of the main building, 12 by 20 feet. A veranda of 12 feet in width surrounds the whole building. The plan furnished from the office of the Surgeon General, (Circular No. 4, April 27, 1867,) has been followed in the construction of this building, except in a few particulars. The main building is warmed by open fireplaces, and the wards by one large wood stove placed in a central position in each, the pipes of which pass into the flues of the main building—the one in the south ward into that of the dispensary, that of the north ward into the flue of the office. Ample light is admitted by the various windows, which are judiciously placed, and although the wards are ceiled and ridge ventilation thus cut off, thorough ventilation is secured in the warm season through windows and doors; but the wards, if filled to their capacity in the season when fires are rendered necessary, would be found very deficient in this vital particular, as the ventilating shafts, which are but 16 inches square, are too narrow to admit of a stove-pipe with safety passing into them, whereby the air boxes, intended by the original plan from the Surgeon General's Office to open

* On August 5, 1870, there were 10 prisoners in the cells, (one of whom was in solitary confinement, occupying one and cell, 38 in the prison-room—more than can find sleeping room on the floor.

under the stoves, are rendered useless, and therefore omitted. It is necessary to have arrangements made for proper ventilation before the beginning of the cold season.

Each ward is 33 by 24 feet, and contains 12 beds, which gives an air space of 990 cubic feet to each patient, the ceiling being 15 feet high.

The bath and wash-rooms, 11 by 9 feet, are furnished with bath-tubs and basins. Sinks are here much needed to drain off the refuse water. The water supply being inadequate for water-closets, the rooms designated for that purpose are furnished with air-tight close stools, which are emptied immediately after use. Two sinks are located about 100 feet in rear of the building. The flight of stairs ascending to the second story is very narrow, (2 feet 8 inches in width,) and at an angle (nearly 45°) that makes it both dangerous and difficult to move heavy packages from one story to the other. The plan, so far as regards a dead-room on the second floor, has been changed on account of the narrowness and steepness of the stairway, and of the climate, which makes it imperative to have the dead-house at a distance from the hospital.

It is thought that the room on the first floor, intended as a store-room, is best adapted as quarters for the hospital steward, it being opposite to the dispensary and well suited to superintend both wards. The baggage of patients is properly labeled and kept in the store-rooms on the second floor. The roof of the hospital is very defective, owing to the inferiority of the shingles with which it is covered. It is desirable that a vane should be placed upon the roof, as the observations of the directions of the winds are necessarily inaccurate without one. A lightning rod is necessary on account of the hospital building forming the highest point within the post or vicinity. The artificial illumination of the hospital since the promulgation of General Orders No. 17, Headquarters of the Army, Adjutant General's Office, Washington, District of Columbia, February 8, 1870, is rather deficient even for the ordinary routine of duty in the evening, and would be found still more so if the performance of surgical operations in the evening should become necessary.

A stockade laundry has recently been erected about 60 feet in rear of the hospital, (marked *t* on plate,) 16 by 17 feet in size, covered with canvas, the pipe of the caldron passing through the roof, no chimney or fireplace having been built. The fixtures are yet incomplete. This building is also used as a dead-house for want of one built for the purpose.

It is to be regretted that a cistern has not been provided for in the plan, as the large expanse of roofing, embracing an area of over 8,000 square feet of surface, would, if properly guttered, supply an abundance of rain water. It is more particularly to be desired that such an arrangement could be made, as the supply of water furnished by the water-wagon is at times inadequate for bathing and cleansing purposes.

The post bakery (marked *f* on plate) is built of stone, 26 by 26 feet, and twelve feet high to the eaves. The oven, built against its rear wall, is 14 feet square, and has a capacity of about 400 rations at one baking. As two "batches" of bread could, upon occasion, be produced in the course of 24 hours, its total capacity per day is upward of 800 loaves. The floor of the bakery is of stone, two windows give cross ventilation, and the whole structure is commodious, and entirely suitable for the purpose designed.

There is no laundry, chapel, or school-house at the post, and no provision is made for affording the troops any opportunity for religious or other instructions.

The magazine is built of stone, 18 by 16 feet, and 11 feet in height to the eaves. The roof is rendered fire-proof, being of rock, covered with a cement of tar and gravel. The walls are double and 18 inches in thickness.

The stables, of which two have been erected, (marked *k k*, on plate,) are built of pickets with shingled roofs. The one nearest the guard-house is 200 feet in length and 35 feet in width, the remaining one of the same length and 30 feet in width; double doors at each end and in the center of each side of the buildings, and loop-holes in each stall admit plenty of light and air.

The post library is at present kept in the office of the post commissary, and contains 120 volumes, the greater part of which are well selected works of fiction, embracing, among others, those of Scott, Lever, and Dickens; in addition to which are a few standard text-books and historical and poetical works. A few weekly papers are furnished from the post funds, but there being neither a reading-room at the post, nor any suitable place provided for the library, its usefulness is greatly restricted.

The water supply is obtained from Lost Creek, and from the several springs situated near its banks, all of which are in close proximity to the post. No cisterns or reservoirs are constructed, although the large area of roofing on the hospital, store-houses, barracks, &c., would serve to collect large quantities of rain water during the wet season. The post water-wagon (a tank of about 500 gallons capacity) is kept running constantly, by which the officers, troops, hospital, bakery, offices, and laundresses are supplied, and each cavalry company, having a cart of their own, can procure additional supplies for their own use when required. The water thus supplied is depended upon by the enlisted men mainly for cooking purposes, by some also for drinking, and by the officers exclusively for cleansing purposes. There are no means at hand for extinguishing fire except by pails filled with water kept standing in the passages and rooms of the various buildings. A fire-engine, with sufficient hose, is needed for the protection of the large amount of public property from this source of danger, as a fire would be very destructive, in the absence of a fire apparatus, owing to the highly inflammable nature of the lumber used in the construction of the buildings.

The natural drainage of the camp is so good that it has not been deemed necessary to improve it by artificial means. Notwithstanding that the drainage from the post reaches the creek at a point above that at which the supply of water is obtained by the post water-wagon, the water is free from impurities, as the rains, during which the washings from camp reach the creek, are usually so violent as to carry away the impurities and leave the water in comparative purity after a short lapse of time. The place where the water is obtained is not a matter of choice but of necessity, the banks above the post being so steep as to be inaccessible to a team. There are no sewers at the post. The slops, offal, and excreta are removed daily, and are emptied into the old bed of the creek below the point where the water supply is obtained and about 500 yards leeward to the post. Nature's scavengers very effectively prevent an accumulation of filth. The system of privies at the post is not free from objections, and notwithstanding the attention paid to the police of the camp by the commanding officer and the officers of the day, they will occasionally become offensive. The soldiers, naturally averse to work of such a nature, will try to shirk it, in handling the boxes carelessly spill the contents, or bring them back insufficiently cleaned; the boxes besides are not sufficiently tight to prevent leaking. As it appears to be intended to continue Fort Richardson as a permanent post for a large garrison, it would be a most important improvement if earth closets or similar contrivances could be arranged, to be cleaned under contract.

A large water-hole in Lost Creek, below the fort, is used by the troops for bathing purposes, and has never yet failed to have a sufficient depth of water. Except this place, however, no facilities for bathing, either natural or artificial, exist.

The cemetery, located nearly in the center of the reservation and about 400 yards east from the fort, is 50 feet square, surrounded by a paling fence, and contains twelve graves.

The post garden, containing about two acres, is located on the bank of the creek in the north-western corner of the fort, (marked *x* on plate.) It is cultivated by the labor of two enlisted men detailed for the purpose, the necessary seeds and implements being purchased from the commissary officer at the expense of the post fund. Sweet potatoes, Lima beans, beets, tomatoes, and lettuce have been produced in limited quantities, but, as before remarked, the irregularity and uncertainty of this climate present almost insurmountable obstacles to the successful prosecution of "truck gardening" in average seasons.

No hospital or officers' gardens have been laid out, but at recent distributions of vegetables a portion has been furnished the hospital for the use of the sick.

Cows can be procured in the spring of the year by obtaining permission from the owners to drive them in from the prairie, as they prefer having their cows and calves cared for during the summer season to allowing them to roam at large. The only labor incident to keeping them is the building of a pen or corral, and to have them driven up each night, feeding being unnecessary, as Texas cattle derive all their sustenance during the entire year from the surrounding prairies. Milch cows (and calves) can be purchased at from \$15 to \$20 each, and sheep at from \$2 to \$3 50 per head.

The majority of the officers at the post have secured cows, but owing to the small number of attendants during the last spring and the considerable number of patients usually in the hospital at the time, the post surgeon did not feel warranted in attempting to secure a supply of milk in this way. The scarcity of timber makes the building of pens also difficult.

The kind and quantities of subsistence stores required by existing orders to be kept on hand by commissary officers can always be obtained from the post commissary. The post trader has occasionally a small supply of fresh fruits and vegetables, but as there is no farming country in the vicinity, and the roads leading to this place from a distance being frequently rendered insecure by the presence of hostile Indians, the market is but poorly and irregularly supplied. An occasional wagon-load of vegetables, brought from Parker or Tarrant Counties, is the only source of supply in this particular. Milk during the summer season averages about 10 cents per quart, and butter from 25 to 40 cents per pound, while during the winter the former article brings 25 cents per quart, and the latter from 50 to 60 cents per pound. These high prices in a country where cattle are so abundant, is occasioned by the owners not feeding their stock, but allowing them to depend solely on the herbage they can pick up. Eggs and chickens are proportionately high, the former ranging from 30 to 75 cents per dozen, and the latter from 40 to 75 cents apiece during the year. Fresh vegetables can seldom be obtained, and command enormous prices for the reasons given above.

The furniture of the barracks has been made by the troops of the garrison, and answers the purpose sufficiently well. That of the officers' quarters (with the exception of a few tables and wardrobes and the shelving in the five frame houses) has been obtained by them from a distance. Owing to the scarcity of lumber, and the small force of mechanics, the officers and men derive but little benefit from the provisions of General Order No. 31, Headquarters of the Army, Adjutant General's Office, Washington, District of Columbia, March 21, 1870. The nearest point at which a general assortment of furniture can be procured is Weatherford, in Parker County, and as a matter of course it commands the high prices occasioned by scarcity of material, long and costly transportation, and want of competition.

The medical supplies are obtained on semi-annual requisitions upon the medical purveyor at New Orleans, and are forwarded by water to Galveston, thence by rail to Calvert, and to this place by teams. There is occasionally a long delay before the supplies are shipped from the railroad terminus. The amount on hand is sufficient to meet emergencies even in case the filling of requisitions should be delayed. On account of the prevalent diseases of the post and the frequent issues to scouting parties or transient troops, the quantity of some articles as fixed by the supply table proves inadequate, especially quinae sulph., sinapis nigri pulveris, line pulvis., tr. ferri chloridi, liquor ammonia, and bismuth. The supplies are stored in store-rooms on the second floor of the hospital, which are well furnished with shelving and closets.

The routes leading to the post are liable to frequent interruption, owing to the suddenness and rapidity with which the rivers and creeks become converted from almost dry ravines into impassable torrents, in which condition they remain for days after a heavy fall of rain. Bridges are rare, and but little labor being expended on roads in this region, their condition after a continued storm is such as to render teaming difficult.

Two mails are received weekly, via Waco. Two mails from the north, via Fort Smith, Arkansas, are also received each week, but this latter line is not yet in successful operation, and along its entire route, from a point about 70 miles east of Jacksboro to Fort Concho, its western terminus, its coaches have been frequently attacked and several of its employes killed by Indians. Letters reach the headquarters of the department (Austin, Texas,) via Waco, in six days, and Washington by either the Waco or Fort Smith route in from twelve to twenty or twenty-four days.

The great majority of the inhabitants in the vicinity of the post are engaged in the cattle business, but little attention being paid to agriculture. The character of the population is such as is peculiar to a frontier country, but less marked by lawlessness than in some other parts of Texas.

The whole of the frontier line of counties of the State west of Grayson County has been for the past four years subject to the inroads of Indians during the summer and fall of each year. Prior to the late war the population of Jack County was about four fold what it now is, the settlements having been deserted during the war, owing to the increased danger from Indians, at a time when the fighting material was engaged elsewhere. The boldness of these predatory Indians is increasing from year to year, the scouting parties sent in pursuit of them failing to overtake or meet them, except in rare instances. It would appear that these bands are principally Kiowa Indians, who draw supplies from the United States government at the reservations north of the Texas frontier, as the instances in which they have boasted of their exploits, after returning from a plundering and murdering expedition in this region, are numerous and well authenticated. The

"Southern Comanches," whose hunting grounds cover all of the unsettled territory of the State west of the Brazos, are also constantly committing depredations, but it is believed they rarely extend their operations so far east as this post. The settlers in the tiers of frontier counties being widely scattered, bands of savages, frequently numbering hundreds, cross into the State during the first of the moon, divide into small parties, and plunder the country (often 50 miles further from this post) during the full of the moon, and in the wane pass out of the country and meet at some point far out of reach of pursuit, with large numbers of horses and scalps as the result of their raid. Each month while the grass lasts depredations are committed, the settlers living in constant dread. There is scarcely a family in Cook, Montague, Clay, Young, Jack, Wise, Denton, or Parker Counties that has not suffered in property or the lives of its members within the past five years. A scout of about fifty men of Sixth United States Cavalry, under command of Brevet Major C. B. McLellan, captain Sixth Cavalry, was attacked by a band of upward of two hundred Indians, near the south fork of the Little Wichita River, (some sixty miles from the post,) on July 12, that was evidently *en route* for the settlements. Major McLellan fought them for several hours, retreating at the same time, and suffered a loss of two enlisted men killed and ten wounded, besides the surgeon accompanying the scout. It was noticed that this band of Indians was armed with breech-loading firearms, in some instances of a superior description to those of the soldiers.

The health of the garrison during the past year was comparatively good, notwithstanding the prevalence, to a certain degree, of malarial diseases. These increased in frequency from February until, in August, they formed nearly three-fourths of all the diseases reported; then gradually decreased, so that after October but few cases were observed, but never disappearing altogether. Many of these diseases are contracted in the river bottoms, where the scouting and escort parties usually camp, in order to be within easy distance from the water; but the majority of the cases certainly originate here, some of the most obstinate cases being observed in persons who have never left the post. The quotidian intermittent is the most predominant type, tertian being much rarer, and quartan not observed in a single case. The cold stage is usually absent, or only observed during the first attacks; the fever high and protracted, with a tendency to anticipating, until, if not checked by the proper treatment, it assumes the remittent type. In obstinate cases the remissions soon become indistinct, so as to give the disease the character of continued fever. The duration of these remittent fevers varied from a few days to three weeks and longer. Several of these protracted cases were observed during the last two months, in which the diagnosis was not without difficulty, their resemblance to typhoid fever in its second week being very striking. They were recognized, after prolonged observation, as remittent fevers, although rather different from those described in text-books. The more important symptoms distinguishing this form of fever from typhoid are absence of the eruption, the most careful examination failing to detect true rose-spots, (sudamina seen in one case.) Clearness of the sensorium during the whole course of the fever; the patients were quite rational, perfectly free from stupor, coma, or delirium, (with the exception of one case;) absence of bronchitis; absence of pain in the ileo-cæcal region. The tongue was heavily coated, but without the bright edges and tips, remaining moist throughout. The pulse, however, was not nearly as frequent as in typhoid fever, but exceptionally ranging above 100. The spleen was much enlarged. The temperature ranged from 100° and 102.5° in the morning, to 101.5° and 104° in the evening. When approaching convalescence the remissions became more marked, until constituting true intermissions, with not rarely a difference of 4° to 6° between morning and evening temperature. In a few cases, where the progress of the fever from the intermittent, through the remittent into the continued type had been watched, the curve of the temperature was that of a mild case of typhoid fever in its second and first half of third week, preceded and followed by vacillations, closely resembling Wunderlich's ambiguous period of typhoid fever. Gastric and intestinal irritation was marked with some tympanities and tenderness in the epigastrium. The stools resembled closely the ochrey discharges of typhoid fever. The debility was great and the convalescence very slow. The proneness to recidivation was striking; all but two cases relapsing, one case twice with fatal termination. The relapses occurred in from two to eight days after apparent convalescence. The temperature, after sinking below the normal, continued during the apyretic stage to show daily undulations, in the evening approaching, and receding again in the morning from the normal. In the case which terminated fatally, death occurred during the second relapse, after three days of violent delirium, algidity,

and coma. The post-mortem examination revealed meningitis, hypostatic splenization of lungs, engorgement of spleen and liver, and well-marked inflammation of lower portion of ilium extending into the ascending colon. Peyer's glands were slightly prominent, but no trace of ulceration or cicatrization observable. Mesenteric glands were enlarged.

Ague increased in frequency in hot weather, following heavy rains. The cause of disease is as obscure here as it is generally. Perhaps the vegetable elements of the bottom of Lost Creek, and of the surrounding alluvial soil, decomposing under the influence of heat and moisture, may appear as the true cause to the adherents of one of the many theories.

Dysentery, which was quite frequent last summer, is rare this year. Diarrhœa is of frequent occurrence. The privations and exposure of scouting parties, and ague, appear to be exciting causes of the diseases of the alimentary canal.

The water at the post, so far as can be ascertained with the means at hand, is free from an appreciable amount of organic matter. Pulmonary and rheumatic diseases are rare the latter chiefly of the character of pseudo-rheumatism, (myalgia,) caused by the local malarial influences. Wounds heal kindly, without complications.

The population of Jack county, taking the vote at the election in the fall of 1869 as a basis, and allowing five souls to each voter, would be 640, nearly the whole of which number live in the village of Jacksboro, the settlers in the remainder of the county being few and widely scattered.

The duties of the garrison during the summer and fall of 1869, in addition to the large amount of fatigue duty incident to building barracks and officers' quarters and removing rock and rubbish from the parade ground and other parts of the fort, were rendered more arduous on account of the incessant escort duty required by the civil authorities, in quelling disturbances in adjacent counties, and in preserving the peace during the process of reconstructing the State. Since the State has been admitted to the Union, and the interference of the military power is no longer necessary, large scouting parties are almost constantly in the field endeavoring to check the depredations of, and to punish hostile Indians.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Richardson, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (10 months).	254.6	688	1	269	163	13	.....	22	2	13	2	17	.....
1869.....	119	313	.....	154	48	3	4	4	1	3	1	15	1

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Richardson, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (five months).....	144	68	35	19	2	6	1	2	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT GRIFFIN, TEXAS.

INFORMATION FURNISHED BY ASSISTANT SURGEONS HENRY McELDERRY AND WILLIAM R. STEINMETZ, UNITED STATES ARMY.

The precise geographical location of Fort Griffin, Texas, has not been ascertained; approximately it is as follows: Latitude $32^{\circ} 8'$ north, longitude $99^{\circ} 1'$ west of Greenwich. It is situated about half a mile from the west bank of the Clear Fork of the Brazos, 37 miles west of Belknap, 85 miles west-northwest of Jacksboro, 150 miles east-southeast of Fort Concho, and about 80 miles east of Double Mountain—the highest peak of the surrounding country. The post was established in the summer of 1867 in lieu of Fort Belknap, which was at that time abandoned on account of a great scarcity of water. After a careful survey of the surrounding country the present location was selected, which is upon a place formerly known as Maxwell's ranch. The command arrived July 31, 1867, and encamped on the plateau near the river, which position being found unsuited for a camp on account of the marshy condition of the ground during the rains, was soon after changed to a point on a neighboring height, situated about a quarter of a mile from the river. Here the camp was permanently located, and designated as Camp Wilson, in honor of the memory of the late Lieutenant Wilson, of the Sixth United States Cavalry. The name of the camp was afterwards changed to that of Fort Griffin, in honor of General Griffin, the late commander of the district.

Through a valley on the east, half a mile wide, runs the Clear Fork of the Brazos, the banks of which are lined by a thick growth of trees; the valley becomes wider about half a mile below the fort, where the Clear Fork makes an abrupt curve, changing its course from south to east. It empties into the Brazos at a point about 15 miles south of Fort Belknap. The left bank rises from the valley with some abruptness, in the shape of bluffs, and, gradually sloping, is lost in a table-land, which, extending to the valley and the bluffs of the Brazos, forms a level or slightly undulating country, broken by vales and creeks. The hills on the right bank rise in form of terraces, some of which, at a distance of four miles from the fort, attain a considerable height.

About a quarter of a mile from the Clear Fork, the first prominent series of terraced hills rise, in the shape of bluffs, the top of which forms a plateau of about a square mile. The fort has its location on the eastern portion of the plateau, covering an area of about half a square mile. To the west this plateau slopes gradually to the bed of Limpid or Collins's Creek in a bottom land, which extends to the foot of the second series of terraces. This is the most prominent series of hills.

The vegetable kingdom is poorly represented in the vicinity of the post. Of trees, there are found the post and live oak, the ash, mesquite, pecan, and cottonwood. There are also several species of the cactus.

The wild animals found in this vicinity are the cougar, or Texas wild cat, the gray and white wolf, coyote, black wolf, gray and red fox, skunk, raccoon, black bear, opossum, gray and fox squirrel, prairie dog, mule rabbit, American buffalo, antelope, deer, and peccary, or Mexican hog.

The birds are the eagle, (bald and Mexican,) wild turkey, goose, duck, buzzard, owl, scissor-tail, Arkansas fly-catcher, common robin, bluebird, mocking-bird, red-winged blackbird, common crow, quail, white crane, sandhill crane, plover, and snipe.

Rattlesnakes, (common and prairie,) copperheads, and meadow snakes, the horned toad, striped and green lizards, snapping and common box turtle, centipedes, and tarantulas are found.

The fish are the bass, cat, gar, perch, and buffalo.

The mean temperature of the winter months is 44.63° ; minimum, 11° ; summer months, 86.99° ; maximum, 99° F. The fall of rain for the months of June, July, and August amounted to 14.40 inches; very little snow falls in this latitude. Prevailing winds during winter, north and northeast; during summer, south and southeast.

The fort is elevated about 100 feet above the level of the Clear Fork, and, as it now stands, has no regular shape; but it appears that originally it was intended to form a square. It was at first proposed to erect permanent buildings of stone at the post, and every preparation to this end

was made. Steam saw-mills, window-sash, door frames, tools, and a number of mechanics were promptly forwarded to the post from San Antonio; and, as it was supposed that it would take a year or more to complete the work, it was determined to erect such temporary structures for the accommodation of the command as could be sawed from lumber in the vicinity—protecting the troops, in some degree at least, from the piercing cold northers so frequent in this climate during the winter season.

Small temporary houses, with shingled roofs, were built for the men. A line of officers' quarters was put up, consisting of a room and a kitchen each. A log house, consisting of two rooms, with a hall between, was hauled from an old deserted ranch, and formed the quarters of the commanding officer. A similar building was brought in for the hospital. Thus the troops, with the exception of being crowded, were comfortably quartered during the winter; and here they still remain. From some cause or other the building of the permanent post has never been commenced.

The barracks consist of four rows of small frame huts, running northeast to southwest, and about 50 yards apart; ten in each row, of the following dimensions: 13 by $8\frac{1}{2}$ by 6 feet, giving a capacity of 660 cubic feet air space to each hut. Each row is supposed to accommodate one company, but, as seen by the figures, is entirely inadequate for the purpose; for, putting the minimum strength of a company down to 60, each shanty would be occupied by six men, which would give to each man 110 cubic feet air space. The only means of ventilation are the door in front and several small openings in the rear of the house intended for windows, the fireplaces, and the crevices between the shingles of the roof. When the door and openings in the rear are closed, as they necessarily must be in the winter and inclement weather, there are no means by which air can enter to supply the upward current with sufficient rapidity to secure an adequate change of air, and, thus crowded, poisoning must be the result. The records of the hospital show that such actually has been the case, and various cases of dysentery, diarrhoea, and continued fever, which occurred during the autumn of 1868, were attributable to this cause. This fact was reported at the time by the post surgeon, with recommendation that more spacious quarters be built; but, so far, nothing has been done in regard to the matter. The beds consist of single wooden bunks; each man has his own bedsack and the proper allowance of blankets. There are no wash or bath-rooms.

About 35 yards from the southwest end of each row of company quarters are the kitchens and mess-rooms—rough frame buildings, of the following dimensions: kitchen, 20 by 20 feet, mess-room, 20 by 60 feet.

The sinks for the companies are three in number, and are situated about 150 yards distant from the quarters, and on a line with the cavalry stables. They are supplied with movable boxes, perforated in the bottom to allow the fluid portion to drain away; the solid portion retained in the boxes is removed by the prisoners every morning after reveille. The boxes, after being washed and disinfected, are replaced.

Since the arrival of the new troops two rows of wall tents have been pitched and used as quarters.

The quarters for the laundresses consist of six rough frame buildings and fourteen wall tents, two of which accommodate one laundress and family.

The officers' quarters consist of frame buildings arranged in two lines, the first running northeast and southwest, parallel to the company quarters, with the parade ground intervening. The first building on the northeast extremity of this line has two rooms and a kitchen. The next has four rooms and a hall, and is inclosed in rear and sides by a picket fence; its roof is hipped. The next is one and a half stories high; has four rooms, a hall, and two attics. The two next are similar to each other, having each four rooms, a hall, and a kitchen. The last building on, and standing a little back of, the line has three rooms and a kitchen. All of these quarters have porticos in front, and some of them in rear. The first, third, fourth, and fifth sets have underground cellars in rear. With the exception of the first and last set, all the buildings are raised eight inches from the ground, resting upon stone pillars. The second line runs almost at right angles with the first, with the parade ground between, some 200 yards from the northeast end of the company quarters, and consists of four small buildings. Commencing from the northeast extremity, the first and second are similar to each other, each containing two rooms, with a kitchen and servants' room detached. The third is a log building, with a shingle roof, having two rooms, a hall, and porch; also servants'

room. The last contains three rooms, a kitchen and servants' room attached; its rear is inclosed by a picket fence. All the buildings are one story high, except the third in the first line, which is one and a half stories high.

Since the arrival of three more cavalry companies, a hospital tent has been put up, so as to cover somewhat the insufficiency of officers' quarters; it is boarded three feet from the ground, and is floored.

The quartermaster's office is in a small frame house in rear of the first line of officers' quarters; its rear is inclosed by a small fence made of barrel staves. The office of the acting commissary of subsistence is at the commissary store-house. The quartermaster's store-house consists of three large wooden buildings, joined so as to form three sides of a square, the fourth side being closed by a fence. The first is a block-house with a shingle roof, and runs northwest and southeast; it is used as a granary. The two others are used for quartermasters' stores, and clothing, camp, and garrison equipage. The open center is used for storing lumber and such other articles as are not damaged by the weather.

The commissary store-house is situated at the extreme southwest end of the fort, and runs northeast and southwest; it is a large frame building, 125 by 25 feet. At its southwest end it is partitioned off into two small rooms, which are used as the commissary office. During a heavy gale last spring it was necessary to support the building by props on either side to prevent its being blown over.

The guard-house is situated between the two mess-rooms belonging to the two inner rows of company quarters. It is an old frame building, 14 by 32 feet, and poorly adapted to its purpose. It is divided into two apartments, one for the guard, the other for prisoners; it is ventilated at the ridge, and by means of one grated window on its front side. The prison-room is heated by a stove, the guard-room by an open fireplace. A small house, 9 by 14 feet, 12 feet from the guard-house, is used by the non-commissioned officers of the guard.

The post hospital stands on one of the prominent bluffs forming the plateau of the fort. It consists of four distinct buildings; the first is a dilapidated log building, which, shortly after the establishment of the post, was hauled in from an old, deserted ranch. It contains the steward's room, dispensary, and a store-room. This building is covered with a dirt roof, is very much dilapidated, leans considerably to one side, and leaks badly. The apartment used as a store-room was poorly adapted to the purpose, as it was impossible to keep it in order, in consequence of the dirt falling off the roof, and rain driving in through the cracks and crevices. It had become necessary, in order to protect the papers and records which were kept in the steward's room, and the medicine in the dispensary, to cover the walls and roof with old pieces of canvas, and even then, during heavy rains, it was necessary to move the papers from one place to another to keep them from getting wet. In its present condition, the old store-room is unsuited for any purpose except storing such articles as will not be damaged by the rain and dirt which is continually falling off the walls and roof. The second building is a frame one, joined to the first at a right angle; is 12 by 34 feet, and is divided into apartments of unequal size, the larger of which, the one adjoining the dispensary, with which it is connected by a door, is 14 by 24, and is used for the mess-room. The smaller, being 10 by 14, is used as the kitchen. The third building stands on the opposite (northwest) side of and six feet from the log building, at right angles with it. It is an old frame house, formerly used as the adjutant's office, and is divided into two rooms; the smaller, at the southeast end, is the office of the surgeon in charge; the other, the store-room, is provided with shelves for the medicines, and a closet, in which are kept the poisons and most expensive drugs. On a line with, and ten feet from the log building, stands the pavilion ward, erected of lumber, raised 18 inches above the ground, on stone supports; it is 44 by 20 by 12 feet, has four windows on each side, and a door at each end; at the northeast end two small rooms are partitioned off, one the wardmaster's, and the other the wash and bath-room. The ward proper is 20 by 33 feet, is heated by two sheet-iron stoves, and ventilated by two shafts, through which pass the stove-pipes. This building is plastered, but not ceiled; it has a shingle roof. The capacity of the ward is 7,920 cubic feet of air space; it contains twelve beds, giving an air space of 660 cubic feet to each man. In order to secure an upward current of air, several small holes are made in the floor under the stove. The crevices between the boards of the floor, at the ends of the building, and between the shingles of the roof, furnish a sufficient

amount of ventilation. The privy for the hospital is placed 60 feet from the ward, and is provided with two sets of movable boxes lined with zinc, placed one within the other. The smaller boxes are perforated in the bottom; through these orifices the fluid excreta passes into the bottom box, leaving the solid portion in the top. These boxes are emptied every morning immediately after reveille, by the prisoners, thoroughly cleaned and disinfected.

The dead-house is a small frame building, 14 by 14 feet, situated on the side of the hill, about 300 yards from the ward; it has a large window on each side, and is ventilated at the eaves; it is furnished with a good post-mortem table. This building and the ward are the best buildings belonging to the hospital. An attempt was made to dig a cellar, but had to be abandoned, as the ground was too rocky.

The hospital laundry formerly consisted of a shanty south of the hospital, the sides of which were weather-boarded, and the roof covered with paulin. This building was destroyed by fire last April; lumber being very scarce at the post, another could not be erected at the time; in lieu thereof a hospital tent was pitched in the hospital cow-pen to prevent its being blown down by heavy storms; in spite of this precaution, however, the tent was blown down several times during severe storms. The matron has since bought some pickets from a squatter in the vicinity, and had a shanty erected in the old place, covered with a tent-fly.

The post bakery is an old dilapidated building at the northern extremity of the post. The oven is of sufficient capacity to bake 200 loaves.

The stables for the cavalry horses are situated at the western extremity of the fort, and consist of four sheds running parallel to each other.

The post library formerly consisted of 56 volumes of miscellaneous books and magazines of a very poor selection. Upon the arrival of Company I, Sixth United States Cavalry, it was increased by 58 volumes more, which had constituted the post library of Corsicana, Texas.

The building which was intended for a reading-room has at present been temporarily assigned to one of the officers in consequence of the great scarcity of officers' quarters; it is a small frame house, 12 by 25 feet, placed between the northwest extremity of the second line of officers' quarters and the outermost row of barracks.

The principal water supply is from Collins's Creek; it is hauled to the post in a wagon built for that purpose. During the winter the water can be used for almost any purpose, but during the summer it has a bad taste, and is unfit for drinking. During the hot weather a cart is sent to the spring on the bank of the Clear Fork, which furnishes a supply of water sufficient for drinking purposes. Behind each set of quarters are several water barrels which are filled every morning. There is no cistern or reservoir at the post. The only means of extinguishing fire are the water barrels and the water-wagon, which is kept over night filled with water. For immediate use in the hospital a dozen fire-buckets are kept constantly filled with water. Owing to the circumstance that the plateau on which the fort stands has an inclination on all sides, the natural drainage is sufficient to relieve the ground of all surplus water. There are no artificial drains.

The offal, slops, and excreta of the post, as also all refuse matter of the stables, are carted away every day by the prisoners, and taken to the flat to the west and about half a mile from the camp.

There are no arrangements or regulations in regard to bathing. During the summer the men bathe in Collins's Creek and the Clear Fork.

There are no gardens at the post, owing to the great difficulty in raising vegetables in this locality during the dry season, it being necessary to keep up constant irrigation.

The provisions are generally of good quality. The flour delivered at the post by the contractor has not been of the best quality. There are two or three stores within a mile or two of the post, from which provisions may be obtained. Fresh vegetables are extremely scarce. Several settlers around the post raise some few vegetables for sale, but ask such high prices that only the officers can afford to buy them. Potatoes do not do well in this vicinity, but can be obtained from Jacksboro and Weatherford for from \$3 to \$5 a bushel.

The only means of communication with any town or nearest railroad station (which is Calvert, Texas) are government trains. These trains consist of a number of wagons drawn by horses, mules, and oxen; sometimes as many as ten wagons are in one train. These trains are often, during the rainy season, obliged to camp on the banks of rivers for some days before they are able to cross.

Four mails per week are received at the post, viz: from the East, via St. Louis and Fort Smith, Sundays and Thursdays; from the West, via San Antonio and Fort Concho, Mondays and Thursdays. The mails are often detained by floods and freshets that occur during the rainy season, and occasionally are captured by the Indians. Eight days are required for a letter to reach department headquarters, and twelve days to reach Washington.

The inhabitants in the vicinity of the post are a rough, hardy people, possessing all the characteristics of the frontier man. Their occupation is chiefly cattle-driving; some little attention is paid to farming.

The sanitary condition of the post is good; the location in regard to hygiene is most excellent. The camp is thoroughly policed every day and the refuse matter carted away. Acute dysentery and diarrhœa, as also malarial fevers in some form or other, prevail here during the summer and autumn months. Of several cases of acute dysentery, which occurred here during the fall of 1869, one proved fatal. Half a dozen cases of this disease have come under my care during this summer, all of which were of an obstinate character; one of them ended fatally. The miasmatic fevers are more amenable to treatment. The cause for these diseases is the malaria which prevails in and about the post, but more especially in the valley of the Clear Fork. In consequence of the frequent heavy rains during the spring and summer months, the creeks and rivers rise above their banks and overflow the valley, and when retreating within their beds leave many animal and vegetable substances behind, which, by means of the high temperature in this latitude, soon undergo rapid decomposition, and malaria is the consequence. Another cause for dysentery and diarrhœa may be found in the men's quarters, which are entirely unsuitable.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Griffin, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868	243	263	110	55	3	6	7	19	2	.....
1869	96.83	128	35	29	.....	1	7	7	1	.....

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Griffin, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Catarrhal affections.*	No. of deaths.
1869, (5 months).....	138	39	16	12	1	1	1	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT CONCHO, TEXAS.

REPORT OF ASSISTANT SURGEON W. M. NOTSON, UNITED STATES ARMY.

Fort Concho is the center of a line of posts extending from El Paso, on the Rio Grande, to the northeastern border of Texas, on the Red River. Beginning from the west the garrisoned positions are Forts Bliss, Quitman, Davis, Stockton, Concho, Griffin, and Richardson. It also geographically, but without as direct a road connection as with the one just named, forms one of the

southern chain to the mouth of the Rio Grande; beginning from the north, Forts Concho, McKavett, Clark, Duncan, McIntosh, Ringgold Barracks, and Brownsville. Upon the establishment and garrisoning of the new or outer line several of the older posts, which had been occupied by federal troops since the war, were abandoned; Fort Mason, Camp Verde, and Forts Inge, Lancaster, and Hudson on account of their position, and Fort Chadburne because of the failure of the water supply.

Fort Concho is situated at the junction of the North Concho and main Concho Rivers, immediately west of their point of confluence, the North Concho flowing in nearly a southeasterly direction, and the main Concho very nearly east, continuing that course until its junction with the Colorado River. The site, by approximation, is about $100^{\circ} 20'$ west longitude, and $31^{\circ} 30'$ north latitude, upon a comparatively elevated plain of prairie land. Brief as has been its existence, the foundation of the first building having been laid in January, 1868, the identity of the post has nearly been lost, especially to the Post Office Department, on account of the multiplicity of names. Originally called Camp Hatch by the first garrison, five companies of the Fourth Cavalry, it was changed at the request of the distinguished officer of that name of that regiment, and re-baptized Camp Kelly, in memory of another officer of the same regiment. The construction department, or quartermaster, called it Fort Griffin, until an order from district headquarters fixed the present appellation. It is still misnamed, and the disappointment of the young officer who may be ordered to it for a station, who has built his ideas of defensive works upon such examples as may be found upon eastern coasts or northern frontier, will not be lessened after his experience has taught him that the isolated post amongst merciless foes should be what it is named, a *fort*.

On March 1, 1870, the buildings of the post were, in the order of their construction, a commissary and quartermaster store-house, hospital, five officers' quarters, a magazine, and two barracks, all built of light-colored sandstone.

The commissary's and quartermaster's store-houses are built upon the same plan, and are of the same dimensions, about 100 feet in length, 30 in width, and about the same to the peak of the roof, each building forming one large room, with one little closet about 10 feet square walled off for office purposes. The flooring is of large irregular slabs of stone, cemented with ordinary mortar. The wood-work—rafters, beams, &c.—as in all the other buildings, is of pecan, a peculiarly intractable variety of our northern hickory, which by its twisting, curling, and shrinking hardly promises a permanence of the symmetry of the buildings in which it has been used.

The hospital, built upon the plan issued from the office of the Surgeon General of the Army, is by far the handsomest and best finished building at the post. It is plastered throughout, and though incomplete, it is better adapted to the necessities required of it than any other structure at the post. It has been objected by some inspecting officers that the hospital building is too large and elaborate. This does not accord with the experience of the medical officer. The capacity of the two wards is for twenty-four beds. Had the original plan of construction been carried out of establishing a post for eight companies, it is doubted whether sufficient accommodation for the sick directly entitled to care would have been found in the building. During last summer (1869) the Fifteenth and Thirty-fifth regiments of Infantry consolidated near this post, and although their combined numbers would not have exceeded the probable full garrison contemplated for Fort Concho, it was found necessary by the post surgeon to pitch a number of hospital tents. The partition walls of the building are of stone, adding much to its stability and security. A belvedere has been placed on the main building, affording a distant if not diverse view of the prairie in every direction. Fire-buckets and axes are kept in the several halls of the building, with printed directions for their use in emergency. The surgery is tastefully and conveniently fitted up. Cases requiring isolation and not contagious are taken care of in the upper rooms, but from the narrow and winding stairway communicating with the upper floor, the rooms are scarcely available for that purpose, and the middle upper room not at all so for the uses laid down in the plan. The wards are heated by stoves, all other rooms by open fires. Ventilation and light, thanks to shrinking windows and doors, are abundantly supplied. The present defects of the hospital building, it is hoped, will gradually be provided for. Among them is the absence of any special means of ventilation as provided for in the plan of Circular No. 4, Surgeon General's Office. The plan of this hospital was drawn by the quartermaster at San Antonio, without following closely the designs shown in "Circular No. 4," and without any consultation with the post surgeon.

No measures have yet been taken for securing the rain water, a necessity which will be explained further on in this report. One cistern, at much expense and labor, has been dug and blasted close to the building, but was left unfinished in February, 1869, since which time no work has been done on the hospital. This subject and the necessity for a lightning-rod and fire-extinguisher were called to the attention of the Quartermaster General of the Army during his recent personal inspection, and he suggested to the commanding officer that they should receive early attention. The flooring of the portico has not been completed, and eave-spouts are not attached to the roof. No inclosure marks the hospital limits, and the out-buildings are of a temporary character and insufficient.

The officers' quarters, standing next in the order of construction, are five cottage buildings of stone. Four, erected for captains' quarters, and one for major or lieutenant-colonel. The quarters are built with two rooms facing the parade, separated by a broad hall; in the rear of the west room a kitchen. The rooms are commodious, about 15 feet square, well lighted, without closets or shutters. The larger quarters are built upon the same plan, with one additional room in the L, and is about four feet higher. All of the buildings have attics, and are heated by open fires. Each kitchen is provided with a pantry. The officers' quarters are not inclosed, nor is any provision made to secure the privacy of separate families. The officers have erected by their own exertions temporary inclosed sheds in the rear of their several quarters, which during most of the year can be used as out-door kitchens. The other outbuildings are temporary structures.

The men's quarters, last in the programme of construction, have never been completed. The one facing the left of the parade is composed of three stone buildings; the two upon the front intended to be used as company rooms and dormitories are each about 120 feet long and 25 in width; the third building stands at right angles in rear of the center of these, and was proposed for mess-room, kitchen, and store-room. These buildings are all joined under one roof, and called a set of quarters for one company, although at present occupied by two. A wide portico surrounds the two main buildings, but has not yet been floored. An experiment was made, after the order discontinuing the building of the post was received, to floor the set of quarters with concrete. It proved a failure. The other set of quarters was started upon the same plan, and except that the wood-work—*i. e.*, fitting in of doors and window sashes—is not so far advanced, and that it has no rear building, is similar to the one already described. No permanent outbuildings of any kind are attached to the men's quarters. The company stables are merely frames covered with canvas.

A new guard-house has just been constructed of heavy pecan plank; it promises to be suitable for the purpose designed. It contains two rooms, one for the guard and one for confinement of general prisoners, and also three secure cells for the security of the more refractory. A stone corral, 200 feet wide by 250 deep, is being inclosed, with the intention of accommodating both the stables of the quartermaster and those of the companies.

The original plan of the post was a parallelogram running due east and west. The cessation of construction has so modified it that it now forms nearly three sides of a square. On the north side of the parade ground, and facing the south, are the men's quarters; facing the west the commissary, quartermasters' buildings, and the hospital; facing the north the officers' quarters.

The general appearance of the country in the vicinity of the post is a flat, treeless, dreary prairie. The edges of the two streams are scantily fringed with the pecan and wild plum; straggling growths of mesquite sprinkle the plain. The open nature of the country greatly affects the climate to the comfort or discomfort of the residents. The glare from the scorched and yellow grass during the summer usually produces inflammation of the eye, while the unchecked sweep of the north wind in winter (the well-known Texan norther) is felt more keenly by the northern sojourner than the severer winters of his home. During but small proportion of the winter is it necessary to wear more clothing than ordinarily would be required in November in the latitude of Washington, but the severity of the "norther" is only equaled by the suddenness of its appearance. A fall of more than 30° F. in the thermometer within an hour has happened more than once during the last year. The irregularity and uncertainty of the season precludes any agricultural calculations, for while the annual rain-fall may equal that of the most fertile of the eastern States, the gathering of all the rain into one or two months of the year either drowns or scorches out the crops. After these rains the narrow streams swell to impassibility, and the luckless gardener who has

trusted to his better chances upon some river-side flat has his labor and investment swept away in an hour. For these reasons no post garden has yet been successful, although an effort is being made about seven miles southwest of the post, by a farming company, to cultivate some bottom lands by irrigation. This is to be done by damming one of the tributaries of the main Concho and bringing the water through a ditch about three-fourths of a mile. The post will undertake to cultivate a garden there, it is understood, this summer. Water-cresses are now abundant upon both streams, having been planted by the present medical officer for obvious hygienic reasons.

The question of the supply of water, wholesome and sufficient for the use of the garrison, is one which may in any year be an urgent sanitary question. Although the rain-fall of 1868 marked about 30 inches and last year 20 inches, it is believed by the medical officer, on the testimony of men whose occupations have made them familiar with these frontiers, and especially cattle drovers, to whom an abundant supply of water is a vital pecuniary question, that the two years recorded have been exceptional, and even with the abundance recorded for the former year, the North Concho, instead of a running stream, has been standing in shallow pools, while the water of the main Concho was so impregnated with putrefying animal matter as to be offensive both to smell and taste. The waters of both streams are slightly impregnated with lime. In very dry seasons, when the half famished buffalo arrive at their banks, they crowd into it in such numbers that very many are drowned—so many as to affect the purity of the stream in the manner just referred to. These rivers in the vicinity of the post and above it vary from fifteen to forty feet in width, have a gravel or rock bottom, and are fordable at almost any point.

In anticipation of this deficient supply of water the post surgeon earnestly urged that suitable cisterns might be attached to each of the buildings, and his application so far met with favorable consideration as to have one, intended then to be one of a series, started. The one begun was at the rear of the hospital building, and was planned according to the diagram and description recommended by Dr. Parkes to the barrack commission. It was completed only as far as the main reservoir. One or more of the large wooden tank cisterns, formerly in use by some of the United States general hospitals in the South, have been asked for.

Three or four severe storms, accompanied by thunder and lightning, have been experienced during the existence of the post, the flashes being vivid, near, and rapid. Considerable anxiety was felt for the safety of the hospital building, standing as it does upon an elevated plain, and being itself higher than any building or tree for many miles. One unusually severe hail-storm occurred in June, 1868, arising without warning, and from the weight and accumulation of the masses of ice, breaking in the tents, (the garrison were not then in quarters,) the troop horses were stampeded, and most of the poultry about the post killed. In fifteen minutes from the beginning of the storm, the parade ground was covered with hail-stones to the depth of more than two inches. Several were measured and found to exceed an inch and a half transversely by three fourths of an inch in thickness. The belt of storm cloud was very narrow, not quite reaching a mile, and was traveling due southeast.

Supply is a vital question to the post. No means of transportation from the coast exist except by wagons. Indianola is about 550 miles distant; San Antonio, the commissary and quartermaster depot, about 230 miles. When the rainy season sets in, communication almost entirely ceases. Two or three days' rain upon the light soil of the prairie so loosens it that an ordinarily laden wagon will sink to the hubs and the mule to his girth. The winter of 1868 and 1869 was specially marked as wet, and no supplies were received. The succeeding winter has been unusually favorable. Rising rivers frequently delay even the mail for several days.

The post is entirely dependent, the soil having no natural products of any utility to a resident. For prevention of scurvy, the post surgeon was fortunate enough to find some "lamb's quarter" (*chenopodium*) for the use of the troops while awaiting the arrival of supplies last spring. The nearest village is Fredericksburg, a German settlement upon the Perdenalis River, 160 miles from the post. The nearest neighbors are the mail station, three miles, Bismarck farm, seven miles. Those are both companies, and not actual settlers. The nearest actual resident is 18 miles, and his nearest neighbor 11 miles beyond him. The vicinity of the post is abundantly supplied with game. Buffalo exist in countless herds during the winter and spring, and deer and antelope at all seasons. The large gray wolf and the coyote, are abundant, and the fox, the badger, and peccary

can easily be found when desired. The prairie for miles in every direction being one vast "dog town," the prairie-dog holes interfere somewhat with the pursuit of the chase. Water fowl of every kind, from the large white swan to the green-winged teal, abound upon the rivers. Wild turkey and quail, both the brown of Virginia and the blue or tufted quail of New Mexico, can be found anywhere upon the streams. Immense catfish, weighing even as much as 75 pounds, with eels of proportionate size, and a trout, called in this country a bass, with smaller fish, reward the angler for very little exertion. It may be some drawback that a country supplied so lavishly with game is equally generously furnished with venomous reptiles and insects. A prairie-dog town is the well-known habitat of the rattlesnake, as also the rocky borders of the streams; his kindred, the water-moccasin, in this country attains a gigantic development. Tarantulas and lesser spiders lurk under every cactus shrub, and the centipede brings forth its interesting brood in every pile of chips or lumber about one's quarters. The post surgeon having been bitten on the hand, while taking hold of a towel in which the insect was coiled, by a centipede, afterwards measured and found to be seven and a half inches long, enters so much testimony against the special virulence either of their jaws or claws. The bite was painful for an hour or two, but no other trouble resulted, neither ulceration nor swelling. Small scorpions, from two to three inches in length, are found, though less frequently than either the centipede or tarantula. Indians, believed to be chiefly Comanches and Kiowas, commit frequent depredations in the vicinity. Horses have been repeatedly stolen within the post lines, and as late as the middle of February of the present year a citizen has been killed and scalped within a mile of the adjutant's office.

The situation of the post is an unusually healthful one, and it is thought, under some precautions, such as guarding against the sudden change of temperature, especially in winter, a desirable one for the treatment of tubercular cases. The prevalent disease has been rheumatism, while at times, from causes before referred to, diarrhœa has been epidemic. The similarity of diseases, as well as topographical resemblance between this portion of Texas and the reports of some of the British surgeons concerning the table lands north of Cape of Good Hope, has been noticed. The post is now garrisoned by three companies of colored soldiers; their duties are scouting, picketing the mail road, escorting the mail coaches, and general escort duty. From the central position of the post on three roads of travel more duty devolves upon the troops and officers than of any post forming parts of either of the chains of defenses referred to in the beginning of this communication.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Concho, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (11 months).....	323.54	736	.....	263	164	2	17	15	20	50	
1869, (7 months).....	226.57	131	1	15	16	.....	18	.....	14	15	1

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Concho, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (10 months)	225.3	261	21	97	2	5	6	34	25	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT McKAVETT, TEXAS.

REPORT OF ACTING ASSISTANT SURGEON REDFORD SHARPE, UNITED STATES ARMY.

Fort McKavett is situated on a high bluff on the right bank of the San Saba, some two miles from the source of the river, latitude $30^{\circ} 50'$ north, longitude $100^{\circ} 20'$ west, and 180 miles north-west of San Antonio, and 2,060 feet above the level of the sea.

The spring which furnishes the post with water expands into a lagoon of considerable size between the post and the San Saba river, and is distant from the post about 300 yards—the post being about 125 feet above the level of the spring. I find in the notes compiled by Brevet Major J. V. D. Middleton, assistant surgeon United States Army, the following historical facts: This fort (McKavett) was built by the Eighth United States Infantry in 1852, and named after Lieutenant McKavett, who was killed in the battle of Monterey, Mexico. In 1860 the post was abandoned by order of General Twiggs, and the troops moved into the interior of the State. When reoccupied April 1st, 1868, the post was found to be one mass of ruins—only one house being at all habitable, and the whole command was compelled to go under canvas. The post covers about six acres of a broad hill which slopes gradually to the river. The river has the appearance of rising from three heads, called the "North, Main, and South prongs," but is now furnished almost entirely by the South prong, arising about two miles west of the post. This prong, in its course, spreads out into a lake about three-quarters of a mile in length, and from 50 to 100 feet in width. Opposite the post the stream becomes small—a mere creek—20 feet wide, and from one to three feet deep. It flows through a fertile valley a mile in width, and afterwards through broad plains to the Colorado, about 100 miles from its present source.

The post is completely surrounded by hills, with intervening valleys. The hills, as a rule, are low, and of uniform size, sloping on every side, and covered with grass, mesquite, and live oak. The stunted live oak, interspersed here and there with trees of larger growth in the valleys, with the pecan, water oak, and willow on the margin of the water-courses, each presenting a different hue, give to the whole country, as far as the eye can reach, a variegated aspect, which is very beautiful. The prevailing wind during the summer months, and, indeed, during the whole year, (except the "northers,") is from the southeast.

Fort McKavett was built originally of stone, the roofing, flooring, &c., of wood. During the time of its abandonment, all the buildings went to ruin. The walls, which were not put up properly in the first place, tumbled down, and the wood-work went into decay. When the post was reoccupied in April, 1868, one house alone was habitable, and that had been kept in repair by the owner of the post. The buildings are located on the top of the hill, and are situated on the four sides of a parade or plaza, 100 yards square. It was, perhaps, built in this manner to render it defensible against the attacks of Indians. At a later period, several buildings were put up on the outside of this square, among which were the quarters of the commanding officer, hospital, and quarters for married soldiers and laundresses.

Until March, 1869, very little work had been done, owing mainly to the lack of mechanics and the extreme slowness with which material was supplied. At that date, Company A, Fourth Cavalry, and one company of the Thirty-fifth Infantry were relieved by headquarters and two companies of the Forty-first Infantry and Companies F and M of the Ninth Cavalry, under command of Brevet Brigadier General R. S. Mackenzie, colonel Forty-first United States Infantry. Almost immediately the work of rebuilding the post commenced; ample and substantial corrals for the cavalry horses were built at once; the barracks for the men were put in complete repair, and company kitchens, guard-house, sinks, and all outbuildings thoroughly renovated. Officers' quarters have also been enlarged, and in fact almost rebuilt, with new floors, roofing, windows, doors, &c.

The quarters of the commanding officer are situated about 100 feet south of the parade, are comfortably large, and, when repaired, will be commodious, and in every way pleasant.

The quarters for officers are on the south and west sides of the parade, opening upon it; are well adapted to the purpose, although not large, and will compare favorably with other frontier quarters, especially so far as the expenditure of money is concerned.

The barracks for the men are three in number, situated on the north, east, and west sides of the square, and, unless the command is very materially increased, afford ample room. Each man is furnished with an iron bedstead, and the quarters are kept strictly clean.

The commissary and quartermaster's store-houses are on the eastern flank, outside the parade, as also the chapel and store of the post trader. The carpenter shop, quartermaster's granary, and other outbuildings, are on the north, in rear of the barracks.

The post hospital is in the southwest corner, rather in the rear of the line officers' quarters, and on a parallel line with commanding officer's house. The main building, 50 by 20 feet, of wood, consists of one ward, containing twelve beds, a dispensary, and a ward-master's room. It is a very inferior building, and in no way adapted to rainy or winter seasons. Upon the occupancy of this post by General Mackenzie, the hospital was, perhaps, the most comfortable building here, hence no work has been done to render it better. A comfortable building of stone should take the place of this temporary wooden structure, with such an addition to its size as would bring the store-room, steward's room, dispensary, office, &c., all under one roof, having the dining-room, kitchen, laundry, and room for attendants in an addition, to the rear, thereby dispensing with the many small and ungainly-looking houses that have been put up from time to time, as kitchen, wash-house, &c., since the temporary hospital was built.

The guard-house is on the north, and in rear of the barracks, and is ample and quite comfortable, as it should be. Its occupancy will average twelve for the past six months.

The post gardens are situated in the north, on the lagoons, and about half a mile distant from the post. They are furnishing a good supply of vegetables, and are in every way a benefit to the command. Fresh vegetables are distributed every morning.

I have served at no post since I have been on duty in Texas, since December, 1865, where more attention is paid to cleanliness of quarters, and where all sanitary and hygienic rules are more thoroughly enforced, and where more deference is paid to the suggestions of the medical officer in regard to such rules. The sinks for both officers and men are built of stone and furnished with movable troughs. These, in addition to being thoroughly disinfected every morning, are washed three times a week, and recently, during the warm weather, they were removed a mile distant, near the San Saba River, daily, washed and returned, and fresh lime, acid carbolie, and ferri sulphas freely used in and about them. No slops of any kind are allowed to accumulate about the kitchens, but all swill, &c., is emptied regularly every morning after reveille. All offal from the stables is removed daily in army wagons more than a mile from the post, except such as is needed at the post gardens.

Water is supplied from the springs in water-wagons, and delivered morning and evening in barrels at each kitchen. The water is pure and clear, but contains a large per cent. of lime. Cisterns have been asked for, which will add greatly to the comfort and health of the command.

There is no more healthy post on the Texas frontier than Fort McKavett. The dryness of the atmosphere, the height above the sea-level, the pure bracing winds that come here divested of everything noxious, or even damp or unpleasant, all tend to make it a paradise for any one suffering from any weakness of the air passages.

The sick rates during the past two years afford ample proof of the above. During the past month, however—May—there has been an endemic or epidemic of acute diarrhœa, resulting in two or more instances in dysentery. What may be the cause it is difficult to conjecture. Unusual pains have been taken both as regards the cleanliness of the camp, carefulness in cooking, variety in diet, and personal cleanliness of the men. The want of force or vim in colored troops in sickness, in contrast with the white, has been thoroughly and forcibly exemplified in this epidemic. That there are some wonderful exceptions to this has been fully proven at this post. They are, however, the exceptions necessary to make the rule good.

The great drought seems to have affected the milk, which has been used in large quantities by the troops, the absence of grass forcing the cows to eat many poisonous weeds. The meat (beef) seems to have been affected in the same way. Whether these causes have in any way influenced these cases of diarrhœa is, to say the least, very doubtful. The use of milk was, however, stopped by a post order, and at this writing the epidemic is almost exhausted, (the last of May.) The disease has not been confined to the men alone, nearly all the officers of the command have been complaining, and an infant daughter of the commanding officer, Captain H. Carroll, died. The exu-

berant growth of cryptogamous and other plants may have induced or helped to bring on a miasmatic influence, which, added to the general carelessness of the black race, is, perhaps, the most probable cause of the endemic. Happily, at this writing, June 20th, there is very little, if any, of the disease left. An abundant rain has given plenty of grass, and the milk and beef are both freed from their poisonous influences.

The post bakery is new, and furnishes most excellent bread; it is under the management of the post treasurer.

So much has already been said as to the geology of the post that little remains. Limestone is the base, and the water is thoroughly impregnated with it. Colonel Crawford, late assistant surgeon United States Army, speaks of the formation as follows, in his report of this post in 1853:

The region consists of the upper secondary, or the substitute for the chalk formation in this country, and the lower tertiary. Here and there the secondary appears in small patches, and continues superficial. No evidence of primary formation or of volcanic rocks exists. The hills have no regularity, are low, of almost uniform size, and composed entirely of limestone. Toward the southwest these hills become higher, and of a rougher and more broken character; and further, there is no sandstone formation in the vicinity, or any arenaceous deposits that have yet been discovered nearer than 35 or 40 miles, where there is a belt running north and south. From the regular outline of the hills there are no faults existing where an opportunity is presented to examine the succession of strata.

Again: The flinty formation is scattered over the whole face of the country, and is deeply imbedded. At the head of Llano River, where the side of a large hill has been washed so as to expose the strata to the depth of 200 feet or more, a continuous layer of flint, underlying marl, and marly limestone was observed.

Upon my arrival in Texas, in December, 1865, after the close of the war, I was continually told that the seasons were exceedingly dry, and at times there would be no rain for months. A residence of nearly five years has disproved this assertion, and there is nothing needed to develop the vast mineral and agricultural resources of the whole State but muscle and vigor. The valley of the San Saba is a garden, waiting to be planted, and wealth awaits those who come here and go to work. The extreme healthfulness of the climate is another great inducement. The steady work of a few years in this magnificent country will enrich any man, and add to the wealth of the State and nation. Once establish a system of railroads, and no more children are stolen, or families made desolate by the inroads of the Indians. The cattle can truly be said to roam upon a thousand hills, and Texas will be the empire of the Occident.

I cannot close this report without calling attention to the fact that much too long a time is used in transporting medicines, &c., from the medical purveying depot; quite frequently four and five and even six months are necessary to receive supplies from said depot. This I do not in any way believe to be the fault of the medical purveyor in New Orleans. While stationed in San Antonio, there were many commands ordered on the frontier whose only supplies were such as I could furnish them from the post hospital; and this I could not have done had I not retained extra quantities of medicines and supplies turned into me by the volunteers going out at that time. But for this the troops would have suffered greatly, and in many instances they did, as I could not supply them. A medical purveyor at San Antonio is a necessity for the convenience of the frontier.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort McKavett, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (9 months)	218.44	116	1	59	12	2	1	8	1	5	1	7	1
1869, (3 months)	93	27	.....	2	2	.....	.....	.....	3	.....	.....	1	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort McKarett, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rhumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1869, (10 months).....	290.9	141	2	9	24	5	16	7	14	1	26	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BROWN, TEXAS.

REPORT OF ASSISTANT SURGEON WILLIAM J. WILSON, UNITED STATES ARMY, DATED JULY 19, 1870.

The government reservation upon which the post of Fort Brown is built is a tract of land containing in all 358½ acres, situated on the Rio Grande immediately adjacent to the city of Brownsville, Texas, in latitude 25° 53' 16" north, and longitude 97° 96' 26" west, and with an elevation of about 50 feet above the level of the sea. On the opposite side of the river, and distant about one mile, is the Mexican city of Matamoras. The reservation is of a somewhat triangular shape, and on the east, west, and south bounded by the Rio Grande.

In 1846, during the Mexican war, a six-bastioned field work—old Fort Brown, (the remains of which are still in existence)—was thrown up by the troops under the command of General Taylor, and when he marched to Point Isabel to bring up his trains, was garrisoned by the Seventh Infantry, under the command of Major Brown. During General Taylor's absence it was bombarded by the Mexicans for seven days. Major Brown lost his life from a shell-wound received during that bombardment. The Mexicans also attempted an assault, but were driven off by a few discharges of grape and cannister. After having fought the battles of Palo Alto and Resaca de la Palma, General Taylor reached Fort Brown, and relieved the fort. In the fall of 1848, immediately after the treaty of peace, the United States troops moved over to this bank of the river, and in the beginning of 1849 quarters for the officers and soldiers were built and a permanent post established. In 1861, at the outbreak of the rebellion, it was evacuated by our troops, and remained in the possession of the rebels till 1864, when it was burned by General Bee. In 1865 it was again occupied by United States troops, and temporary huts or cantonments were built, which were nearly all demolished by the hurricane of 1867. Plans and specifications had at that time been prepared and approved for the erection of quarters, and one house had actually been commenced, but it too was destroyed.

The reservation consists of low flat prairie land covered with chaparral, a small stunted growth of underbrush or small timber, mostly consisting of mesquite and wausatchie. This prairie land, at no very distant period of the earth's history, must have been covered with water, as it consists mostly of an alluvial deposit, underlaid at a depth of about 6 feet with a quicksand some 4 to 6 feet in depth. It contains no mineral products whatever, but is very fertile during favorable seasons, producing two crops of corn or cotton annually. Cotton here, as in Mexico, is perennial, and sometimes reaches the height of 15 or 20 feet. Sugar-cane grows in great luxuriance. The castor-bean seems a native of the soil, and can be produced with very little trouble, and in great abundance. These are the principal crops raised in this vicinity.

There is a considerable variety and abundance of game; the bob-white or quail, plover, and several varieties of wild duck—the teal, the black duck, the gray or spoonbill, a few mallard, and still fewer canvass-back—visit this neighborhood, and are easily obtained on the ponds or lagoons about here. Wild geese and brant are plentiful, and deer can be obtained at a distance of from 6 to 12 miles from Brownsville. The fish that are obtained here are brought from Brazos

Santiago, a distance of some 28 miles; they consist of bass, mullet, flounders, oysters, and redfish. The June fish, weighing sometimes some 300 to 500 pounds, is also caught and obtained from there. In the Rio Grande and in the lagoon inside the reservation, the silver bass and the mud catfish, buffalo, and perch, weighing from 5 to 6 pounds, are caught. Of wild animals there are few, the principal being the catamount, and the prairie wolf or coyote. Of reptiles, there are the rattlesnake, moccasin snake, the adder, the blacksnake or racer, and the chicken snake.

The climate of this part of Texas is very dry, *i. e.*, with rain at very long intervals, though the average annual fall is probably as great as in other and more northern parts of the State. The air, however, as shown by the wet-bulb thermometer, is nearly always saturated with moisture, there being at the most about two degrees difference between the wet and dry bulb. During the summer months, from May till October, the thermometer generally stands, in the daytime, from about 85° to 95° F. There is, however, a steady breeze (the southeast trades) blowing all the time, which very considerably moderates the temperature and renders the extreme heat very endurable. The nights, after sundown, are also very cool, so that we can sleep with comfort, and rise in the morning refreshed for the labors of the day. In the winter months the temperature rarely falls, even on the coldest days, below the freezing point, though the sudden change on the occurrence of a "norther" makes us feel the cold much more than what would be supposed from the actual temperature. The mean temperature from November till the end of April was about 64°; the greatest cold on the 19th of December, 1869, 30°; the greatest heat, 87° F. Snow or ice of any considerable thickness is such a rarity that the oldest inhabitant has hardly any recollection of either. Since last January we have had hardly any rain; $1\frac{1}{3}$ inch was recorded as having fallen during the month. Two or three slight showers have since occurred, none of any consequence until the 12th of June, when half an inch of rain fell. During the summer months, however, rain is more frequent, and in large quantity. In August, $1\frac{1}{10}$ inch; September, $10\frac{1}{2}$ inches; October, $1\frac{1}{2}$; and in November 1 inch. During the summer months the prevailing winds are the southeast trades, mentioned above, which blow almost constantly during the twenty-four hours from the southeast or south. In the winter months the winds vary more from the south and east, with frequent "northers." The "northers" are to me more pleasant than otherwise, as the system, debilitated by the long-continued heat of summer, feels the refreshing influence of a good, strong, cold wind from the north. They are said by the citizens here to bring an increase of sickness on account of passing over the salt marshes between this place and Corpus Christi, but I did not find such to be the case last winter; on the contrary, there was very little sickness in the garrison, and that of a very mild type.

Inside the reservation is the lagoon, evidently an old channel of the Rio Grande. It is of an elliptical form, about 150 yards in width, and in some places from 10 to 14 feet in depth. It incloses a small island, containing $25\frac{1}{2}$ acres, which was formerly (prior to 1846) heavily covered with timber, but this timber was at that time cut down by United States troops to prevent the Mexicans from massing and stealing up to attack Fort Brown. The national cemetery, containing space for 2,000 graves, is there located. In the center of the island is a flag-staff, and circularly arranged around it are the graves of Major Brown and various other officers of the regular and volunteer army. Extending south from the flag-staff, and laid out in plats 75 by 15 feet, separated by walks, is the space reserved for the graves of enlisted men. Each plat is intended for 50 graves.

The post of Fort Brown has accommodation for one battery of artillery, one company of cavalry, and four companies of infantry. These different quarters are separated from each other by a very considerable distance. The four sets of infantry quarters are situated on the northern boundary of the reservation, merely separated by a wall from the city of Brownsville. The artillery quarters are almost at the extreme southern end, while the cavalry are stationed about midway between. In close proximity to each of these barracks are the officers' quarters.

The infantry officers' quarters consist of seven houses, situated along the northern border of the lagoon, opposite to and distant from the infantry barracks about 175 yards. The commanding officer's house is a one and a half story frame building, 39 by 33 feet, elevated on brick piers about two feet above the ground. It contains on the ground floor four rooms, each 16 by 16 by 12 feet, with a hall, 6 feet wide. There are four attic rooms on the second story, each similar in size to those below, but only about 8 feet in height. A covered porch, 7 feet wide, is in front of the house. The porch at the rear of the house is 12 feet wide, and by means of a lattice-work at the

sides is converted into a dining-room. In the rear of this is a kitchen, 16 by 12 feet. Extending backward for about 60 feet, and inclosed by a lattice-work, is a yard, and at the lower end of this is a small water-closet, 11 by 11 feet, situated over a brick vault about 8 feet in depth. Underneath the stairs leading to the second story is a small closet or pantry. The three houses for captains are almost similar in size to this, but each house contains two sets of quarters, *i. e.*, two rooms, 15 by 16 feet on the ground floor, attics above, a small dining-room and kitchen, and yard in the rear.

The lieutenants' quarters are similar in plan, but the rooms are only 14 by 15 feet, on account of the staircase running up between the rooms. These quarters are all very comfortable and in good repair. A brick walk, 4 feet wide, runs along the front of the officers' quarters, and up to each house. The intervening ground is nicely sodded with Bermuda grass, as is also the remainder of the ground between these quarters and the main barracks.

The cavalry officers' quarters are situated adjacent to the cavalry barracks, and distant about 150 feet; they are built of brick, on the same plan as described for the infantry officers' quarters, and consist of two houses, each having a covered veranda, 7 feet wide, in front. One double house, containing four rooms, 15 by 16 by 14 feet, with attic of the same size on the second story, a kitchen and dining-room in the rear. This is occupied by the captain of the cavalry company stationed here. The other house is divided into two sets of quarters, each containing two rooms, kitchen and dining-room, with attic rooms above; these are occupied by the cavalry lieutenants.

The artillery officers' quarters are situated almost on the extreme southern end of the reservation, and about half a mile distant from the infantry quarters and hospital. They consist of three brick buildings, built on exactly the same plan as the cavalry officers' quarters—one, the middle house, containing four rooms, with attics, kitchen, and dining-room, intended for the captain; the other two houses are situated one on each side of this, and each contains two rooms, with attics, kitchen, and dining-room—one set of quarters for each lieutenant. These quarters are at present occupied by some of the non-commissioned staff and their wives, who act as laundresses for the command.

The infantry barracks consist of four two-story frame buildings, each 34 by 163 feet, elevated on brick piers some 3 feet above the level of the ground, and with a covered porch, 7 feet wide, on either side on each story. The lower story, 9 feet high, is divided into an office, $11\frac{1}{4}$ by 55 feet; first sergeant's room, $11\frac{1}{4}$ by $22\frac{3}{4}$; reading-room, $11\frac{1}{2}$ by $19\frac{1}{4}$; lavatory, $11\frac{1}{4}$ by 22; day-room, $11\frac{1}{4}$ by 55; mess-room, 23 by $49\frac{1}{2}$; kitchen, $13\frac{1}{2}$ by 29; cook's room, 9 by $10\frac{1}{2}$; and commissary store-room, 9 by 18 feet. The upper story, $8\frac{1}{2}$ feet in height, is reached by a staircase, and is used as a dormitory for the men, and is fitted up with a sufficient number of single, two-tier wooden bunks, ranged down both sides of the room. The building is ventilated by twenty-eight windows in each story, and also by ridge ventilators through lattice-work in the ceiling of the dormitory. Situated as these quarters are, almost north and south, they are freely exposed to the prevailing winds, and thorough ventilation as a consequence ensues. In each of these dormitories there is an air space per man, for an average strength of 50 men, of about 650 cubic feet.

The cavalry barrack is a long, one-story brick building, 26 by 20 feet, elevated some 3 feet above the surface of the ground, and surrounded by a covered veranda, 9 feet in width. This building is divided by an archway, 12 feet in width, into two large rooms, each 24 by 92 by 14 feet, used as day-rooms for the men, and also as dormitories. Though an extremely comfortable barrack in every respect, still I believe a barrack built on this plan, where a common room is used by the men both as day-room and dormitory, is objectionable, as the men, during the day, are accustomed to lounge in their beds, which would not be so much the case were the dormitory in a different story. In this climate, where diseases of a malarious type prevail, the dormitory should, in my opinion, be in the second story. As in infantry quarters, the men sleep in single, two-tier bunks, on bedsacks filled with hay, and covered by the ordinary government blanket. Each room of the barrack is sufficiently ventilated by doors at each end, and by twelve windows, six on each side, and also by ridge ventilator, through lattice-work in the ceiling. Projecting backward from the center of the building is a large mess-room, 40 by 40 feet, divided into two rooms by four open arches. It is fitted up with a sufficient number of tables and wooden benches. There are two small store-rooms, one $14\frac{1}{2}$ by 10 feet, the other 19 feet eight inches by 10 feet, at one end of the mess-room, in which commissary stores are kept. One of these was, I believe, intended for a kitchen,

but it was utterly inadequate for the purpose, and a small, temporary wooden building was erected in rear of all, in which the cooking is done, and answers the purpose. This barrack, for an average strength of 80 men, gives an air space of 775 cubic feet per man.

The artillery barrack is a long, one-story building, 26 by 300 feet, elevated some 3 feet above the ground, and entirely surrounded by a covered veranda, 9 feet in width. By a covered archway, 12 feet wide, it is divided into two rooms, each 24 by 142 by 14 feet, which are used both as day-rooms and dormitories by the men. Projecting backward from the center of the building is the dining saloon, 50 by 60 feet, at one end of which is a kitchen, 23 feet 9 inches by 14 feet 3 inches, store-room, 12 feet 9 inches by 14 feet 3 inches, and sergeant major's room, 8 by 14 feet 3 inches. The dining-room proper is, by four open arches and a passage, 5 feet wide, divided into two rooms, 21 by 48 feet. This barrack is occupied at present (the battery of artillery having left here April, 1869) by the band of the Tenth Infantry.

To all these barracks water-closets are provided, situated some little distance in the rear, and all built on the same general plan, being small, frame buildings, elevated some 3 feet above the ground, with a trough which slides underneath, and can be drawn out as often as necessary, emptied, and washed out in the Rio Grande below the reservation, and disinfected. The water-closets attached to the cavalry and artillery barracks are, like the quarters, built of brick.

The ordnance building, about 150 yards distant from the artillery officers' quarters, is a large, fire-proof, brick building, 60 by 40 feet, used as an ordnance store-house; it is roofed with slate, and furnished with six windows, $7\frac{1}{2}$ by 3 feet, in each side, secured by iron window-shutters, inside of which the windows, or rather the window frames, are covered with iron gauze. The floor is of Roman cement.

Close to the gate of the principal entrance to the reservation is the guard-house—a quadrangular building, 44 by 35 feet—constructed of hewn logs, with a veranda, 9 feet wide, all around. The arrangement of the building is shown by Figure 23.

C, cells, 4 by 8 feet; G, guard-room, 18 by 21 feet; H, hall, 3 feet wide; P, prison-room, 18 by 21 feet; V, veranda.

The cells and the room used by the guard are floored with lumber. The prisoners confined in the large room sleep on the ground, or upon some pieces of loose lumber in the room. There is a wooden bed made for the guard, and in most of the cells there is a small wooden bunk erected, upon which the prisoners sleep. In the doors of each of these rooms and cells, and in the ceilings, a small hole, secured by iron bars, is cut for ventilation. Those in the ceilings communicate with a small, dome-shaped ventilator at the top, and also with lattice-work around the side underneath the eaves. The number of prisoners confined in the guard-house would average

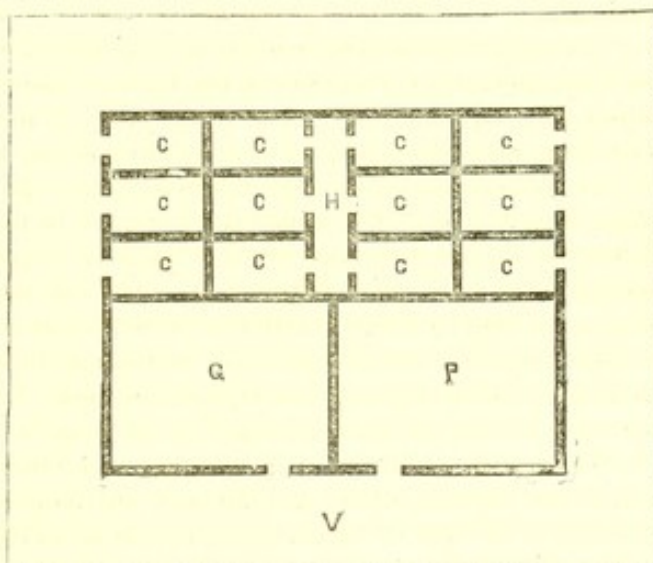


Figure 23.

at least 30. The guard-room is warmed in the winter by a wood stove, but there are no means of warming any other portion of the building. At night it is lighted by candles secured in lanterns and kept in possession of the guard. This building is entirely inadequate for such a garrison as this, for besides being an unsightly structure situated at the main entrance to the garrison, it is much too small, the ventilation is very insufficient, and I am only surprised that there has not been much more sickness among the prisoners confined there. The building should be condemned and a new one of proper size, capable of free ventilation, erected. Owing to its insufficient size, the commanding officer has been obliged to place the prisoners in the room intended for the guard, and have the guard sleep on the porch around the building. I understand that plans and specifications have been prepared and approved for the erection of another guard-house, but nothing further has been done in the matter.

The post hospital is a handsome brick building, recently erected, and only fitted for occupation

about May 1, 1869. It was built in accordance with the plans of Circular No. 4, Surgeon General's Office, for the year 1867. A covered veranda, 9 feet wide, surrounds the entire building. Extending laterally from the executive building, and separated from it by a covered archway, 10 feet 3 inches in width, are the wards, each of which is 24 by 66 by 14 feet, intended for twenty-four beds. These wards afford sufficient accommodation for the sick of the command, and seem admirably adapted for hospital purposes. A constant breeze (sometimes almost too strong) blows through each ward, thus securing perfectly free ventilation. Each ward is intended for twenty-four beds, though, at present, I have only fourteen in each, and the amount of sickness in the garrison, for several months past, has been so small that one ward is quite sufficient to accommodate them. Each ward is ventilated by thirteen windows and one door on the side, and a door on each end; there is also ventilation through the ridge by lattice-work in the ceilings. The windows are $11\frac{1}{2}$ feet high by 5 feet wide, and are furnished with venetian blinds, opening down to the floor. In the winter months a large wood stove is used in each ward, which gives sufficient heat. The fuel used is the "mesquite," the same as supplied to the post, an excellent fuel, making almost too hot a fire. The hospital is lighted by candles and lard-oil lamps in each ward. A post order, issued long before the order from the War Department, prohibited the use of volatile oil in any of the public buildings in the post, except the officers' quarters.

Medical supplies are obtained, on the usual quarterly requisitions, from the medical storekeeper at New Orleans, and usually reach here by the middle or latter part of the first month of the quarter for which the supplies are drawn. They are of good quality and in excellent condition.

The general sanitary condition of the post during the past year was excellent, the principal diseases being diarrhœa, intermittent and remittent fever, venereal diseases, a few cases of rheumatism and pulmonary complaints, and, after pay-day, some cases of delirium tremens. I believe that most of the cases of diarrhœa are produced by some excess in either eating or drinking, and also by the water. The rise in the Rio Grande generally takes place about the end of June. For the few months previous to this, the water being very low, is much saturated with salts, principally sulphate of lime, when it is by no means palatable. The water in the lagoon, by evaporation and soakage through the bank between it and the river, (the bed of the river being much lower than that of the lagoon,) also becomes very low, so that a by no means pleasant odor arises from those portions of it covered over with water in the winter and now dry. These two causes, I believe, give rise to intermittent and diarrhœa. General Clitz, fully alive to this source of danger from the lagoon, causes about 40,000 gallons of water to be pumped into it every day from the river, which makes up for the loss by evaporation. There is a much less number of intermittent cases treated this spring than were treated for the corresponding portion of last year. The occurrence of a sudden "norther" brings a few cases of pulmonary complaints, mostly catarrh and slight bronchitis; but I think this climate is very favorable for some cases of pulmonary disease. Cases of phthisis, where there is little expectoration, would be benefited, while to some other cases of the same disease it would be a constant source of torment, and certain death. It is also very unfavorable for rheumatic diseases, there being so much moisture constantly present in the atmosphere. The excessive heat is also very debilitating to weak constitutions, and few persons of this kind remain perfectly well during the summer months.

About 100 yards distant from the guard-house is the office building, a large quadrangular brick building, 50 by 112 feet, elevated some three feet above the ground, and surrounded with a covered veranda, 9 feet wide. This building, by means of two halls, 9 feet wide, intersecting one another at right angles, is divided into adjutant's office, quartermaster's office, library, also used as reading and court-martial room, with a small room at one end, formerly used as the commissary's office. On the opposite side of the hall are two corresponding rooms, one, the larger one, used since the 1st of May last as a billiard-room and officers' club; the other, and smaller one, is not in use at present.

On the edge of the river, about 75 yards from the office building, is a small frame house, 26 by 58 feet, used as a post bakery. It contains two ovens, though one is out of order at present, and is provided with the necessary bake-pans, troughs, &c. It is capable of supplying bread for a command of 1,000 men, and the bread is generally of good quality. The baking is done by enlisted men, detailed for that purpose, who receive some extra compensation out of the post fund.

Along the western side of the lagoon, and on the spit of land between it and the river, are the quartermaster and commissary store-houses, stables, &c. The store-houses, of which there are seven quartermaster's and one commissary's, are frame buildings of sufficient capacity for both depot and post. There are also one blacksmith shop with seven forges, one carpenter's shop with four work-benches, one paint and saddlery shop, one small steam engine (about five-horse power) for pumping water, and one fire-engine house, containing one hand-engine. There is one large stable for depot and post mules—capacity 120 mules; one large shed stable (east and a little north of the cavalry barracks) for cavalry horses—capacity 100 horses; and also one stable for the horses of mounted officers—capacity 10 horses.

The water is an important item about this post, which I think is capable of improvement. The water supplied to the officers' and men's quarters, the hospital, and the entire post, is taken from the Rio Grande, pumped up by the engine mentioned above, received into large tanks, of which there are eight, drawn off into other tanks where the mud separates, and finally, by means of a water cart, is distributed to the different parts of the garrison. Each officer's quarters and the laundresses have a couple of barrels, the different sets of men's quarters a large wooden tank, which is filled every morning. This water is used for drinking, washing, and culinary purposes. In the spring and early part of the summer, before the summer rise takes place in the Rio Grande, the water gets pretty bad, charged with salts, principally sulphate of lime. A large dripping stone is used in the hospital, through which every day passes a quantity of water sufficient for drinking, and though it is not by this process purified from the salts, still, the taste is very much improved, and it is rendered much more agreeable and palatable. It would be extremely easy for large tanks or cisterns to be erected in which the rain water could be secured and used for drinking and culinary purposes. There is an enormous surface from which the rain water could be collected, and though the rain-fall is by no means equally distributed over the different months, still the average fall would be quite sufficient for all the wants of the garrison. When persons first arrive at this post they are generally attacked by diarrhœa, which I attribute in a great measure to the quality of the water necessarily used by them. Ice is such a rarity that of course none can be procured or saved during the winter, so that we are entirely dependent upon artificial ice. There is a manufactory on the opposite side of the river at which 12½ cents per pound, specie, was last year charged. This year, thanks to a manufactory started in Matamoras, a block of ice weighing at least 10 pounds is procured for 50 cents, specie, so that we are now able to indulge to a limited extent in this luxury. The ice machine, however, frequently gets out of order, and we are sometimes for two or three days without it.

In the same room of the office building used as the court-martial room is kept the post and regimental library; the post library, lately purchased, consists of 295 volumes, and the regimental library, formerly belonging to the Twenty-sixth Infantry, of about 400 volumes. These are mostly works of a scientific, historical, and biographical character, with works on naval and military science, travels, novels, &c. Several of the weekly papers are also taken, and reading desks have been erected for the convenience of the readers. Books are lent to the officers and enlisted men of the command.

About midway between the hospital and cavalry quarters are the quarters for the married soldiers, whose wives act as laundresses for the command; these consist of twelve wooden "shanties," placed six in each row; two of these are, I believe, unserviceable. As mentioned before, some of the non-commissioned staff, with their wives and families, are temporarily occupying the artillery officers' quarters. It is intended to build twelve more frame houses for their accommodation, which will be amply sufficient. There are, in all, twenty laundresses with twenty-two children, and two soldiers' wives not laundresses, who have three children.

The ground occupied being so level, there is very little natural drainage; but two or three large drains have been made—one about half-way between the infantry officers' quarters and the hospital, and one midway between the hospital and cavalry barracks. Both these drains empty into the lagoon by means of square wooden pipes; this prevents any water from accumulating in the immediate vicinity of the hospital. All the slops, offal, and excreta of the officers' quarters hospital, and barracks, are received into barrels, which are emptied each morning into a slop-cart and thrown into the river.

On the east bank of the lagoon is a small wooden building, about 18 by 20 feet, intended as a bath-house; there is a small wooden platform running from this house down into the lagoon. Every evening, after retreat, the men are at liberty to bathe in the lagoon; and, on every Saturday evening, the prisoners are marched from the guard-house, under a sufficient guard, and permitted to bathe and wash themselves.

Cows being of small value in Texas, the butcher who has the contract for supplying the post with meat usually loans, without charge, a cow to the hospital and to the different officers of the post; these cows, however, give but little milk; they are usually worth about \$10 to \$18, specie, and can at any time be readily procured at that price.

A most excellent commissary supply is kept at this post, where nearly every article of food required by families can be procured at much more reasonable rates than are charged by the citizen traders in Brownsville. The enlisted men purchase small articles from the post trader principally, because he sells to them on credit, and they pay him on the arrival of the paymaster. But few articles are obtained from the vicinity. There is usually a supply of vegetables in the market all the year round; and, for 12½ or 25 cents, specie, a quantity sufficient for a family's consumption can be procured. Irish potatoes are very scarce and dear—about \$9 a barrel, specie. The climate seems to be very unfavorable for their preservation, as they sweat on their way hither on board the steamer, and soon decay and spoil after their arrival.

Servants can hardly be procured here at any price; and even for the very poor class we are compelled to take we pay from \$12 to \$20, specie, per month.

Last spring the captains of the three infantry companies then stationed here attempted to start a company garden, and for that purpose each of them fenced in about three-quarters of an acre of ground some little distance from the hospital building; various vegetables—Irish potatoes, string beans, tomatoes, onions, radishes, turnips, &c.—were planted; but the season was very unfavorable, being very dry, and notwithstanding constant irrigation, a very small crop was raised. There is no hospital garden.

The population of Brownsville is said to be about 5,000—one-third Americans, or foreigners of the Anglo-Saxon race; the remainder are Mexicans, with some few Spaniards and negroes. The white men are generally employed in trade, the Mexicans and negroes as laborers. The country around Brownsville is very sparsely settled, and mostly by Mexicans employed in "ranching" and raising cattle. There is, also, very little respect for human life or property outside the town—a very small amount of property offering an irresistible temptation to the Mexicans to plunder or kill. There is very considerable smuggling of everything—dry-goods, wines, brandies, cigars, &c.—going on from Mexico, notwithstanding the constant vigilance of the custom-house authorities.

The Morgan steamers, carrying the United States mail, are supposed to arrive at Brazos every alternate Tuesday; but it is generally every alternate Thursday, or perhaps later; should the weather be unfavorable, the mail is then brought by land direct to Brownsville. The river steamers pass up and down the river frequently, carrying freight and passengers. One of these steamers, also, goes up twice a month to Ringgold Barracks. A private telegraphic wire runs to Brazos and Clarksville, at the mouth of the Rio Grande. There is no telegraphic communication between Brazos and Corpus Christi, or Indianola, the nearest points from which communications can be made with the North. We cannot have a letter go from this place to department headquarters, or to Washington, and an answer received, in less time than a month. A mail rider leaves here every Monday, carrying the mail by land to Corpus Christi; and the mail from that place reaches Brownsville every Thursday evening. Letters leave here for Ringgold Barracks, by land, every Monday, and arrive every Friday.

Statement showing mean strength, number of sick, and principal diseases at Fort Brown, Texas, white troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	366.25	1,535	1	863	195	3	1	86	4	40	.....	55	4
1869	307.91	640	.....	245	92	2	.....	93	.....	28	1	45	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

RINGGOLD BARRACKS, TEXAS.

REPORT OF ASSISTANT SURGEON H. M. CRONKHITE, UNITED STATES ARMY.

Ringgold Barracks is situated in Starr County, Texas, latitude $26^{\circ} 23'$ north, longitude $98^{\circ} 47'$ west from Greenwich, with an elevation of 121.9 feet above the Gulf of Mexico. The location is on the left bank of the Rio Grande, which at this point, flowing in a southeast direction, is about 200 yards wide, shallow, and impeded by sand-bars; navigable for 20 miles further up, and of an exceedingly tortuous course. Rio Grande City, a town containing 300 inhabitants, is on the left bank of the river, three-fourths of a mile northwest from the post. Brownsville, Texas, also situated on the left bank of the Rio Grande, is 125 miles to the southeast. Fort McIntosh is 120 miles to the northwest, at the town of Laredo, Texas.

For the protection of the frontier, a temporary camp was, in 1849, established near the present site of Ringgold Barracks. In the year 1850 the location now occupied was selected for a permanent post, and the erection of quarters was commenced. From 1850 till 1859, the place was garrisoned by United States troops. After its abandonment, in 1859, Costina, with a company of Mexican marauders, pillaged the adjoining country and murdered many of the inhabitants. For that reason a detachment of United States soldiers regarrisoned Ringgold Barracks in the same year, and the occupation was continued from that time until the commencement of the rebellion in 1861, when the troops were again withdrawn. Since the termination of the war in 1865, the post has been garrisoned by the military forces of the United States. The reservation here is in the form of a square, extending 1,000 yards along the bank of the Rio Grande, and the same distance at right angles back from the river. It is above the extreme limit of high water; generally it is level, but there is an elevation of ground near the southwest corner, upon which stands the building now occupied as quarters by the commanding officer.

Geologically this region is of aqueous formation. Univalve mollusca are found in the recent tertiary strata, identical with those which now inhabit the country, feeding upon cactus and mesquite; and beds of oyster shells to be found in the older tertiary strata give proof of marine action during a more remote period. In its general configuration the surface of the country is flat, but there are hills of moderate altitude at various places in the vicinity of the river covered by, and containing in their interior, pumice and siliceous boulders, which have evidently been transported by water from distant mountain ranges. Beautiful specimens of agate and jasper have been collected in the vicinity of Ringgold Barracks. The soil is very fertile, but the long droughts to which southern Texas is liable are prejudicial to many kinds of vegetables. Maize is the cereal most cultivated, and it constitutes the principal food of the inhabitants upon this border. One characteristic of the indigenous vegetation in this locality is the abundance of many species of the cactus family. The acacias are represented by mesquite, of which the forests here are principally composed. Of animals the most conspicuous are the antelope, deer, Mexican lion, wolf, prairie wolf, wild cat, peccary, badger, raccoon, rabbit, and several species of the bat tribe. Of birds the prin-

cipal are the eagle, vulture, turkey, goose, duck, snipe, quail, crow, blackbird, turtle dove, mocking bird, and swallow. The rattlesnake is the only venomous reptile. There are many innocuous species. Catfish are caught in the Rio Grande; their flesh is inferior in flavor. There are no fresh-water wells, springs, or ponds.

From the first of June to the end of October the heat is extreme, Fahrenheit's thermometer at midday usually indicating 100° in the shade. Occasionally the mercury attains a height, in the shade, of 110° or more. The prevailing wind during the summer is from the southeast. In winter there are occasional frosts, but snow is rare. From November to May northwest winds, popularly termed "northers," prevail at irregular periods. The usual duration of a norther is from three to five days. If the norther is accompanied by rain the weather is cold and disagreeable. When the northwest wind does not blow the climate in midwinter is warm and pleasant. The mean annual temperature is about 73° ; the extremes are about 102° and 29° F.

The buildings now occupied by the garrison are constructed of wood, ill adapted to the purpose, and liable to be blown over by the first heavy gale. There is, however, in process of construction, an entire new set of quarters for officers and enlisted men, with hospitals, store-houses, and all other buildings necessary for the use of the garrison, and if the plan now pursued in the building of the post is followed to completion, there will be little room for improvement. The buildings are to be of brick. The guard-house and one company barrack are completed, and the hospital, commanding officer's quarters, four other buildings for officers' quarters, and second company barrack, are far advanced toward completion. This post is intended to accommodate a command of four companies.

Each company barrack is two stories high, 130 feet long, and 43 feet wide, inclusive of a porch, 9 feet wide, upon Moorish arches, in front and rear. It contains on the first floor a reading-room, wash-room, dining-room, squad drill-room, store-room, and a room for the first sergeant. The second story is to be occupied as a dormitory. The bunks are of wood, double, and in two tiers. The company kitchen is in rear of the main building, with which it is connected. It is 24 feet long, and 18 feet wide. A large building, divided into nine compartments, with wash-shed in rear of each, will be erected for laundresses' quarters.

Officers' quarters, six in number, are each 54 feet long, 40 feet wide, and one story and a half in height. A building contains quarters for three officers, a captain and two lieutenants. It has two halls, each 7 feet wide, running through the center from front to rear. By the halls the buildings are divided into halves. Each half contains two rooms on the first floor, and two on the second. Each room is 18 feet square. The lower rooms are 12 feet high, and the upper are 9 feet high. In the rear of every building is a smaller one, the roof of which projects and connects with the main structure. It contains two kitchens, each 14 feet long by 10 feet wide. The commanding officer's quarters is 50 feet long by 40 feet wide, and has a hall, 10 feet wide, running through the center from front to rear. In all other respects it resembles a building for officers' quarters as above described. It will be ready for occupation in fifteen days.

The guard-house is 43 by 34 feet and one story high, with a porch in front, 12 feet wide, resting upon Moorish arches. It has a guard-room, 20 by 16 feet; and a prisoners' room of the same dimensions. It contains also three cells, each 8 feet long and 4 feet wide.

The hospital is 190 feet in length, and has a porch, 12 feet wide and 15 feet high, upon Moorish arches, extending around the building. It is composed of a central administration building two stories high, and of two wings, each one story high. The central portion has a capacity of $37\frac{1}{2}$ by 36 feet, exclusive of the porch. It has a hall, 4 feet wide, running lengthwise through the center. Each wing contains a ward, 40 feet long, 25 feet wide, and 15 feet high. In addition to this it contains a matron's room and a store-room, each $13\frac{1}{2}$ feet long by 8 feet wide. The hospital kitchen is 20 feet long, 14 feet wide, and 15 feet high, and is connected with the porch in the rear of the central building. The post bakery is 43 by 33 feet, and contains a bake-room, store-room, and a sleeping-room. The dimensions of the other buildings to be erected cannot be ascertained at present. There is ample ventilation in those which have been described. The post is to be supplied with earth-closets.

For drinking and cooking, rain-water will be supplied from brick cisterns; for washing and bathing, water will be obtained from the Rio Grande.

There are no gardens at the post, and it is almost impossible to procure fresh vegetables.

Weekly mails are received from Laredo, Brownsville, and Corpus Christi. Mail communications with the North are through Brownsville and Corpus Christi. From Brownsville there is a bi-monthly mail to New Orleans, Louisiana. There is a bi-weekly mail to New Orleans from Corpus Christi. Mail communications with Brownsville are sometimes interrupted by the overflowing of the Rio Grande. With Corpus Christi they are always regular. The average time occupied by letters in transit from Washington to Ringgold Barracks is fifteen or twenty days.

The inhabitants of the surrounding country are mostly Mexican.

The sanitary condition of the post during the last year has been good. The diseases are principally of malarial origin, and most prevalent in midsummer, when the water is high in the Rio Grande. The erection of suitable privies and brick cisterns of ample capacity will very much lessen the frequency and severity of the typhoid and malarial fevers, diarrhœa, and dysentery, which were so prevalent among the troops during the summer and autumn of 1868.

Statement showing mean strength, number of sick, and principal diseases of white troops at Ringgold Barracks, Texas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	149.18	485	10	232	59	2	12	3	14	1	28	3
1869	169.66	338	8	214	14	1	9	.....	6	2	6	1

Statement showing mean strength, number of sick, and principal diseases of colored troops at Ringgold Barracks, Texas, for the year 1868.

Year.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (3 months)	173.66	162	1	59	45	2	23	10	7	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT McINTOSH, LAREDO, TEXAS.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS HENRY SPOHN AND J. E. TALLON, UNITED STATES ARMY.

Fort McIntosh is located on the left bank of the Rio Grande, latitude 27° 45' north, longitude 99° 50' west, altitude 806 feet, and situated near the town of Laredo, Texas. Ringgold Barracks is distant 118 miles, Fort Duncan 125 miles, and San Antonio 180 miles. The nearest approach by railroad is to Brenham, 350 miles east of the post.

Laredo is the oldest settlement on this frontier. It was founded in 1757 by a company of Spaniards, who received a large grant of land from the Spanish crown. They were armed occupants of the soil. The first United States garrison entered the town in 1849, at the close of the Mexican war, and Fort McIntosh was built during the following year. In 1858 the post was abandoned and all stores were removed to Fort Brown. Subsequently the fort was reoccupied by two

companies of the First United States Infantry, who garrisoned the post until the outbreak of the war. In 1865, a company of the Second Texas cavalry held the post, which has been continuously occupied until the present time.

"The plain upon which the post is placed," says Assistant Surgeon Perin, "has about 50 feet elevation above low water of the Rio Grande, and extends from the river at this point about two miles, where it is interrupted by a low range of hills running parallel with the same. The soil is of a loose, sandy character, containing a small portion of clay; it has a depth of from 15 to 30 feet, resting upon a basis of cretaceous limestone. Coal of a very bituminous character is found in small quantities in the bank of the river, a few miles above the post. The principal, and almost the only tree to be seen, is the mesquite. Along the river banks may occasionally be observed the willow, ash, and mulberry. A great variety of the family of the *cacti* grows here; the most common is the prickly-pear. The climate is mild. The seasons may be considered as but two—summer and winter. The summer usually commences in March and ends in November; a high temperature usually prevails during this period, the thermometer ranging between 75° and 107°F. in the shade. The winters are very mild, except during the prevalence of northers, which continue from three to six or eight days, accompanied usually by rain. The mean annual quantity of rain, on an average of three years, is 16.63 inches."

Troops stationed at this post have been quartered either in Fort McIntosh, about one mile outside of the town, or in buildings in the town hired for the purpose. Buildings for a new post are in course of erection, though the plan of the post is not definitely fixed upon. The only buildings completed are the hospital, post bakery, and quartermaster's store-house, which, together with tents, afford shelter for the command. The store-house, built of sandstone, is used as quarters for one company. A new frame building is occupied by the cavalry troops.

Officers are quartered in the new hospital building, which is substantially built of sandstone, with roofing of wood.

The building is 136 by 40 feet, one story high, with a porch extending its entire length both front and rear. Halls extending through the building divide it into three sections, the first of which contains five rooms, varying in size from 10 by 15 feet to 15 feet square; the second or middle section contains four rooms, divided by a hall, each 10 by 15 feet. The remaining portion of the building contains the ward, 40 by 25 feet—the dispensary and bath-room adjoining. Each room contains an open fireplace and a sufficient number of windows to insure perfect ventilation. At present the officers occupy the smaller rooms of the building, while the ward is converted into a headquarters. There are no water-closets in the hospital, in lieu of which pits are dug at convenient distances from the building. The kitchen is a detached building of similar material, measuring 15 by 20 feet, placed to the rear of the hospital, and reached by a hall extending from the porch of the latter.

The guard and prisoners occupy tents. The sick, with hospital attendants, are accommodated in an old stone building in the town. Though in poor repair the building is well adapted for hospital purposes. It is warmed by fireplaces, and well lighted and ventilated. The ward contains twelve beds, giving 250 cubic feet to each. Its average occupancy is one patient.

As there are as yet no stables at the post, horses are fastened to picket lines in a large yard.

The post is supplied with water from the Rio Grande, hauled by the water-wagon and distributed to the entire garrison. The population of the town, as well as of the whole Rio Grande frontier, obtain water for all purposes from this source. The water, no doubt owing to the fact that the river in its upper course runs through a large bed of stratified clay and other cretaceous matter, is, even in its purest state, contaminated with alkaline salts, such as chloride of sodium, and sulphate and carbonate of lime, which give it a slightly brackish taste. In the fall and spring of the year the river water becomes so muddy as to form nearly a paste, and only after continued filtration is it comparatively fit for domestic use. This change is effected by the steady and heavy rains which commence to fall in August and the subsequent fall months of the year. During that season the river rises immensely. Tributaries, which for the most part of the year have been without water, become powerful rivers, filling the bed of the Rio Grande with muddy water.

But little drainage or sewerage is required on account of the dryness of the climate.

There are no means of communication except by government trains and horseback. The mails

are irregular and liable to interruption from floods and Indians. The mail contract is for once a week, but it is often delayed two or three weeks. The length of time required for a letter to go to department headquarters is from ten days to three weeks. The inhabitants are chiefly Mexicans and mixed breeds.

The sanitary condition of the command has been excellent. The prevailing diseases during the past year were acute diarrhœa and dysentery, probably caused by defective diet and dissipation.

Statement showing mean strength, number of sick, and principal diseases at Fort McIntosh, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Veneral diseases.	Rheumatism.	Catarhal affections.*	No. of deaths.
1869, (10 months)	127.4	350	97	69	17	16	17	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT DUNCAN, TEXAS.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEON G. C. DOUGLASS, UNITED STATES ARMY.

Fort Duncan is situated in Maverick County, Texas, on the east bank of the Rio Grande, and about 650 miles from its mouth; latitude $28^{\circ} 50'$ north, longitude $100^{\circ} 30'$ west. It is south of, and adjoining, the town of Eagle Pass, directly opposite the town of Piedras Negras, Mexico, 40 miles south of Fort Clark, and 156 miles southwest of San Antonio. A range of low hills, with abrupt bluffs or spurs projecting toward the river, lie about a mile to the eastward. These hills rise to a height of 80 feet, and abound in detached masses of sandstone, which are suitable for building purposes, and from which most of the buildings at the post have been constructed.

There is no reservation, the government having a lease of about 600 acres of land upon which the post is situated, and of another tract of about 2,000 acres, lying along the river north of Eagle Pass. This last tract is leased with the privilege of cutting timber, quarrying rock, and mining coal. Coal is not known to exist on this tract, but its presence is inferred from the fact that surface coal of tolerable quality has been found on neighboring land. The soil is sandy, and not fertile.

This post was first occupied in 1849, was abandoned in 1861, and reoccupied by the United States in 1868. It was occupied by the rebel forces during the war, and the buildings were all more or less injured or destroyed. It was originally intended for a two-company post, and the buildings are now much crowded, four companies being present. A part of the men are in tents.

The buildings are of stone and adobe. The dormitories for enlisted men measure 76 by 30 by 18 feet, each being intended for one company. They are warmed by fireplaces and ventilated by openings at the eaves. The officers' quarters consist of two stone and one adobe buildings.

The guard-house is of stone, $47\frac{1}{2}$ by $22\frac{1}{2}$ feet, and 10 feet high to the eaves. It is divided into three rooms, which are not ceiled. The average number of prisoners is 19. The building is too small, and not properly lighted or ventilated.

The hospital is a one-story stone building, 84 by 25 feet, and 14 feet high, surrounded by a porch, 14 feet wide. It is warmed by fireplaces, and has no provision for ventilation. The ward measures 40 by 25 by 12 feet, and contains 12 beds, the average occupancy being 4. One end of the building is occupied as quarters by the post surgeon. There is no bath or wash-room. Water is kept in barrels, supplied by water-wagons.

The post library contains about 200 volumes of a miscellaneous character.

Water for the use of the garrison is obtained almost entirely from the river. The natural drainage is good.

San Antonio is the nearest city of any size. Communication with it is effected semi-weekly by stage. The town of Eagle Pass contains about 1,500 inhabitants. There is a camp of 80 Seminoles attached to the post.

Statement showing mean strength, number of sick, and principal diseases at Fort Duncan, Texas, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (9 months).....	197.44	259	47	100	3	17	5	22	2	16	.....
1869.....	126.5	249	23	58	3	15	.....	26	6	23	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT CLARK, TEXAS.

REPORT OF ACTING ASSISTANT SURGEON DONALD JACKSON, UNITED STATES ARMY, JULY 20, 1870.

Fort Clark, Texas, is situated in Kinney County, in latitude $29^{\circ} 17'$ north, longitude $100^{\circ} 25'$ west, at an approximate elevation of 1,000 feet above the level of the sea. It is 125 miles west of San Antonio, and about 45 miles north of Fort Duncan, at Eagle Pass, on the Rio Grande.

The site of the post is a rocky ridge of limestone, embraced in a curve of Las Moras Creek at its head, the post being about 400 yards south of the Las Moras Spring, from which the creek takes its rise. There is, west of the post, at the San Felipe Creek and Rio Grande, 30 miles distant on the El Paso and San Antonio road, a small settlement containing about a dozen families. There are but few settlers in the county; they are scattered along the Rio Grande and Nueces River. From the spring the Las Moras takes an easterly direction, curving south, then west, and keeping this general direction until it reaches the Rio Grande, distant about 18 miles. The government reservation extends from the spring down the creek about 8 miles, for which distance the creek is skirted with a belt of heavy timbered land, varying in width from a few yards to 70 or 80 rods.

This bottom land is very fertile, and about 500 acres are susceptible of irrigation; but a great part of this is liable to overflow during the summer freshets, greatly diminishing the value of the land in an agricultural point of view. Brackettsville, (or Bracketts City,) a small village containing about thirty families, is situated between the reservation and the El Paso road.

This post was established in 1852, with a view of protecting the southwest frontier against depredations by Mexicans and Indians, as well as for the protection of the road. Since the reoccupation of the post in 1866, (it having been abandoned in 1861,) the Indians operating in this region have been the Lipan and Kickapoo tribes, whose homes are in Mexico. The military operations have been, therefore, comparatively futile, as but little injury can be done to Indians unless their homes are reached; however, on several occasions they have been known to reside on the Pecos River, in this State. While there, in 1867, Captain Wilcox, Fourth Cavalry, succeeded in driving them from their encampment, whence they had been operating successfully against mail parties and others. In 1869, Major J. M. Brown, Ninth Cavalry, succeeded in completely routing the Lipans from the Lower Pecos.

The land included in what is called the reservation belongs to a citizen of San Antonio, who owns nearly all the land on the Las Moras. The first survey of the reservation included the spring, and is one mile square; the other surveys vary in size and shape, so as to include the creek with all the arable and timbered land on it for a distance of eight miles from its source. I believe the

lease on which the government holds this property expires in 1872. The land on the reservation is gently rolling or level, and generally well timbered with mesquite or post oak. Along the river bottom the timber is pecan, live oak, and elm.

The land lying from southeast to southwest of the post for the most part is low and gently undulating, and the flats well covered with mesquite, while that from northwest to northeast is high and rocky, with but little timber, except on the banks of streams. On the north the highlands dividing this scope of country from the Nueces bound the view, while on the east and southeast is seen, some 20 miles distant, what is called the Turkey Creek range of mountains, ridges of from 100 to 200 feet in height. The Las Moras, Piedro Pinto, Elm Creek, and Turkey Creek ranges of mountains are all elevations of from 100 to 200 feet in height, and from one-half to one mile in circumference, all visible and within 20 miles of the post; they are all on this side of the Nueces "Divide," and are near the sources of the streams from which they receive their names. A range of mountains in Mexico is seen, in clear weather, west of this place; they are upwards of 100 miles distant, and extend parallel to the Rio Grande and to a point opposite to the mouth of the San Felipe Creek.

In the greater portion of this section of country limestone forms the surface. In the flats and valleys the soil, which is calcareous mixed with vegetable mold, is exceedingly productive in grass and timber, and in wet seasons, or when susceptible of irrigation, produces excellent sweet potatoes, beans, onions, corn, cotton, and sugar. The latter are cultivated at the San Felipe settlement, 30 miles west of this.

Beds of bitumen are found on the Nueces, probably of little or no value. Grass is abundant, and the country is adapted to stock-raising only. Along some of the streams, such as the Rio Frio, Nueces, &c., are to be found, though not very plentifully, cypress, walnut, oak, elm, sycamore, mulberry, willow, and pecan. In the region of the Nueces and the mountain regions cedar grows abundantly. Prairie flats are usually covered with mesquite, or post oak. Large quantities of mulberry timber is to be found below the reservation along the Las Moras. The cactus is in great variety, and abundant throughout the barrens and higher regions.

The principal wild animals are the wolf, black bear, panther, wild cat, lynx, leopard, lion, gopher, red squirrel, raccoon, polecat, civet cat, red deer, and antelope. Buffalo rarely come down this far. Wild turkey, duck, grouse, plover, &c., are found, and all the streams have abundance of fish—trout, sunfish, bass, catfish, and buffalo.

All the rivers and creeks in this vicinity contain good water, originating from mountain springs; the most famous in this section, and, I believe, the largest in Texas, being the San Felipe Spring, 30 miles west of this. The Las Moras Spring, about 400 yards north of the post, is a sort of pond about one-eighth of an acre in area, from which issues the Las Moras Creek, a rather sluggish stream, having an average breadth for the first mile of about 20 yards; for the rest of its course its breadth is 6 yards; depth from 3 to 4 feet, with marshy banks.

When this section of country was first occupied by United States troops the rivers were much higher than at present; the period of time from 1858 to 1868 was considered exceedingly dry. In 1866, when I came to this post, there was but one (medium) running stream crossing the road from San Antonio to this place; (Las Moras does not cross the road.) The San Felipe alone continued to run an abundant stream to the Rio Grande from its source. In 1865 the Las Moras was dry eight miles below here, and it was generally believed the whole country would become uninhabitable. In 1868 rain was more abundant. In 1869 all the streams, from the Devil's River, 40 miles west of this, to San Antonio, again commenced to flow from long dried up springs, and nearly all have since continued to run. Last season rain, during summer and spring, was so constant and abundant that corn was raised in abundance; this year only that irrigated, or in very low bottoms, will be of any use. The mean temperature of the Las Moras Spring is 73.50° F.

The mean annual temperature at this post during the year ending June 30, 1870, was 67°; wet bulb, 63.45° F. Lowest mean monthly temperature, December, 48.64° F.; highest, August, 82.87° F. The lowest extreme was 26°, at 7 a. m., December 20; the highest 97°, on August 9, at 2 p. m. The rain-fall during the year ending June 30, 1870, was 23.87 inches. It usually snows on three days of each year.

The prevailing winds at this post are east-southeast. Excepting just preceding a "norther,"

the wind does not vary. When it varies in force and direction, it is always the premonition of a "norther," which occurs about once every ten days during the winter season, *i. e.*, from the beginning of November to the end of March. During these northers the wind usually blows with great violence from the northwest, north, or northeast, but most severely from the northwest, during which it is impossible to travel over the plains; in summer they are less frequent and not so violent.

The seasons are usually divided into "wet" and "dry," or summer and winter, the former commencing in April and ending in October, and consequently the dry or winter months being November, December, January, February, and March.

There is no fort proper. The post is built in a quadrangle, one of whose sides, the northeast, runs nearly parallel to the Las Moras Creek, from which it is distant from 75 to 100 yards, and on an elevated ridge of nearly bare limestone rock, 40 or 50 feet above the level of the creek.

Two buildings were erected last year for barracks, but are not yet quite completed; each measures 120 by 20 by 15 feet clear; they are of limestone rock, and have square gable roofs, which are shingled. In the front of each are three doors and two windows; on one end of each is one window, and in the rear three windows and one double door. From one end of each is set off a space of 20 feet, which is again divided into two rooms—the front, the first sergeant's; the rear, the commissary and quartermaster sergeants' store-room. The first sergeant's room has a door in front, a window in the end, and a door leading into the men's quarters. In the rear room there is a window in the rear and a door leading into the general quarters; there is also a neat fireplace in each of these rooms.

In the general barrack-room, which is 100 by 20 feet, there are two doors and two windows in front, and one double door and two windows in the rear, with a large fireplace at each end. Ventilation is secured through the gable and ridge. To a company of 80 men this would give 450 cubic feet air space per man. There are no wash or bath-rooms. Bedsteads are arranged in tiers, each $6\frac{3}{4}$ by $21\frac{9}{12}$ feet. There is a gun-rack at one end and two shelves at the other, near the wall. These beds are placed at right angles to the wall, or across the barrack, in two rows. Bedsacks are filled with hay. Ordinarily each man has two blankets, of tolerably good quality.

The water-closets are of a temporary nature, built of wood, situated about 150 yards from the barracks.

A kitchen and mess-room of stockade, and shingled, has been erected for one of the barracks; it is in the rear of and parallel to the latter; has one double door and three windows in front, and one door in the rear, with fireplace in one end; it has no fixtures as yet. There is also used as a kitchen and mess-room for one company, a stockade grass-covered building, formerly used as traders' store; it is situated some 150 yards from the barracks. The barracks are on the southeast side of the post. Married soldiers and laundresses are provided with small tents.

There are five buildings at present used as officers' quarters; three on the northwest side, framed, grass-covered, square or gabled-roofed buildings. The space between the posts of the frame are filled with light logs, lying horizontally, and fitting into grooves in the post; they were put up in 1854-'55, and are 18 by 50 by 10 feet. In each end is a room, 18 by 20 feet, with fireplace, two windows, and a door opening into a hall between these rooms, which is open, except in one of these buildings; there are also dilapidated portions of porches in front, and old stockade kitchens in the rear. All the kitchens are shingled. These buildings are all leaky and generally in very bad condition. On the southwest side of the rectangle are two stone buildings, with shingled roofs; one built in 1857, the other just completed; the latter, now occupied as headquarters, is intended for two sets of quarters—dimensions 50 by $37\frac{1}{2}$ by 12 feet. It has two halls, 6 feet wide, through the center. The front room in each set is 18 by 18 feet; each has one fireplace, two windows in front, and one in the end, and each communicates both with the hall and the room in the rear. The latter are not quite so large. In each there is also a fireplace and two windows, with door opening into the hall. From one side, or set of quarters in this building, there extends a stone building, shed roof, shingled, 36 by 12 feet, divided into three equal apartments, the one adjoining the main building communicating with it by a door and window; one used as dining-room, another as kitchen, and the third as servants' room.

The building formerly used as headquarters is 40 by 50 feet, 12 feet high, with shingled roof, a

porch both in front and rear, 12 feet deep; a hall, 8 feet wide, through the center, and two capacious rooms on either side opening into it. Each room is about 20 by 20 feet. The front rooms have two windows in front and one in the end, with fireplace in each; the rear rooms have fireplaces, one window in end and one in rear. Extending from one side or one set of these rooms, is a stone building, shingled and shed-roofed, 36 by 12 feet, divided into three equal apartments for dining-room, kitchen, and servants' room. In the rear of the other set of rooms, but not connected, is a stockade shingled building, used as kitchen and servants' quarters. The new building was designed for two sets of officers' quarters. The set with the dining-room, kitchen, and servants' room is at present occupied by the commanding officer. The old stone building was designed, I believe, for one set of quarters only, but is now intended for two sets, though not very well adapted for this, as there is but one hall. The double hall style of building, like the new quarters, is not well adapted for this climate, as the wind in the warm season invariably blows from the same direction, southeast or east; unless the building fronts toward the east or southeast, one set of quarters must be effectually shut off from the direct breeze.

Except the commanding officer, who has two rooms, no officer has at present more than one, exclusive of kitchen. The officers and men not provided with quarters occupy tents.

The privies are placed in the rear of the officers' quarters, at a distance of fifty yards, and are provided with portable boxes. There are no bath-rooms. Water is supplied from the spring by a wagon.

The adjutant's office at present is a hospital tent; the offices of the acting commissary of subsistence and acting assistant quartermaster are in the second story of the commissary and quartermaster store-house.

The principal building used as store-house is on the northeast side of the quadrangle; it was built in 1855, of stone, with shingled roof, two stories, 56 by 30 by 19 feet. The lower story has two windows and one door in front, and one door in each end; it is used exclusively as the commissary store-house. An addition is built of stone, with shingled shed roof to the rear, and extending around each end to near the end doors, 16 feet wide; this is used as corn-room and carpenter shop. The upper story of this building is used as quartermaster's store-house, and one room set off in front for the offices of the acting commissary of subsistence and acting assistant quartermaster. Next the store-house, on the same line, is an old stockade, shingled-roofed building, 16 by 30 feet, used also as quartermaster's store-house and harness shop.

The guard-house is a substantial stone building, placed on the northeast side of the quadrangle, outside the line, and near the eastern extremity. It measures 19 by 51 by 14 feet, and contains two rooms and four cells, for the arrangement of which see Figure 24.

C, cells, 3 by 8 feet; G, guard-room, 18 by 18 feet; H, corridor, 9 by 18 feet; P, prison-room, 15 by 18 feet.

The cells open by grated doors into the corridor, which opens on the front of the building. There is also a grated door between the guard-room and prison. The cells and prison-room are ventilated and lighted through grated holes high up in the wall, which are entirely too small, admitting an inadequate supply of air and light. There are no direct means of heating these cells or the general prisoners' room.

The hospital is built at the north angle of the post, on the northwest side; it is a substantial stone building, with shingled roof; outside dimensions, 81 by 28 feet, with walls 13 feet high, and porches, 12 feet deep, all around; it was built in 1856, and is now very much out of repair. In each end is set off a ward, with fireplaces, doors in front and rear, two windows on the end, and two on each side. The arrangement of the hospital may be seen by reference to Figure 25.

A, ward, 25 by 25 feet; D, dispensary; E, steward's quarters, 9 by 12 feet; K, kitchen and dining-room; S, store-room, 9 by 12 feet; P, porch.

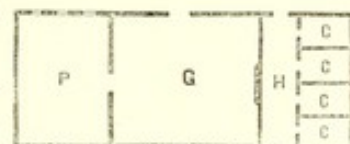


Figure 24

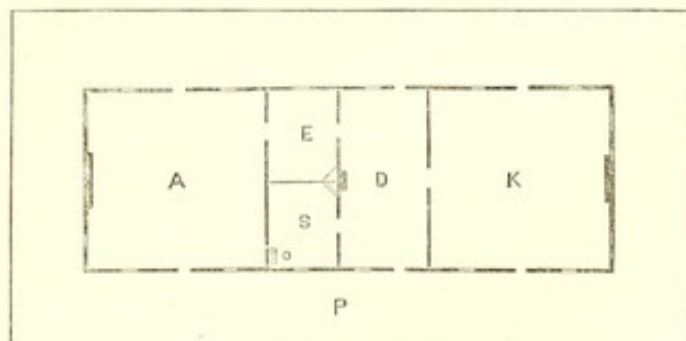


Figure 25.

The dispensary is the only ceiled room in the building, and contains the usual shelving, the drawers having been taken out during the rebellion and never replaced. To the rear of the hospital, at a distance of a few feet, is a stone building, 18 by 24 feet, now used as a store-room, but formerly designed for a kitchen. Only one ward is used as such, the other being in use as kitchen and dining-room. The ward occupied contains twelve beds, and gives 1,200 cubic feet air space to each man. There is a temporary bath-room arranged on the porch, but no wash-room. A privy is situated 50 yards in the rear of the hospital; it is provided with portable boxes. A dead-house, 6 by 9 feet, in bad repair, is also located in the rear of the hospital.

The hospital requires a new roof, new joists under the porch, a few doors, and other general repairs. The baggage of patients is stored in the general store-room. There is abundance of room in the hospital for all legitimate purposes if properly divided. There is also a good cellar underneath.

The post bakery is a substantial stone building on the northeast side, 25 by 19 by 9 feet, with shingled roof. In its rear is an oven capable of baking at one time 300 rations. There is neither chapel, laundry, nor school-house at this post.

The stable was formerly on the opposite side of the creek in the rear of the commissary and quartermaster's store-house, being a stockade shingle-roofed shed. It is very much dilapidated, and used at present as quartermaster's corral. A new stable, 200 by 30 feet, of boards, with shingle roof, has been lately finished, situated 100 yards in the rear of the new barracks. It is divided into two rows of stalls, 10 feet wide, has a door on either end, 12 feet wide, an air hole, 8 by 12 inches, opposite each horse, and a corn-room, 8 by 20 feet, in one corner.

The regimental library of the Twenty-fifth Infantry is kept at present by the regimental adjutant, boxed in his office. It contains 900 volumes. The post library at present consists of 184 volumes, kept in the quarters of the post treasurer. The books are generally in good condition.

The water supply of the post is obtained from the spring a few hundred yards distant, and distributed by means of a water-tank on a wagon. At the commissary's and quartermaster's store-houses and hospital water is stored in barrels; those of the hospital sunk in the ground. The water supplied by this means is abundant for all culinary and other ordinary purposes; it is slightly impregnated with lime, but answers very well for washing purposes.

There are no special arrangements for extinguishing fire except at the hospital, quartermaster's and commissary store-house, where water and buckets are kept in readiness.

The post being on a limestone ledge with not more than an inch or two of soil, and some 40 or 50 feet above the level of the creek, and embraced in a curve of the same, it is evident that the natural drainage itself is ample; offal, slops, and excreta are carted off some distance to leeward of the post and dumped out on the prairie. There are no special arrangements for bathing; sheltered and secluded spots along the creek are usually selected, both in summer and winter, for this purpose.

The cemetery is located south of the post about 200 yards, near the creek; it is unfenced.

The garden this season has been an entire failure, as the frost in the early part of the season destroyed the early vegetables. Scarcity of labor, as the men were busy working at the buildings, was another cause of failure. Fresh vegetables sell at almost fabulous prices, and, except onions, which are brought from Mexico, are very scarce.

Medical supplies are at present obtained from New Orleans, Louisiana, semi-annually.

Communication may be made with San Antonio, Texas, by stage twice a week, liable in the wet season to interruption from floods, which occur about half a dozen times a year. After leaving the post a letter usually reaches department headquarters at Austin in three to four days, and Washington in from ten to twelve days.

The inhabitants of the surrounding country are principally Mexicans of the most worthless class. They subsist by performing the work required around the post, such as cutting wood and hay, and many of them have no visible means of support. There are a few industrious and energetic stock raisers in the country who thrive well, notwithstanding Indians and others are constantly committing depredations on their herds.

The sanitary condition of the post has been excellent during the year, the prevailing diseases being malarial, chiefly in the form of intermittent fevers of a mild type. Pulmonary diseases or

rheumatism are rarely met with unless in persons predisposed by previous condition. The climate is favorable to both of these diseases. Bowel diseases are not uncommon, and are chiefly of malarial origin. During the late dry season malarial diseases were very prevalent.

Statement showing mean strength, number of sick, and principal diseases at Fort Clark, Texas, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (9 months)	227.55	238	39	38	6	10	12	14	6	7	5
1869.	150	148	28	40	6	12	2	9	3	7	4

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT STOCKTON, TEXAS.

REPORT OF ASSISTANT SURGEON P. J. A. CLEARY, UNITED STATES ARMY.

Fort Stockton, Texas, is situated on Comanche Creek, on the line of the great Comanche trail, latitude 30° 50' north, longitude 102° 35' west from Greenwich, with an elevation of 4,950 feet above sea level. It is on a line of travel across a vast dry and barren prairie, far removed from any city or town, and is 35 miles southwest from the nearest river, the Pecos, and 50 miles north of the nearest mountains, a continuation of the Guadalupe chain, which runs in a southeast direction to the Rio Grande. The nearest post is Fort Davis, 74 miles southwest. Fort Concho is 170 miles east-northeast, Fort Clark lies 266 miles southeast, and Fort Quitman 202 miles west-southwest. The nearest town is Presidio del Norte, in Mexico, 147 miles southwest. The nearest American town of any importance is Fredericksburg, 370 miles west, with a population of about 7,000. San Antonio is 392 miles southeast. The nearest railroad is at Columbus, 575 miles east-southeast. The place was first occupied as a military post in December, 1858, by a detachment of twenty men of the First and Eighth United States Infantry, under command of Lieutenant Cherbourne. In May, 1861, it was abandoned by the United States troops, and soon after was occupied by the rebels, who only remained here a short time, but burned all government property before they left. It was reoccupied by United States troops in July, 1867, and has been garrisoned ever since by the Ninth Cavalry and Twenty-fourth, formerly the Forty first, Infantry.

The reason for establishing a military post here was to guard the mail route from San Antonio to El Paso. It is also a valuable link in the chain of forts which protect emigrants, merchandise &c., going to or coming from California and Chihuahua, against the attacks and depredations of hostile Indians. Before the post was established, and also prior to its reoccupation by the Ninth Cavalry, the Comanche Indians lived here, and, being far from any settlement, held almost undisputed possession of the road, rendering it exceedingly dangerous to all who attempted to travel on it, and issuing in bands to the settlements drove off stock and found here a safe retreat with plenty of water. But at present, though they yet roam about in thieving bands, the road is comparatively safe, as they very rarely attack the mail or a passing train.

There is no government reservation, the post being located on land belonging to a citizen. The land gradually rises from the creek, so that the center of the post is about fifty feet above it. The land on the opposite bank of the creek is much lower and almost perfectly level, so that when there is a heavy rain the creek overflows it to a distance of half a mile from its bank. For the most part the land in the neighborhood is flat, though in some places it is gently sloping for miles, terminating abruptly in extensive valleys. Elevations, called "table-lands," are in all

directions from the post, varying from seven to twenty miles distant. They are from 100 to 500 feet high, with an area varying from three to twenty miles. Their surface is flat, and covered with coarse grass and several species of cactus. Their sides are abrupt and rocky. But few mineral products have as yet been found in the vicinity. Gypsum has been found in several places in and near the post, about three feet below the surface, but not in such quantities as to warrant an outlay in procuring it. The soil for the most part is sandy and strongly alkaline, containing chloride of sodium, sulphate of potash, &c., and cannot be farmed except by irrigation, but when cultivated in the vicinity of the creek and of a large spring, where it can be thoroughly irrigated, it produces corn, melons, and garden vegetables generally. Wheat and oats have not been successfully cultivated yet, though the effort this year promises to be a success; neither have potatoes nor cabbage.

There are no indigenous trees at or in the vicinity of the post, except one cotton tree in the post garden. Mesquite bush covers the entire surface. There is a water-cress which abounds in the creek, and which is an excellent antidote for scorbutus, as is also a species of cactus called the "Turk's head." This last is often roasted and eaten by the Mexicans, and frequently fed to their horses when on the road, in absence of other food.

In winter there is an abundance of ducks, and sometimes of wild geese, on the creek, while the marsh is frequented by cranes, herons, and a large number of water-hens. In the spring immense flocks of curlew visit the creek and remain about six weeks, and recently a species of partridge, called the Mexican, or California partridge, has made its appearance in the vicinity, and is increasing so rapidly that it will soon be an attraction for the sportsman.

There are but two kinds of fish found in the creek, the perch and catfish; but fishing is carried on to such an extent by the soldiers and Mexicans that they rarely attain over a pound in weight. Turtle are plenty, and are often caught, weighing from 12 to 15 pounds.

The only water at the post is from the creek, which rises about half a mile south of the post and runs nearly due north for about four miles, when it sinks into the ground, forming a kind of marsh or swamp. In the first half mile of its course it is fed by six fine, clear springs, has an average width of about 40 feet, and a depth of 5 feet. About eight miles west from the post are what are called the "Leon Holes," three large springs, having an average diameter of 30 feet and a depth of 20 feet. From them issues a stream which irrigates a large tract of land cultivated chiefly by Mexicans. Eighteen miles east from the post, on the mail route to Fort Concho, is the Escondido Spring. It is about 10 feet square; its stream runs a short distance and forms a miniature lake about 50 by 8 feet; its water is strongly impregnated with sulphur, but is cool and pleasant. About 12 miles northeast from the post, on the "Horsehead" crossing road to Concho, is a large spring called the "Antelope." There is a salt lake about 35 miles to the northeast, near the Pecos River, whence excellent rock salt can be obtained. The supply is almost inexhaustible. Frequently large quantities of it are taken to Mexico by trains returning from San Antonio.

The mean temperature is 70° F., with extremes 104° F. and 27° F. The heat is not so oppressive as the same temperature in the Eastern or Middle States, but the cold is felt more acutely, owing, probably, to the suddenness with which it comes. In the winter and early spring the thermometer sometimes falls as much as 30° in two hours. The climate is for the most part dry, even in winter, the wet bulb on an average standing 15° lower than the dry. When there is rain it generally comes in a violent tornado. The heaviest rain-fall since the reoccupation of the post, in 1867, occurred September 17, 1868, to the depth of 3 inches. There are generally one or two heavy rain-falls in the spring and early part of summer, and then again toward the latter part of autumn. The only time snow has been known to fall, by any of the old settlers here, was in January, 1868, when it fell to the depth of half a foot.

The winter may be said to commence about the 1st of December, and lasts until about the middle of February, when the spring opens. Though we frequently have "northers" after that time, we have no continued cold weather. The spring continues until about the middle of June, and from then until December the summer and autumn prevail. What is somewhat remarkable is that, although the spring commences so much earlier than in the Eastern or Middle States, the garden and farm produce is absolutely later.

Although the place is called a "fort," strictly speaking there is no fortification at the post.

The barracks consist of three adobe buildings with stone foundations. Each building is 80 by 24 feet, and two of them have wings for kitchen and mess room, each wing being 40 by 24 feet. They are roofed with thatch, except the wings, which are partly roofed with canvas and partly with thatch. The barracks have a capacity of 462 cubic feet air space per man. Each building is warmed by one large fireplace, the fuel being "mesquite root," and is lighted and ventilated by eight large windows and two doors. Each building is intended to accommodate a full company, but seldom contains over 50 men. The men sleep on straw-ticks and wooden bunks, two men to each; the bunks are of old lumber, and, having been made by the men, are of rough workmanship. There are neither wash-rooms, bath-rooms, nor water-closets. Two of the quarters have each a mess-room and kitchen, formed by the wing of each building; the remaining company uses a tent for a kitchen and has no mess-room. The kitchens have no special furniture; the cooking is done in camp kettles,* &c., on a kind of a rude mud construction which answers the purpose of a cooking range or stove, and, as the mess-rooms are not furnished with anything, the men generally eat their meals out of doors, each man supplying his own knife and fork and seat; yet they have plenty to eat, and seem to be well contented.

There are no quarters set apart for laundresses or married soldiers.

The officers' quarters comprise five buildings, built of adobe, with stone foundations and shingle roofs, and a porch front and rear, boarded floors, plastered and whitewashed inside, and well finished; they are each one story high.

The buildings altogether contain thirteen rooms; the dimensions of the rooms are 18 by 15 by 14 feet, and are heated by a fireplace in each room, and supplied with water every morning by a water-wagon, from which barrels are filled. There are neither water-closets nor bath-rooms.

The guard-house is built of rock, with shingled roof, and is located on the south side of the parade ground, in view of the officers' quarters. It is 56 by 16 feet, and is divided into two rooms, one for the guard, and the other for the prisoners. That for the guard is ventilated by means of one door, one window, and a fireplace. The cell where the prisoners are confined is ventilated by two openings in the wall, each 18 by 4 inches; it is not lighted except by these apertures, and is not heated except by the exhaled air of its occupants. Its means of ventilation are such that its capacity ought to be two, though it is generally occupied by fifteen prisoners. As to its fitness for the purpose, it is very well fitted, since it combines security with punishment, but punishment which deprives a man of light, ventilation, and of fire in winter.

There is no hospital at the post, though an old building which was formerly used for an officers' quarters is used as such, but it does not deserve the name. A permanent hospital is in process of completion.

The post bakery consists of one apartment, or building, of adobe, with shingled roof; it is 22 by 18 feet, and well adapted for the purpose.

There is neither laundry, chapel, nor school-house at the post.

The stables are situated 100 yards in the rear of the men's quarters, between them and the creek; it was intended to complete three large buildings for the purpose, but two of them have not been finished and will not be; the remaining one is an excellent building for the purpose. It is 250 by 30 feet, has stone foundation and adobe walls, with shingled roof. There are 100 apertures, each 18 by 10 inches, for the purpose of ventilation, in addition to two large doors at the ends and one large door on each side.

There is no post library.

The post is supplied with water from the creek and from the springs which flow into it, but there are no cisterns nor reservoirs. The water is hauled every morning in a large wagon, and distributed into barrels kept for the purpose. The quantity of water is abundant; it is decidedly alkaline, but is not unhealthy; one likes it very well a short time after using it, though at first it is rather unpleasant to the taste. It has not been analyzed, but it contains chloride of sodium and probably nitrate of soda and sulphur, with salts of lime and magnesia. The only means of extin-

* Note by Surgeon L. A. Edwards, United States Army, Medical Director Department of Texas.—The cooking apparatus is entirely unsuited to the needs of a permanent post—only proper for the march; this method of serving food is exceedingly objectionable, for it is not only in violation of sanitary laws, but subversive of good order and to the prejudice of military discipline.

guishing fire are the barrels of water kept outside the quarters of the officers and men for drinking purposes.

The drainage of the post is effected by the gradual slope of the ground toward the creek. It has a fall of about 50 feet in 1,000 yards, so that no water whatever remains on the surface at the post. The only artificial drainage consists of a ditch on the west side, in rear of the officers' quarters, and emptying into a ravine, which carries its water to the creek. This ditch prevents the rains from running over the parade ground, or into the officers' quarters, barracks, and stables. The excreta of the men accumulate in neighboring ravines, which are thoroughly washed by heavy rains. The offal or rubbish of the post is carried off on carts by police parties, and conveyed to a distance beyond the post.

There are no special arrangements for bathing, but the men, and all who desire, bathe in the creek, parts of which are well adapted for the purpose.

The cemetery is located one mile north from the post.

There is a post garden which has an area of 20 acres, and is cultivated by men detailed for the purpose. This is the third season it has been under cultivation. It is located about four miles north from the post, and is rendered productive by an excellent system of irrigation, the water being obtained from the creek. It furnishes abundance for the entire command; in fact, last year the supply of some articles was more than could be consumed, as of okra, onions, melons, cucumbers, &c. The value of the garden is almost inestimable, from the fact that vegetables cannot be obtained from the citizens in the vicinity except in small quantity, small variety, and at enormous prices. The amount of articles of food procurable from the post commissary is abundant, and, for the most part, they are of good quality. Although the supply of milk is abundant, it is high, chiefly, I presume, because it is sold only by two persons at the post. It is 20 cents per quart; butter is \$1 per pound; eggs, 75 cents to \$1 per dozen; chickens, from \$1 to \$1 50 each.

The medical supplies are obtained from the depot at New Orleans, Louisiana, semi-annually. The amount on hand of every article required is ample. The supplies called for on a requisition rarely arrive sooner than six months after the requisition is forwarded; more frequently nine months after. The supplies are at present stored in the ordnance store-house, which is badly adapted for the purpose, being an old and leaky building; yet it is the only available place at present. When the new hospital is completed there will be an excellent store-room.

The only means of communication with the nearest large city is by the stage coach, which is generally regular, though liable to interruption from Indians and floods; last year during the summer it was frequently interrupted by floods for two weeks at a time. The mail arrives and departs twice weekly. This year it has not been interrupted by floods and only once, for about an hour, by Indians, who, to the number of 25, made an attack upon it at the head of the Concho; they were driven off by the driver, an escort, a passenger, and the road agent, four in all; six Indians were killed in the encounter. This occurred the 1st of May.

It requires seven days for a letter to reach department headquarters at Austin, Texas, and fifteen days to reach Washington, although letters have been received here from Washington in twelve days; but so short a time is the exception.

The inhabitants of the vicinity are chiefly Mexicans, a cross between the Spaniard and Indian, which seems to have deteriorated both races; their occupation is farming and laboring work, such as making adobes at the post. They are quiet and inoffensive, and, with few exceptions, are thriftless and immoral, and, in consequence, most of them are poor and afflicted with syphilis in all its stages.

The general sanitary condition of the post is and has been excellent. In the winter and spring, in consequence of the "norther," catarrh is the prevalent affection; during the summer and autumn there are many cases of mild diarrhœa, and a few of intermittent fever. The only apparent cause of the diarrhœa is indiscretion in eating fresh vegetables, especially watermelons and cucumbers. The cases, however, are mild, and yield readily to treatment. The only malarial diseases were a few cases of intermittent fever, which also yielded readily to treatment; it is supposed to be due to the men bathing in the creek at evening, often after sunset; also to the men fishing at that part of the creek where it forms a marsh. In other respects, the place is entirely free from the affection, and there are several parties now at the post who have been, before their arrival, liv-

ing in a malarial atmosphere, and for months suffering with ague, who have never suffered since their arrival here nor taken medicine. The only cases of rheumatism during the past year were in patients who were suffering with the disease before coming to this post. There has been but a single case in that period of acute rheumatism originating at the post. There has not been a single case of pulmonary disease, which originated at the post, during the past year. The beneficial effects of the atmosphere and climate of this place on pulmonary affections, and particularly on phthisis pulmonalis, cannot be too highly extolled. The atmosphere is warm, dry, and pure. There were two cases at the post recently which forcibly illustrated the effect of the climate on the disease; they arrived here last autumn with the disease well developed, and left this spring strong and well enough to herd cattle going to California. Many people come to the State to have their "consumption" cured, but generally arrive when the disease is too far advanced, and, moreover, do not come far enough west.

Notwithstanding poisonous reptiles abound in the vicinity of the post, there has not been an instance of a soldier or civilian having been poisoned from such during the past two years. Rattlesnakes, tarantulas, and centipedes are very numerous.

There are no special amusements for the soldiers, though they indulge considerably in card-playing and going to dances or parties of their own getting up. It is but justice to them to state that there is less drunkenness among them than is generally found among an equal number of white troops. During the past eighteen months there has not been a case of delirium tremens, and even on pay-day it is rare to see a soldier drunk.

Statement showing mean strength, number of sick, and principal diseases at Fort Stockton, Texas, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (11 months)	398.09	648	1	27	90	71	22	140	92	1	41	10
1869.....	279.66	537	.....	33	107	75	10	35	55	2	74	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT DAVIS, TEXAS.

REPORT OF ASSISTANT SURGEON D. WEISEL, UNITED STATES ARMY.

Fort Davis is located near Limpia Creek, Presidio County, Texas, in latitude 30° 36' 23" north, longitude 103° 36' 45" west, about 475 miles northwest of San Antonio, and 220 miles southeast of El Paso. Altitude above the sea, 4,700 feet.

The post was created by virtue of the following order:

[Order No. not given.]

HEADQUARTERS DEPARTMENT OF TEXAS, PAINTED CAMP, ON THE LIMPIA,
October 23, 1854.

Lieutenant Colonel Washington Seawell, with his command of six companies of the Eighth Infantry, will occupy the camp where he is at present in position, which will be called Fort Davis, where he will proceed to make his command as comfortable as circumstances will admit of for the winter. He will immediately make requisition for the necessary stores, provisions, and forage for the half year commencing November 1st next, drawing as little as possible upon the forage already and about to be delivered. Preparations will be made for an additional quantity of provisions, supplies, and forage for detachments which may shortly be expected for service in the field.

By order of Brevet Major General Smith:

A. GIBBS,
Brevet Captain, A. D. C. and A. A. A. G.

Fort Davis was named after Jefferson Davis, then Secretary of War, and the location was selected because of its communication with San Antonio and El Paso by a fine natural road, its fine climate, its defensibility, and its vicinity to the favorite haunts of many of the wild Indian tribes, as the Mescalero Apaches, the marauding bands of the Gila Apaches and Comanches, (southern,) who could be easily intercepted from this post at the different crossings or fords of the Rio Grande to or from Mexico. It was partly designed, also, it is said, as protection to Presidio del Norte, 110 miles distant, and at one time it was seriously debated whether or not to move the garrison to that place.

Fort Davis was continuously occupied by the Eighth United States Infantry until April, 1861, when General Twiggs, commanding the department, forwarded orders to the post commander to prepare to turn over the fort and property to commissioners belonging to the State of Texas, move down the country, concentrate his command at Eagle or Beaver Lake, and there await the settlement of the differences between the State of Texas and the United States. He also ordered that no property be destroyed, and care be taken not to offend or exasperate citizens. About the 1st of April, 1861, the garrison evacuated and marched for San Antonio, but when within nine miles of San Antonio, at Adam's Hill, was captured by General Van Dorn, C. S. A., and taken to San Antonio. Immediately upon the evacuation of the post by the United States troops it was occupied by Colonel Baylor's Texas troops, who remained until the large amount of stores left by the Eighth Infantry was consumed. Upon their leaving it was occupied by roving Mexicans and Indian bands, and by the latter almost entirely destroyed. The post was reoccupied by United States troops July 1, 1867.

Fort Davis is located at the mouth of a cañon about three-fourths of a mile long, about 400 yards wide at its mouth, and gradually narrowing to its termination in a recess in the mountain. The mountains on either side are formed of metamorphic rocks, are about 250 feet high, very rough and precipitous, and covered with grass and small oak trees. The surrounding country is wild and barren, with no trees excepting a few live oaks in the cañon in rear of the post, and a few cottonwoods on the Limpia.

The climate is delightful and very healthy, and sudden changes of temperature are not so common as in other parts of Texas. There is but a small amount of rain-fall during the year, and that occurs chiefly in June and July, and scarcely any snow. January is the coldest month, the mean temperature of which last year was 42° mean, maximum 62°, minimum 15°, and August the warmest, the mean temperature last year being 74°, maximum 87°, minimum 62°.

There are no local causes of disease at this post. During the summers of 1867 and 1868 dysentery and scurvy prevailed very extensively and fatally. The causes of the prevalence of these diseases, however, at that time, were probably, of the first, the use of water rendered impure by long neglect, and a system of acclimation the troops were undergoing; of the second, an irregular supply of provisions. But during the entire year of 1869, and thus far, June 20th of this year, scarcely any sickness has occurred at this post. West winds prevail, and in spring are very strong.

The officers' quarters are located in a line running north and south across the mouth of the cañon. These are nineteen in number, one story, a covered porch in front and rear along the entire building, a separate house for each officer, and distant from each other 24 feet, the commanding officer's in the center, each third building a captain's set, and on either side a lieutenant's set; each of these consists of a main building, 48 by 21 feet, containing two rooms, each 15 by 18 feet and 14 feet high, with a hall between, 12 by 18 feet; in addition, the commanding officer's has a wing, 41 by 21 feet, containing two rooms, each 15 by 15 feet; in all four rooms. The captain's set have each a wing, 21 by 18 feet, containing one room, 15 by 15 feet; in the main line are thirteen of these buildings, and on each flank adjoining are three additional. Four are built of native limestone from a quarry one mile from the post, the rest of adobe; all have shingle roofs, and are warmed by open fireplaces. But nine of these buildings are completed, all that at present it is contemplated to complete. East of, and in a line parallel with the officers' quarters, with a parade of 500 feet in width intervening, are located the barracks, four separate buildings, distant from each other 30 feet, built of adobe, plastered inside and out and ceiled, a wide covered porch extending entirely around. Each barrack is 186 feet long and 27 feet wide, and contains two dormitories, separated by a passage-way, 27 by 12 feet, which leads to a building, 86 by 27 feet, containing the mess-room, 50 by 24 feet, the kitchen, 20 by 24 feet, and store-room, 10 by 24 feet. Each dormitory is 24 by 82

feet and 12 feet high, containing 23,760 cubic feet of air space. They are warmed by open fireplaces, and ventilated by large windows, four in the opposite sides of each room, and by a large ventilator in the ceiling, 20 by 4 feet. But two of these barracks are completed. Large and commodious sinks are placed 200 feet in the rear. There are no permanent quarters for laundresses and married men. On the north side of the parade, midway between the barracks and officers' quarters, are the executive offices, three rooms, each 15 by 18 feet. On the south side of the parade, and opposite the executive offices, is the guard-house, built of limestone, 54 by 22 feet, and containing the guard-room, 13 by 15 feet and 11 feet high, three cells, each $4\frac{1}{2}$ by 9 feet, and the prisoners' room, 15 by 16 feet. The cells are between the prisoners' room and the guard-room, and a passage, 6 feet wide, by the cells communicates with these two rooms. It is warmed by an open fireplace, and ventilated by holes, 12 by 3 inches, in the upper part of the walls, and a large ventilator in the ceiling. Average number confined monthly, 15. In the rear of the barracks, at a distance of about 700 feet, are the quartermaster's and company stables and corrals. The former occupies a space 367 by 300 feet, inclosed by walls built of adobe, 10 feet high. Along two of these walls are the stables, well roofed, but otherwise open, the climate being such that additional shelter for the stock is not required. Separated from this 70 feet, are the company stables, inclosing a space 350 by 450 feet, constructed like those just described, with stalls on all sides, capable of accommodating 400 horses.

The quartermaster's and commissary store-houses are located respectively north and south of the corrals, 100 feet distant. They are each 110 feet long by 27 feet wide, constructed of adobe and not ceiled.

The post bakery recently completed is situated south of the commissary's store-house, and consists of one room, 40 by 16 feet, and one oven with a capacity of 600 loaves.

The permanent hospital, after the plan published in Circular No. 4, Surgeon General's Office, Washington, April 27, 1867, was begun in February, 1869. It is located north of the executive offices, about 400 feet therefrom, at the foot of the mountain, fronting east of south. It was being constructed of native limestone, and the walls of the entire building had reached a height of 8 feet when work upon it, together with that upon a large part of the post, was suspended, and so it still remains, June 20, 1870. There is a prospect, however, that work upon it will be either soon resumed or another building upon a different plan, which has been submitted by the post quartermaster for approval, will be erected. The hospital now in use is a temporary adobe building, 50 by 19 feet, and contains one ward, 35 by 17 feet, with a capacity of fourteen beds, and the dispensary, 13 by 15 feet. It is plastered inside and whitewashed, well lighted and ventilated by numerous small holes in the lower and upper part of the walls. There is an addition containing the dining-room, 8 by 10 feet, and the kitchen, 12 by 16 feet. The entire building was hastily and temporarily constructed, but, with some repairs lately put upon it, answers all the requirements of the post. It is situated about 500 feet in the rear of the officers' quarters, midway up the cañon. A full supply of medical stores is now on hand, and for eighteen months there has been no difficulty in obtaining supplies regularly and without delay by requisitions upon the medical purveyor at New Orleans.

The post is supplied with water distributed by means of a water-wagon from the Limpia Creek, a small stream running through Limpia cañon and the northern part of the reservation. It is always clear, pure, and cool, not very hard, containing carbonate of lime and a small amount of organic matter, during the season of heavy rains, which is probably washed from the mountain at the foot of which it runs. Observation and experience show that it does not affect those using it in any manner, and no means of purification have been resorted to. There is also a large spring within the limits of the post, the water from which is harder than that from the Limpia. This water, it appears, was once, for some reasons unknown, condemned as unfit for potable purposes. It does not contain either organic or alkaline matter sufficient to render it unhealthy, and if it did, the cause was probably neglect during the long time the post was unoccupied. For extinguishing fire a sufficient number of barrels and buckets are kept constantly filled with water and placed at proper and convenient places.

The general conformation of the ground, gradually sloping from the post, is such that but little artificial drainage is necessary. Slops and refuse are collected in barrels, and emptied some distance from the post.

The post garden, heretofore situated on the creek, has been very successful, but the post com-

mander, thinking it not sufficiently large, established it this season at Mosque's rancho, about 8 miles from the post. It is rich prairie soil, and when well established will probably yield an abundant supply of all vegetables. So far, however, owing to the labor of preparing the new soil and the continued dry weather, it has not succeeded.

Domestic animals are scarce and inferior. Poultry of all kinds, butter, milk, eggs, &c., are scarce, and command high prices.

The El Paso and San Antonio mail line, driving four-mule coaches thus far, and running twice a week, communicates with San Antonio, the nearest and largest city. The communication is liable to frequent interruptions by floods and Indians. The time required for a communication to reach department headquarters is about ten days, and Washington from fifteen to eighteen days.

The duties of the troops have been the usual garrison and guard duty, and much scouting also. Owing to the large amount of work going on at the post, and the very limited number of employés, much irregular work has been necessarily imposed upon the troops and greatly interfered with their legitimate duties as soldiers. As yet there are no permanent facilities for bathing, but it is contemplated soon to erect bathing-houses on the Limpia, where the troops now bathe.

Fort Davis, by reason of its delightful climate, its healthfulness and comfortable quarters, is one of the most desirable posts on the Texas frontier, and the surrounding country may be called grand and picturesque. In front of the post the country is undulating for a distance of 15 or 20 miles, then start up abruptly high mountains. On either side are mountains ascending abruptly some distance, and capped by immense masses of unstratified basalt or trap rocks. At the base are numerous stones of various sizes, from small pebbles to immense boulders. One range of hills adjoining the post is formed almost entirely of limestone, from which was quarried the stone used in constructing the post.

Statement showing mean strength, number of sick, and principal diseases at Fort Davis, Texas, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	267.75	472	48	231	4	2	47	31	1	22	17
1869	241.91	274	32	105	.....	9	8	21	.....	24	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT QUITMAN, TEXAS.

REPORT OF ACTING ASSISTANT SURGEON JOHN J. CULVER, UNITED STATES ARMY.

The post of Fort Quitman is situated between the 104th and 105th degrees of west longitude and between the 30th and 31st degrees of latitude. The post was abandoned by the United States troops during the war, and not occupied again until the spring of 1868, when it was garrisoned by three companies of cavalry and one of infantry.

The country in every direction is a rolling sand prairie, covered with small stunted chaparral and mesquite bushes, and wild cactus which grow very high; beyond the prairie and within ten miles of the post at one point are steep rocky mountains, destitute of all vegetation. At the foot and on the sides of these mountains are found beautiful specimens of quartz containing small quantities of silver, iron, copper, &c. West of the post, about 400 yards, runs the Rio Grande from which the post receives its supply of water.

The climate is warm during the summer, and liable to sudden changes from warm to cold and from wet to dry during the winter.

The site has a gradual slope toward the river, thereby allowing excellent drainage. The buildings are all adobe houses, and when new were doubtless comfortable quarters, but are now in a deplorable condition, entirely unfit for the accommodation of troops. Whenever it rains, which it does frequently during certain seasons of the year, officers, but more especially men in quarters and patients in hospital, are invariably subjected to a disagreeable and unhealthy wet and muddy bed. Nor can this be avoided until the present roofs are replaced by new ones, put on by mechanics who understand building adobe houses.

Fort Quitman is, as a whole, entirely unworthy of the name of fort, post, or station for United States troops. The buildings, from the commanding officer's quarters to the smallest corral are nothing but patchwork. The post was established previous to the war, and during the period from 1863 until 1868, was abandoned by the United States, and the rebels, Indians, and all travelers passing back and forth over the road, made it their stopping place, and while resting here apparently used every endeavor to dismantle the houses, tearing away and burning doors, windows, and all available wood in their reach; the consequence was that when the troops were sent here in 1868, they found the adobe walls yet standing, but minus all other appurtenances which would tend to make them habitable; in some of the quarters even the roofs were gone. There are barracks for two companies, but so insecure are they that every rain we have floods the rooms, and all bedding becomes wet and muddy. The doors and windows are only so many holes in the wall. One company has built quarters for themselves by placing sticks perpendicular in the ground and closing the crevices with mud; they are probably a little superior to the original barracks, but, nevertheless, unfit to be designated as quarters for soldiers.

The hospital has been, until lately, in the same condition, and it has been necessary, upon more than one occasion, to take the patients out of the wards during a rain and place them in tents. The building is very inconvenient as a hospital. It was found necessary to convert one of the wards into a dispensary and steward's room. The kitchen and store-room are entirely too small for the requirements, and the dining room is so situated that it is impossible to get at it from the ward or dispensary without walking on the outside half the length of the building. The rains have washed away parts of the walls and left it in a deplorable condition. Heating is effected by open fires; lighting and ventilation abundant. The ward contains eleven beds; air space per bed, about 900 cubic feet.

The dormitories of the barracks, having neither doors or windows, have an abundant ventilation; they are warmed by open fires. Air space per man, 620 cubic feet. Temporary bunks are used. The sinks are ordinary pits. Rooms built of logs and mud are used as kitchens and mess-rooms combined.

The married soldiers' quarters are adobe houses, built by the soldiers. The laundresses, who wash for the soldiers, either occupy a small "jacal" or tent immediately in the rear of the barracks, or else live in "jacals" of their own within a quarter of a mile of the post.

The guard-house is in the same condition as the barracks, with the exception of light and ventilation, it being impossible in the present building to allow sufficient of either.

Several attempts have been made to cultivate a post garden, but have all proven failures, owing to the warmth, dryness, and sterility of the soil.

In the immediate vicinity of the post we are able to purchase milk, and sometimes butter, eggs, and chickens. Fresh vegetables, grapes, peaches, pears, melons, &c., can usually be procured during the summer months, but they are hauled over a dusty road 50 or 75 miles before they reach us, being raised in the Mexican towns of San Ignatius Guadalupe, San Elizario, and El Paso. Milk can be purchased for 5 cents per gallon; butter, from 70 cents to \$1 per pound; eggs, 50 cents per dozen; chickens, \$1 per pair; and vegetables, such as cabbage, onions, turnips, beets, &c., range from 8 to 12 cents per pound.

Medical supplies are obtained from New Orleans every six months, unless muddy roads impede transportation.

The inhabitants of the surrounding country are Mexicans and Pueblo and Apache Indians.

Statement showing mean strength, number of sick, and principal diseases at Fort Quitman, Texas, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (six months).....	195. 16	156	15	61	.....	1	2	4	.....	8	1
1869.....	189. 16	203	7	66	1	16	5	10	2	4	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BLISS, TEXAS.

REPORT OF ACTING ASSISTANT SURGEON E. H. BOWMAN, UNITED STATES ARMY, JULY 19, 1870.

Fort Bliss is located on Concordia ranche, three miles northeast from the town of El-Paso, Texas, in latitude $31^{\circ} 46' 5''$ north, longitude $106^{\circ} 21'$ west, at an altitude of 3,600 feet. It is situated on the immediate edge of the drift formation where the alluvium of the Rio Grande and the drift meet. It is near the northern apex of the detour formerly made by the river after emerging from the Paso del Norte and sweeping around the town of Franklin, now called El Paso, in a northeast direction, gradually turning almost due north, then abruptly turning east and southeast. The post is so located that it is exposed to malaria from the bottom lands of the Rio Grande whenever the winds prevail from the west, southwest, south, or southeast.

The depression of the ancient river bed is in close proximity to the post on the west. It is usually kept full of water from the acequia, but the supply failed this year in April, May, and June, so that there was an insufficient supply for the ordinary purposes of irrigation. The mud of the pond dried out to a great depth, opening into large seams, so that it was dangerous for stock to travel over it. Large quantities of malaria were thus evolved. The region around was under the same condition of drought; the earth everywhere was parched and cracked to a great depth. In consequence of this malarious influences have prevailed to an unusual extent.

The post is located on a bed of sand and gravel destitute of loam. Small sand-knolls abound in the immediate vicinity, north of the post. Two and a half miles north are found the broken hills of sand and gravel, the southern terminus of the Mesa, or great plain between the El Paso and the Huaco Mountains. The total elevation of the post above the waters of the river is estimated at 10 feet.

The post is distant from the southern terminus of the El Paso Mountains $2\frac{1}{2}$ miles; from the center of Paso del Norte $3\frac{1}{2}$ miles; from Fort Quitman, Texas, 90 miles; from Fort Stanton, New Mexico, 200 miles, and from Santa Fé, New Mexico, 350 miles.

Fort Bliss was formerly located half a mile south of the present site, close to the river. The encroachments of the river washing away the corral and part of the buildings, the location was abandoned March 1, 1868, and the present place occupied.

The post is rented property, a ranche, the extent of which is 100 acres, only a small part of which is occupied or controlled by government, say 10 acres for garden, vineyard, and the post buildings. These latter consist of three large adobe structures and several small ones, some of which are outside of the limits of the ranche, on adjoining property. The buildings are all one story high, with earthen roofs and floors.

Two of the main buildings are situated in line on the north of the parade ground, with a street between them of 60 feet width. Each has a front of about 125 feet, one has eleven, the other twelve rooms. Each has a court in the center; they are occupied as quarters by the quartermaster and commissary, as adjutant's office, as store-rooms of quartermaster's and commissary's stores, quarters for the troops, kitchens, guard-house, &c. The rooms are large, the ceiling 14 to 16 feet

high, with a sufficient number of doors and windows for light and ventilation. On the north side of the west building, and adjoining by an adobe wall, 10 feet high, are the post bakery, carpenter shop, and blacksmith shop, the three, with the side walls, inclosing a second court, which is used for storing lumber, charcoal, &c. On the north side of the east building, and adjoining, is the corral, inclosed by an adobe wall, 10 feet high. On the south side of the parade ground and near the southwest corner, is the other large building, containing eighteen rooms. Two officers occupy part of it as quarters. One large room is occupied as a store-room by the assistant quartermaster. Three rooms are now vacant. Seventy-five feet east of this main building is a small building, 18 by 28 feet, of one room, occupied as surgeon's quarters.

The present location presents no advantages of a military character that is not afforded in as great, or greater degree, by almost any forty-acre lot that borders on the Rio Grande.

There is no water nearer than the river, and it requires to be hauled three-fourths to one mile in a wagon-tank, at the daily expense of three men and eight mules. No trees grow in the vicinity. It will be readily seen that the only inducement to retain this as a post would be its importance as a military position; but a single glance at the topography will show that it has no such importance. The Paso del Norte, three and one-half miles distant, has an important military significance. It is not commanded in any respect nor secured from possession of any hostile force by this post.

The best soil, when the supply of water for irrigation is abundant, will produce two crops in one season. The drift is composed of sand, gravel, and boulders, is destitute of loam or any appearance of fertile soil, and is two or three miles in width. In some places near the mountains it is formed into an imperfect conglomerate, the cementing medium of which looks like carbonate of lime. It is a barren region, with nothing but stunted, scattering tufts of chaparral and cactus, with an occasional dwarf mesquite, sparsely sprinkled over it. The scanty rains of July and August gave rise to a few weeds and small and widely-scattered tufts of a short, thorny-pointed grass.

The Mesa is a vast elevated plain which terminates two to three miles north of the post, in sandy, gravelly hills. It embraces the region between the El Paso Mountains on the west and the Huaco Mountains on the east. This plain is, at the lower end, if possible, more barren than the drift, but further north the influence of the mountains, causing great precipitation of moisture, has developed more fertility, and a short grass is produced which, carefully gathered by hand, constitutes the principal supply of hay for this post.

The mountains are distant from the post at the nearest point about $2\frac{1}{2}$ miles. They are called by different names, as the El Paso Mountains at the southern end, where they terminate or are broken by the pass. At the northern end of the chain, 50 miles from here, they are called the Organ Mountains, probably from the basaltic columns which are said to present the appearance of gigantic organ pipes. The elevation of the mountains, in the absence of any means of measurement, save ascending them on foot, I should estimate at between 3,000 and 4,000 feet above the level of the plain. These mountains are tilted over to the west at an angle of about 35° , thus exhibiting on the eastern face the different strata. The lowest visible stratum is red granite, of which feldspar appears to be the principal component. Narrow seams of quartz traverse this region of granite, but again other seams of later date, probably made at the time of upheaval, are filled with beautiful specimens of carbonate of lime, in some observed instances so beautifully colored as to justify the name of "landscape marble." On a seam of this description in the south end of the mountain a shaft was sunk in former times, at a great expense of time and labor, in fruitless search for the precious metals. Old red metamorphic sandstone, in heavy strata of over 100 feet thickness, appears next above the granite, easily accessible and capable of furnishing inexhaustible supplies of the most durable building material. Above this appears a six-foot vein of a mottled brown and gray stone, in appearance not unlike the samples of ore from the recently discovered mines in New Mexico, which are said to be rich in chloride of silver. Some distance above this, with various kinds of secondary rock intervening, is a stratum of very light gray stone, very hard, of crystalline fracture. It is not acted upon by acids, and would make indestructible material for monuments, &c. Heavy ledges of brown ferruginous sandstone appear above, next in order, giving dark lines of shading to the landscape view. The ancient limestone formations commence above and comprise many hundreds of feet in thickness. In one place the appearance of outcrop of dolo-

mite or magnesian limestone shows itself near the surface rocks. We have not had opportunity to develop this so as to test it. If it should prove to be the true water-lime, its value for roofing and flooring would be immense in this treeless region, particularly in view of the prospect of influx of population expected to flow in with the advent of the Southern Transcontinental railway or thirty-second parallel railroad.

The crests of the mountains are surmounted by immense ledges of limestone, in which the fossil remains of gasterpods, crinoidea, chain coral, columnaria, and other varieties of coral and radiata abound. I observed a section about two feet long of what appeared to be the remains of a gigantic orthoceras, at least six feet long when perfect. Fragments of baculites and ammonites of large size are to be seen in abundance. The western slope of the mountain was evidently once the ocean bed; the limestone ledges over the mountains show everywhere the action of eroding agencies of an active and powerful character, as if, for instance, of water impregnated with acid or corroding agents; the rock is of almost flinty hardness, and very compact, yet is so corroded as to have an exceedingly rough surface. In many places they are covered by a ferruginous coating that presents to the eye the appearance of extensive deposits, but the hammer shows only a thin incrustation over the blue limestone.

No evidences have been found of the existence of coal in this vicinity. If found at all, owing to the great displacement of strata, it will probably be in small basins at great depths. The mountains terminate within two miles of the town of El Paso. The Paso del Norte is about $2\frac{1}{2}$ miles in width, and is made up of a collection of small hills of drift, about 150 feet above the level of the river. The strata of the mountains dip to the south, so that at the southern terminus the limestone is at the surface, affording inexhaustible supplies of most excellent building material already uncovered for the hand of the workman; yet with all this profusion not a single house of any size in this country is built of stone. To the northward of this post the mountains are said to give evidence of mineral wealth, gold, silver, and lead. Near the north end of the chain, 50 miles from here, silver was discovered twenty years since, but the interior location and exposure to Indian depredations have prevented proper exploration and development.

There are no springs, wells, or ponds at the post except the pond made by the old river bed, which is a muddy nuisance. The drainage into the river is slight, and the water found a few feet below the surface is so brackish and alkaline as to be unfit for use.

This is an almost rainless region. The little that falls is during the month of June, July, and August, making a period of about two months during which an occasional shower may fall, but no heavy continued rains occur. The temperature is mild and agreeable most of the year. The winters are mild, no snow to cover the ground. The springs are windy, with terrible storms of sand and dust. So densely was the air filled with sand and dust during one of the storms in April, that the large building on the opposite side of the parade ground was for a time completely invisible.

The extremes and mean temperature, with amount of rain, for the months of the year ending June 30, 1870, are as follows:

Months.	Maximum.	Minimum.	Mean.	Rain.
1869.	<i>Degrees.</i>	<i>Degrees.</i>	<i>Degrees.</i>	<i>Inches.</i>
July	103	66	98.48	0.26
August	102	64	97.27	5.14
September . . .	99	57	75.15	....
October	90	35	60.51	0.58
November . . .	85	32	58	....
December . . .	66	15	44.03	....
1870.				
January	71	13	40.03	0.10
February . . .	77	20	42.21	....
March	81	26	52.15	....
April	89	37	59.08	....
May	100	60	72.01	....
June	105	58	77	0.40
				6.48

The prevailing winds in winter are west, northwest, north, and northeast; in spring, west and southwest; in summer, southwest, south, and southeast; in autumn, west and northwest. The east and northeast winds seem here to be caused by the "northers" sweeping down over the Llano Estacado and crowding over westward, giving rise to cold and uncomfortable winds. These are only the western overflow of the mighty aerial current that sweeps down from the Rocky Mountains, and, descending the slopes of the Staked Plains, expends its force over middle Texas, making the much dreaded "norther." The farming season lasts most of the year, as it rarely freezes so that wheat cannot be sown.

There is no fortification whatever here. The barracks are in the two large buildings on the north side. There is capacity for two hundred men. The buildings are warmed by fireplaces, and ventilated by windows and doors, the air space per man being 500 cubic feet.

The quarters for laundresses are two small buildings outside, one of adobe, two rooms, the other, of "jacal" style. The quarters for married soldiers are in rooms in the barracks and in rooms to the rear of the officers' quarters.

The officers' quarters are in the large buildings at the southwest quarter of the parade ground and in the west building on the north side. They are supplied with water by the water-wagon daily.

The post hospital is located outside the northwest corner of the parade ground. It is built of adobe; dimensions, 75 by 30 feet. There are six rooms in all, being a store-room, kitchen, dining-room, dispensary, steward's room, and a ward. They are warmed by fireplaces, ventilated by doors and windows. The ward contains six beds, giving 800 cubic feet of air per man. There is no bath-house, wash-room, or dead-house. The privy is in the rear, and consists of a vault, with wooden superstructure.

The water supply is obtained from the Rio Grande by means of a wagon-tank, and deposited in barrels at each set of quarters. As it comes from the river it is always muddy and alkaline, but by settling or filtering it becomes comparatively pure and good.

There are, practically, no means of extinguishing fire, the only supply of water being that contained in the barrels. In case of fire at night there is almost no water on hand, as the use during the day has nearly exhausted the barrels, and there are not half a dozen buckets in the entire garrison to distribute what little may be on hand.

The surface drainage is naturally good, water easily running off or soaking in the ground; but permanent water of a brackish and alkaline character may always be found within 10 to 12 feet from the surface.

There are no bathing facilities about the post.

The post garden contains two acres. The product has as yet been small and unsatisfactory. It is cultivated by hired labor and details from the troops.

Cows, sheep, &c., cannot be kept, on account of the scarcity of water and grass, and the unfenced condition of the cultivated land. The expense of a herder when animals are at large, and the high price of forage when kept up, make the cost and trouble too great. There are few cows or sheep in the country. Goats are kept for milk and meat for the reason that they are more manageable in flocks, and can subsist where cattle would starve.

Communication may be made with St. Louis by wagons and railroad, 500 miles by the former and 600 by the latter; also with New Orleans, Louisiana, 900 miles by wagons, 400 by railroad and steamer. Either way is tedious and uncertain, as wagon trains only start when a full load of freight is obtained. Mail communication with the southeast semi-weekly; with the north, via Santa Fé, six times a week, quite regularly.

The inhabitants of the vicinity of the post are Mexicans and Pueblo Indians, agricultural and industrious; thieving and lewd, as a general thing, among the lower orders. The exceptions are said to be few, and, therefore, more honorable.

Malarious influences were rife at the post during the present season, commencing and continuing through the months of May and June. Nearly every person, white and black, was more or less under malarious influence, and suffering in many instances quite seriously, although not reporting on the sick list. The causes were low water in the river, defects in the dam, making scarcity of water in the acequia, so that there was not enough for the ordinary purposes of irrigation, and

the pond made by the old bed of the river, immediately west of the post, was completely dried out, the mud cracking into great seams, and to a great depth; the rich alluvial grounds around the vicinity were also parched and wonderfully cracked, thus evolving immense quantities of malaria. Intermittent, diarrhœa, and dysentery, from the malarious poisoning, were quite prevalent. One case in the hospital of syphilitic poisoning progressed favorably until he came under malarious influence, then diarrhœa set in, which rapidly ran into dysentery, resisting all treatment, and finally terminating in death. The rise in the river filling up the acequia and permitting irrigation, the filling up of the pond, and the occurrence of rain, have pretty well relieved us of malarious impressions. The salubrity of this location has been greatly overrated. In the spring, when the west and northwest winds prevailed, rendering the weather raw and chilly, several pulmonary and rheumatic cases were observed, but none of a very grave or serious character.

The population in the vicinity of the post is estimated at between 400 and 500.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Bliss, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (6 months).....	106.5	78	3	21	10	2	5	.....

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Bliss, Texas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (4 months).....	91	90	36	8	4	4	9	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

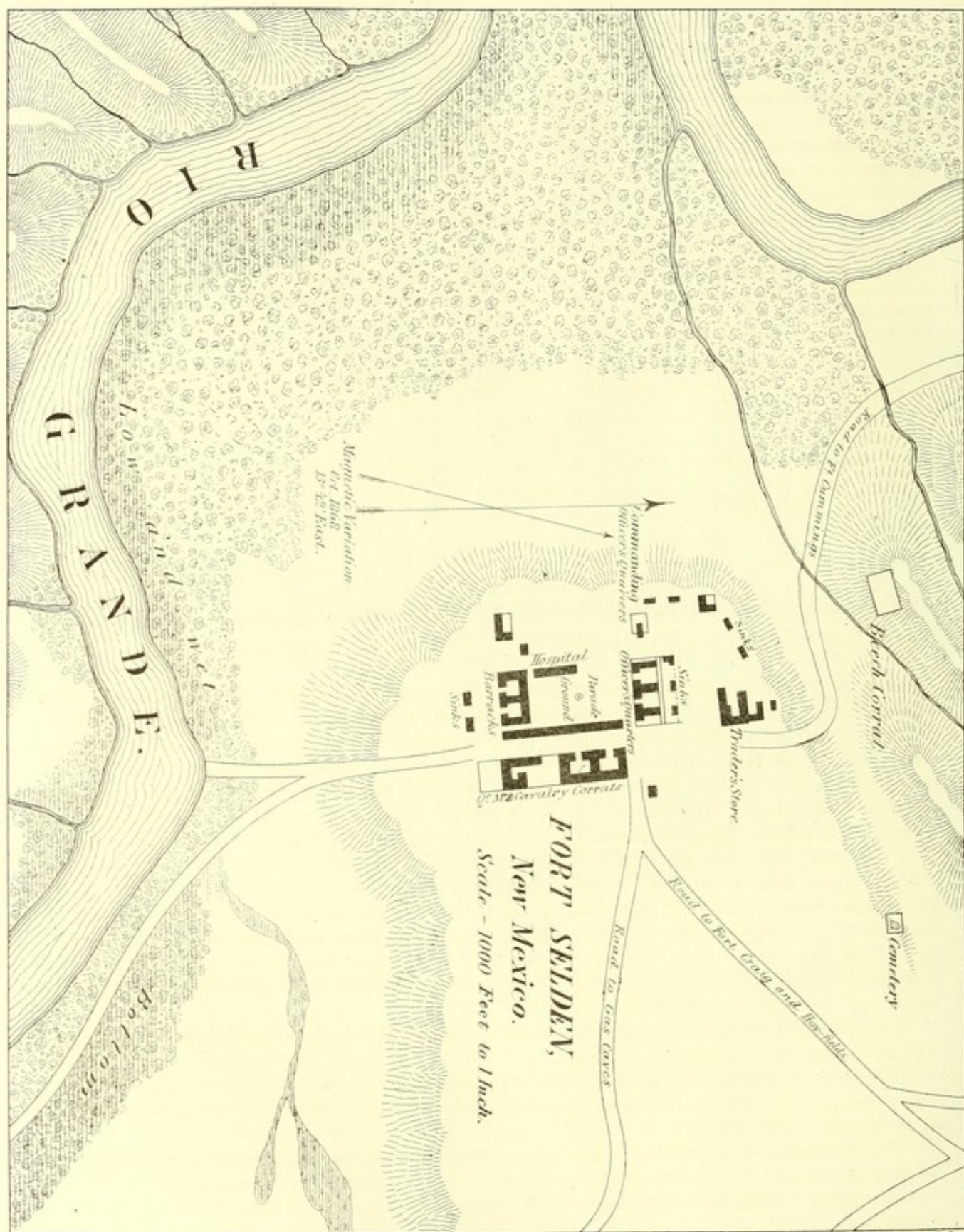


PLATE 5.

French, Langran & Ogilvie, Lith. Washington, D.C.

DEPARTMENT OF THE MISSOURI.

POSTS DESCRIBED.

Fort Selden, New Mexico.	Fort Smith, Arkansas.
Fort Cummings, New Mexico.	Little Rock, Arkansas.
Fort Bayard, New Mexico.	Jefferson Barracks, Missouri.
Fort McRae, New Mexico.	Fort Leavenworth, Leavenworth City, Kansas.
Fort Craig, New Mexico.	Fort Riley, Kansas.
Fort Stanton, New Mexico.	Fort Harker, Kansas.
Fort Wingate, New Mexico.	Fort Larned, Kansas.
Fort Bascom, New Mexico.	Fort Dodge, Kansas.
Santa Fé, New Mexico.	Fort Hays, Kansas.
Fort Union, New Mexico.	Fort Wallace, Kansas.
Camp Supply, Indian Territory.	Fort Lyon, Colorado Territory.
Fort Sill, Indian Territory.	Fort Reynolds, Colorado Territory.
Fort Gibson, Cherokee Nation, Indian Territory.	Fort Garland, Colorado Territory.

FORT SELDEN, NEW MEXICO.

REPORT OF ASSISTANT SURGEON CHARLES STYER, UNITED STATES ARMY.

Fort Selden is situated in a sandy basin one and a half miles from the Rio Grande, in southern New Mexico, latitude $32^{\circ} 25'$ north, longitude 107° west, height above the sea about 4,250 feet. At this point the river incloses an irregular crescent, upon which the fort is placed. Twenty-five miles east are the Organ Mountains, the Pechaco Mountains lying four miles to the west. The nearest posts are Fort McRae, 58 miles north; Fort Cummings, 55 miles west, and Fort Bliss, Texas, 67 miles south. The nearest towns are on the river to the southeast, being Leesburg, $1\frac{1}{2}$ miles distant; Doña Ana, 12 miles; Las Cruces, 18 miles, and Franklin, Texas, 65 miles. A good rope ferry across the Rio Grande is one and a half miles above the post.

The reservation is four miles square. The soil is sandy and sterile, resting on volcanic rocks. The ground rises gradually to the north for about four miles; on the south it slopes to the river bottom. The cottonwood on the river, a coarse and scanty growth of grass on the reservation, with plenty of cacti and stunted mesquite comprise the botany of the vicinity. Deer, antelope, and bear are found in the mountains. Wolves and skunks are annoyingly numerous about the post. At the river, beavers are plenty.

The climate is warm and dry, mean annual temperature, 66° F.; extremes, 99° F., and 13° F. Amount of rain-fall, 7.3 inches. No snow.

The post was established in May, 1865, for protection of settlers and of the post road. It is not yet completed. The buildings are of adobe, plastered outside and in, and the plan of arrangement is shown in Plate No. 5.

The dormitories measure 90 by 24 feet, and allow 840 cubic feet air space per man. They are warmed by stoves. The bunks are double in two tiers. No special arrangements for ventilation.

The officers' quarters are all one story buildings, with flat earth roofs. They are heated by fireplaces.

The hospital is also one story, with dirt roof and floor, warmed by fireplaces, and ventilated by these and by windows. It has two wards, each containing five beds, giving 1,440 cubic feet of air space per man.

Sinks to all the buildings are ordinary latrines with deep vaults.

The water supply is from the river, by a water-wagon. It is kept in barrels, there being no cisterns or reservoirs. The quantity supplied is ample and the quality tolerably good. The natural drainage is good, and answers every purpose.

There is a mail six times a week, irregular. Time to department headquarters, from 12 to 20 days.

The only inhabitants of the vicinity are at Leesburg, which consists of a small store and grog-shop with about twenty miserable huts. The residents are principally Mexicans of the lowest class, having no occupation except prostitution by the females.

The sanitary condition of the post is good, and there are no prevailing diseases.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Selden, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868	63.58	156	3	29	.....	26	4	24	.....
1869	53.58	144	5	31	1	18	6	24	1

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Selden, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	94.91	262	4	42	3	16	21	2	47	1
1869, (ten months)	74.8	199	.....	58	3	3	7	.....	41	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT CUMMINGS, NEW MEXICO.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS G. M. WARMOTH, J. LECARPENTIER, AND SAMUEL KITCHEN, UNITED STATES ARMY.

Fort Cummings is situated on the northeast side of Cook's Mountain, near the mouth of Cook's Cañon, in Grant County, New Mexico; latitude 32° 20' north, longitude 107° 48' west; altitude, 4,750 feet. It is 53 miles west of the Rio Grande, and 20 miles east of the Rio Miembres, the nearest water after leaving the post. Camp Bowie, Arizona, is over 100 miles to the west—by road, 130 miles. Fort Bayard is 40 miles northwest. Fort Craig 137 miles north. The reservation includes four square miles, a part of which is on the side of the mountain. The rocks are volcanic. The soil is a coarse gravel, not arable. There is no timber. Deer, antelope, bear, quails, centipedes, and rattlesnakes are found in the vicinity. The post was established in 1864 for the purpose of protecting trains passing through the cañon from the Apaches, who have committed many murders at this point.

The climate is mild—mean temperature for 1869, 56.5° F; extremes, 99° F. and 38° F. Total rain-fall, 15.4 inches. No snow.

The post is small, compactly built, and inclosed by a wall, 10 feet high, composed of adobe.

The buildings are one story high, built of adobe and covered with earth. For general arrangement, see Figure 26.

A, store-rooms; B, company and adjutant's offices; C, quartermaster's office; D, corral; E, shops; F, sally-port; G, prison; H, sheds; I, guard-house; J, officers' quarters; K, commanding officer's quarters; L, hospital; M, unfinished room; N, company quarters; P, sinks.

The barracks occupy the eastern side of the garrison, and consist of two sets of quarters poorly built and badly ventilated. The quarters afford sufficient room for one company. They are warmed by open fireplaces, and lighted by windows. Air space, per man, is 223 cubic feet, with the actual strength. They are supplied with double bunks. The sinks are located too near the post by 100 yards. They are used by the whole command, and are in a very bad condition. The kitchen and mess-rooms are large and well adapted to the purpose. There are no special quarters for married soldiers at the post.

Three sets of quarters for officers are completed, and two sets are in process of erection. They contain four rooms each, plastered within, well lighted and ventilated, and sufficiently large and convenient. The store-houses belonging to the post are sufficient and in good repair.

The guard house is in good condition, and its means of ventilation and warming are all that can be desired. The hospital building, in point of location, is badly situated. It contains one ward, 29 by 20 feet; a laundry, 23 by 20 feet; kitchen, 23 by 20 feet; store-room, 17 by 20 feet; dispensary, 15 by 20 feet, and steward's room, 12 by 20 feet. The hospital is sufficiently large for a post of one company. It is warmed by open fireplaces, which, by the aid of windows, afford good ventilation. There is no bath-room. The dispensary, store-room, and kitchen are convenient and well adapted. The ward is furnished with seven beds, allowing 828.67 cubic feet to each. The hospital sinks are insufficient. Those formerly used have been taken for the use of the troops.

A never-failing supply of water is obtained from a large spring located nearly one-fourth of a mile from the post. Though the water is of good quality by itself, owing to a prolonged state of stagnation it becomes impregnated with a large amount of organic matter, animal and vegetable, dead and alive, so as sometimes to become really obnoxious to health.

Inside, and also outside of the post, the drainage is not sufficient, as may be noticed after any heavy rains, where immense pools of water cover the ground, particularly in front of all the buildings. It has been recommended that the ground be leveled and covered from time to time with a new bed of gravel, making it more consistent. The drains are greatly out of repair, retaining a part of the water instead of carrying it off. Behind the post-trader's buildings, and over a great extent of ground, may be seen many piles of refuse. As it stands at present, rain-storms wash away the greater part of this refuse, which, mixing with the water contained in the ponds, is a cause of disease at the post.

A post garden is cultivated by irrigation and the use of fertilizers. Corn, cabbage, onions, melons, and peas are raised.

Mail communication is by weekly stage to Santa Fé. Mail is received three times a week from California, via Tucson. Time to Santa Fé, 7 days.

There are no inhabitants in the immediate vicinity of the post.

From January to April, 1869, a mild epidemic of small-pox existed at the post. Intermittent and remittent fever also existed for a few months, and a few cases of diarrhœa and dysentery. To the impurities contained in the water used at the post must be attributed several cases of the last-named diseases. Proper measures have been recommended, as mentioned above, for purifying the water, and also that the water-tank and barrels used for water purposes be well cleaned and washed

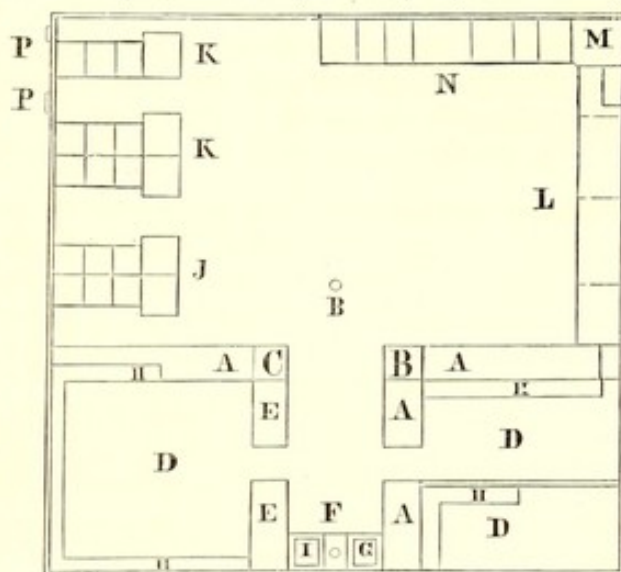


Figure 26.—Scale 125 feet to 1 inch.

as frequently as practicable. Large pools of water, or ponds, between the butcher's house and the post-trader's buildings, make of that ground a sort of marshy place, to the existence of which may be attributed the numerous cases of intermittent and remittent fever referred to.

Statement showing mean strength, number of sick, and principal diseases at Fort Cummings, New Mexico, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	79.5	108	.....	14	6	.....	2	13	.....	22	3
1869, (10 months).....	88.5	55	1	12	3	1	.....	.....	1	6	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BAYARD, NEW MEXICO.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS J. LE CARPENTIER AND A. J. GRAY,
UNITED STATES ARMY.

Fort Bayard is situated in a small valley between the Sierra Madre and Santa Rita ranges of mountains, latitude $32^{\circ} 40'$ north, longitude $108^{\circ} 25'$ west; altitude about 6,000 feet.

On the summit of the Sierra Madre, distant ten miles, are the gold mines and village of Pinos Altos; and at the base of the Santa Rita range, distant eight miles, are the copper mines of Santa Rita.

The valley ends abruptly four miles north of the post in a series of precipitous cliffs connecting the mountain ranges. Two miles to the south, the location of the little town of Central City, or Santa Clara, the valley opens on a vast and nearly level plain, across which are visible the mountains in Mexico; and to the southeast, Cook's Peak, distant forty miles, the location of Fort Cummings, the nearest post.

It is on no direct line of travel, the nearest railroad being nine hundred miles distant. The only stream of any size in the vicinity is the Gila, thirty-five miles west. The post was established in 1866, its object being to protect the miners against the Apache Indians, whose trail lies through this valley from southeastern Arizona to the settlements in New Mexico, the objective point of many of their thieving expeditions.

The reservation is two miles square, with an undulating surface, the cliffs and sloping hills crowned with cedars, and the long and circuitous arroyas fringed with willow and cottonwood.

The soil, where it can be irrigated, is rich and productive. A great variety of minerals is found in the vicinity; gold and copper being the most important; silver, cinnabar, iron, lead, zinc, and antimony are also present.

The agave, or American aloe, called here "mescal," grows in abundance, and its root forms one of the staple articles of food of the Indians.

There are few wild animals—deer, bear, wolves, and foxes being the principal ones. Of birds, the wild turkey, duck, snipe, meadow lark, robin, raven, and mocking bird have been observed.

The only water on the reserve proceeds from a series of small springs in an arroya near the fort, the united capacity of which is about fifteen barrels per hour.

The climate is delightful, and changes in temperature are gradual. Mean annual temperature, 51.97° F.; extremes, 8° F. and 89° F. Rain fell on twenty-eight days; total fall, 11.2 inches. Total snow-fall, 15.77 inches.

Winds are chiefly northwest and southeast; seldom severe. Late in the fall, after several days of continuous wind from the southeast, a few cases of intermittents are said to appear. This wind passes over a marsh twenty-five miles distant.

The post is on the side of a small hill, sloping to the east, near the center of the reservation.

The officers and men occupy temporary log huts, which are in bad condition. When the post is built, it will be of adobe; the hospital and store-houses having already been so constructed.

The post will form a parallelogram, 650 by 400 feet, and is intended for three companies.

The barracks for enlisted men are log structures, roofed with earth, warmed by open fire-places, fitted with double bunks in two tiers, and allowing at present 368 cubic feet air space per man.

The officers' quarters are log huts in very bad condition.

The store-houses are new, commodious, and convenient. The hospital building has recently been completed, though its location, from insufficient drainage and aeration, is not desirable. In the construction of the building, the plan proposed in Circular No. 4, from the Surgeon General's Office, has not been followed. It is built of adobes, and very badly constructed; the windows are too small and not sufficient in number; there is no steward's room, and the administration building is but one story high. The roof is formed by sloping rafters meeting at the apex; the inclination of its sides is contrary to all architectural principles, being twenty-five degrees, when, in this latitude, fifteen to sixteen degrees only would be indicated for greater security. There is but one ward in the building, which is used alike by white and colored patients. It has a capacity for twelve beds, and its superficial area is 910 square feet, allowing 1,060 cubic feet air space per bed. Provision is made in the plan of the building for a bath-room adjoining the ward, though as yet it is not prepared. The sinks and urinals are separate from the building and in good condition; they are situated too far away from the hospital for the convenience of the sick. The dead-house is also too far off, being placed outside of the hospital yard.

The water supply is good as to quality and quantity. There are no facilities for bathing.

The drainage is entirely superficial, and is imperfect. Post gardens are cultivated, and furnish a good supply of vegetables. There is good grazing on the reservation. Cows, pigs, and chickens are kept. Mail is received twice a week. It is rare that any article of value reaches its destination by mail, to or from this point. Communications to publishing or furnishing houses are almost invariably opened *en route*, and money removed if present.

The general sanitary condition of the post is very good.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Bayard, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (nine months)...	60.11	26	2	4	4	.....	1	1	.....	4	1
1869, (eleven months)...	71.63	66	.....	5	12	4	7	3	2	3	1

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Bayard, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	168.5	85	10	14	3	3	13	3	22	1
1869, (ten months).....	135.9	108	11	18	5	3	11	4	13	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT McRAE, NEW MEXICO.

REPORT OF ACTING ASSISTANT SURGEON W. B. LYON, UNITED STATES ARMY.

Fort McRae is situated three miles from the Rio Grande, on the line dividing the counties of Socorro and Doña Ana, New Mexico. Latitude $33^{\circ} 01'$ north, longitude $107^{\circ} 08'$ west; height above the sea, 4,500 feet.

It is in a wide cañon extending westward from the plain of the Jornada del Muerto to the Rio Grande, and is five miles from the head of the cañon. The Miembres range of mountains is 25 miles distant to the west, and 30 miles to the east are the San Andres Mountains. It is 32 miles south of Fort Craig, and 60 miles north of Fort Selden. The post was established in 1863, for the protection of the Jornada del Muerto from the depredations of the Miembres branch of the Apaches.

The crossing at the mouth of the cañon is the best on the river, and this was the principal pass through which the Indians drove their stolen stock. The fort also protects the Ojo del Muerto, (spring of the dead,) which, except at certain seasons, is the only water to be found near the Jornada, between Fort Selden and Paraja, a distance of 90 miles. The reservation is 2 miles square. The formation is quite recent, nearly the whole of the reservation having been simply washed out from the original level of the plain to the present broken slope to the river. The whole mesa is of recent water formation. A well sunk at Aleman, midway between Paraja and Fort Selden, passed through successive layers of soft sandstone, in which hard, flinty water-washed pebbles were imbedded.

Thirty feet from the surface well-preserved bones were found. At a depth of 100 feet a petrified walnut was discovered. Abundance of water was struck at a depth of 140 feet. Thin veins of coal crop out at several points near the river. A ten-foot layer of lava covers the mesa near the fort, extending to the mountain of Fra Christobal above, and the Sierra de Caballo below. The soil is covered with fine grama grass, but is not arable, as it cannot be irrigated. Cedar and ash grow in the neighboring ravines, groves of cottonwood on the river bottoms, and there is a good supply of mesquite on the higher slopes. Many species of cacti abound. The principal wild animals are the antelope, deer, panther or Mexican lion, cinnamon bear, wolves, foxes, and beaver. The eagle, crane, wild turkey, ducks, and quail are found. The Rio Grande abounds with cat-fish. The climate is delightful, except in June and July, when the heat is excessive. Mean temperature 60° F., extremes 105° F. and 8° F. The rainy season sets in about the middle of July, and continues one or two months. Average amount of rain-fall about 9 inches. There is very little snow.

The buildings are all of adobe, and of but one story. The barracks, officers' quarters, and hospital buildings are plastered on the inside with lime; they have mud roofs, and jaspe or gypsum floors.

The commanding officer's quarters, barracks, guard-house, and hospital were built in 1866; the other buildings belonging to the post are new.

The barracks, for one company of soldiers, measures 120 by 27 feet, and is divided into two apartments, with a hall. The rooms are sufficiently warmed by one heating stove in each, and lighted by three windows in the east and five in the west side; there are no means of ventilation except by the windows and doors, and the air space per man is 260 cubic feet when the barracks are full. They are furnished with double bunks, with an interval of 2 feet and 10 inches between the beds. The kitchen and mess-room are together in the rear of the center of the main building. Two small rooms are cut off from the east end of the barracks for the use of married soldiers.

Excellent quarters for officers have recently been completed, the outer walls of which are of adobe, and 27 inches in thickness. These quarters are lime plastered, with jaspe floors and good cellar, and are heated by open fireplaces. Each set contains four rooms and a hall; the rooms measure from 14 by 18 feet to 18 feet square. The commanding officer's quarters contain six rooms, each about 16 feet square.

The store-house comprises two large rooms, 20 by 30 feet, with an office, 20 by 15 feet, between.

This building is used by the commissary and quartermaster department, and is in excellent condition.

The guard-house is also of adobe, with jaspe floors; dimensions, 44 by 18 feet, and 10 feet high. The walls are mud-plastered and whitewashed. It comprises a guard-room, 14 by 14 feet, a prisoners' room, 14 by 18 feet, and a cell, 10 feet square; these rooms are 10 feet high, and are all warmed by open wood fires. The ventilation of the guard-house is insufficient, consisting only of openings, 12 inches by 24 inches, in the north, south, and west walls, 7 feet and 8 inches from the floor. Prisoners sleep on boards without ticks, and with but one blanket per man; the average occupancy, 2 prisoners. The hospital fronts on the parade ground, facing east, with shade trees both in front and rear. The building is 95 feet front and 25 feet deep, and, excepting its low and leaky roof, is in good condition, and well adapted. On the right of the main hall entrance is the dispensary, and immediately adjoining is the steward's room. On the left of the hall is a ward, 30 by 14 feet, containing five beds, and giving, when full, 83 square feet, or 707 cubic feet of air per man. The hospital is warmed by large wood open fires, which, with the windows, furnish good ventilation. The sink is located 40 yards to the rear of the hospital, and is kept in good condition. There is no bath-room.

The post bakery is a separate building, in good condition, and well adapted to the purpose.

A large corral in which 28 permanent mules, besides transient animals, are kept, is placed 40 yards to the southwest of the medical officer's quarters and hospital, and to the windward of both.

The police is excellent; the refuse is daily carted to a point half a mile down the cañon.

The men's sink is so situated that in the rainy season the excrement is washed to the river by each successive rain; at other times it is transported to the same place and in the same manner as the refuse of the corral.

The post is supplied with an abundance of good clear water from the Ojo del Muerto, so named from historical associations. The water is slightly alkaline, but pleasant to the taste and perfectly healthy. A post garden has been planted near Alamosa, (six miles distant,) cultivated by a permanent detail from the garrison, but from an insufficient supply of water has as yet been but partially successful. The hospital garden, for the same reason, has been a failure. Extra vegetables have been obtained from the surrounding country, but at high prices.

There is a weekly stage line to Santa Fé. The nearest post office is Aleman, distant 20 miles. Mails are received twice a week. A letter should go to Fort Leavenworth in from 12 to 15 days. The inhabitants of the surrounding country are Mexican farmers, who are a very healthy class of people. About 300 Apache Indians, professing to be friendly, have recently been living within 30 miles of the post.

Diarrhœa has prevailed at the post and in the vicinity; among the citizens, rheumatism and skin diseases.

Statement showing mean strength, number of sick, and principal diseases at Fort McRae, New Mexico, colored troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	89.16	312	58	116	4	2	5	8	31	.....
1869, (10 months).....	81.5	125	13	43	.....	9	2	4	6	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT CRAIG, NEW MEXICO.

INFORMATION FURNISHED BY LIEUTENANT COLONEL CHARLES SUTHERLAND, ASSISTANT MEDICAL PURVEYOR UNITED STATES ARMY, AND ACTING ASSISTANT SURGEONS W. R. BREWER AND H. G. TIEDEMANN, UNITED STATES ARMY.

Fort Craig is situated in the county of Socorro, Territory of New Mexico, on the right or west bank of the Rio Grande del Norte; latitude $33^{\circ} 38'$ north, longitude 107° west, with an altitude of 4,576 feet above the sea. Its location is about 10 miles above a well known landmark in that vicinity, known as Fra Christobal, the commencement of the Jornada del Muerto. This Jornada is about 80 miles in length on the eastern side of the river, and mostly dry during the year. The nearest military post is Fort McRae, 32 miles distant to the south, on the eastern bank of the Rio Grande. Paraja, 8 miles distant south, on the east side of the river, and San Marcial, 3 miles distant north, on the west bank, are the only neighboring towns.

The post was established on the abandonment of Fort Conrad, distant 9 miles north, April 1, 1854, the buildings having been in process of erection some months previous. The object of Fort Craig was to afford protection against the inroads of the numerous bands of Apaches that roamed at large throughout the lower portion of New Mexico, from the Pecos to the Gila Rivers. Those supposed to be most immediately under its influence were the Gila or Miembres Apaches, and the Mogyon Apaches, both of which bands lived on the western side of the river. The fort served also the purpose of protecting a road running to the lower portion of the Territory on the west side; this road, not much traveled ten years ago, is now principally used. The Apaches have always been a terror to the inhabitants and travelers of New Mexico, and at the time of the location of this post they had spread desolation far and wide. The location of Fort Craig was preferred to that of Fort Conrad as affording better grazing, and, being at the entrance of the Jornada del Muerto, as affording greater protection to the inhabitants of the vicinity.

The reservation embraces an area of a little over 38 square miles; the fort overlooks the river from the edge of a plain which extends for miles to the base of the western range of mountains. This table land is a succession of rude grades, increasing in height as they proceed, until the formation is lost among the mountains. To the south, southwest, west, and north of the fort, the mountains are mainly basaltic, and partially covered with timber and scrub bushes. There is a large "mesa" nearly opposite and northeast of the fort, rising very abruptly from the river bank, which is of volcanic origin, and whose summit is crowned with an extinct crater.

The mineral products are gold, silver, mercury, galena, and copper; also mines of bituminous coal. A small portion of low land used for gardens is immediately on the bank of the river, which is here narrow and rapid. The soil of the bottom lands is fertile, producing excellent vegetables and cereals, while that of the uplands affords only pasturage for stock. The cottonwood, oak, black walnut, mesquite, cedar, and willow, are the indigenous trees, and are sparsely scattered; the cottonwood and willow on the bottoms, and the others on the mountains.

Of wild animals, the grizzly, brown, and black bear, panther, wild cat, weasel, large and small wolves, are the most important. The rodentia are represented by the large hare, (jack rabbit,) the ordinary burrowing rabbit, gray and ground squirrel, the ground rat, prairie dog, the badger, and mouse. Black and white tailed deer, as well as antelope, are abundant in the mountain regions. Swans, pelicans, wild geese, brant, and almost every species of duck abound on the river, as well as sand-hill cranes, blue herons, bitterns, and several species of snipe. At some distance from the post, and principally in the mountains, are found turkey, quail, blackbird, meadow lark, robins, doves, sparrows, bluebird, cardinal bird, snow bird, and many others. Of the birds of prey, are the golden eagle, white headed eagle, the falcon, chicken and sparrow hawks, turkey buzzard, carrion crow, and raven; the last three species being the most numerous, and answering the purpose of scavengers. The river abounds in catfish, buffalo, and white fish. Beavers and muskrats are found in great numbers within a mile of the post.

The climate is variable; in summer the heat is very great; in winter there is slight frost, and

some little snow. This season is disturbed by the great storms of dust which blow, from the west principally, over this post as well as over all the lower posts of New Mexico, thereby marring what would otherwise be a very delightful climate at that time of the year. The dust at times is stifling. The average temperature is 58.59° F.; the greatest degree of heat, 98° F.; that of cold, 4° F.; the greatest difference observed between the thermometer and hygrometer, 26° F. The annual rainfall for 1869, was 11.23 inches. The prevailing winds in summer are southwest; during winter, from the north. The fort is placed nearly equidistant from the northern and southern boundaries of the reservation, and is 72 feet above the Rio Grande.

The buildings are, with few exceptions, constructed of adobe, and are arranged around a rectangular area 1,050 feet by 600 feet. For the general arrangement of the post, see Figure 27.

A, casemates; B, commanding officer's quarters; C, guard-house; D, initial point; E, adjutant's office; F, soldiers' quarters; H, officers' quarters; I, store-houses and shops; K, married soldiers' quarters; L, old hospital; M, new hospital; N, corral; P, unfinished part.

The post was designed for two companies.

The barracks, two in number, built of adobe in the form of a hollow square, each inclosing a plazita, are occupied, the one by white troops, the other by colored troops. Each barrack contains two dormitories, 51 by 20 by $12\frac{2}{3}$ feet, with a wide hall extending from the front of the building to the inclosed court in the rear. The buildings are badly designed; the ventilation is defective; they cannot be heated; and should they happen to be crowded during an epidemic, the consequences would be serious. The dormitories have each two windows in front and one in the outer end; at the adjoining ends a door opens from each into the hall. Air space per man, 538 cubic feet; single iron bedsteads are used. Movable sinks have been built 200 yards distant. The kitchens are comfortable and well floored rooms, furnished with stoves and open fireplaces for cooking purposes. These, with the mess-rooms, non-commissioned officers' quarters, laundresses' quarters, and wood and coal rooms, are located to the rear of the dormitories, and complete the square inclosing the court.

The officers' quarters are three one-story buildings, built of adobe, well finished, being plastered within and without; the flooring of all is composed of impure gypsum; the roofs are flat and of the same material. A portico, supported by wooden columns, extends the entire length of the western front of two, and eastern front of one of them. Each set of quarters has a hall, 20 by 15 by $12\frac{1}{2}$ feet, extending from front to rear, with a bed-room, 20 by 20 by $12\frac{1}{2}$ feet, on either side. Adjoining one of these rooms is the dining-room, 20 by 20 by $12\frac{1}{2}$ feet, which communicates by a hall with the servants' room, 12 by 15 by $12\frac{1}{2}$ feet, and kitchen, 20 by 20 by $12\frac{1}{2}$ feet. All the quarters for officers are heated by open fireplaces, and well lighted by windows. There are no bathrooms; the privies are small detached buildings in rear of the quarters; the guard-house is located in the center of one side of the post; the sally-port passes through it. On one side of the sally-port is the guard-room, 20 by 17 feet, and in rear of this a room, 20 by $21\frac{1}{2}$ feet and $10\frac{1}{2}$ feet high, which is used for colored prisoners. On the opposite side of the sally-port is a room containing 2,226 cubic feet of air space used for the confinement of white prisoners.

The prison-rooms are poorly lighted and ventilated, the last mentioned having only a few small holes near the roof and chinks around the door for the admission of fresh air. The guard-room and room occupied by white prisoners are warmed by open fireplaces; but there is neither fireplace nor stove in the room occupied by colored prisoners. The prison-rooms had, during a period of three years, an average of sixteen men confined in them—the greatest number reached was thirty-two.

In one corner of the guard-room is a trap-door opening upon a stairway which leads down to the cells where prisoners are kept in solitary confinement. The cells are six in number, three on each side of the passage way. Each cell is 5 feet 7 inches long, 2 feet 10 inches wide, and 4

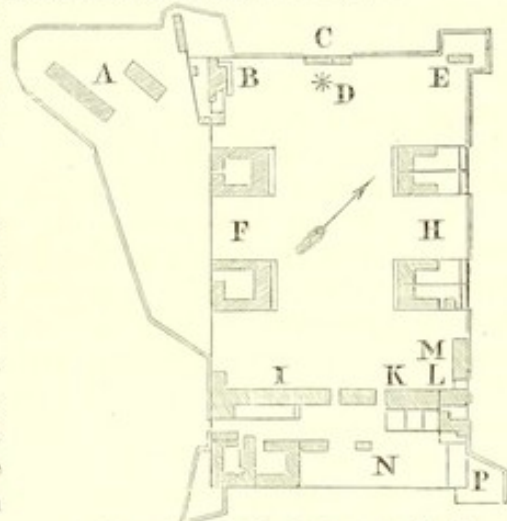


Figure 27.—Scale 500 feet to 1 inch.

feet 10 inches high, giving a cubic space of 76 feet; width of passage way 3 feet 7 inches. Eight augur holes and the chinks around the doors are the only means of admitting air and light from the passage-way into the cells. The whole amount of air and light admitted into the dungeons passes through an opening beneath the guard-room steps, not to exceed in area *one square foot*. This is the only opening, except the trap-door, which is always closed at night.

The glaring defects noticeable in these rooms and cells are, first, the great want of ventilation; and, next in importance, the want of proper board flooring.

The men, with seldom more than a single blanket, sleep upon the earthen floor, which, from being frequently sprinkled to lay the dust, contains much moisture. Colds and rheumatism are frequent among the inmates, and, if not removed at once to the hospital for treatment, are very difficult to treat.

The old hospital consists of two adobe structures; one 15 by 90 feet, the other 20 by 90 feet, parallel to each other and 40 feet apart. The rooms contained in each building communicate with each other by doors, and there are no halls, except the one which separates the two wards. Open fireplaces are the means of warming the hospital, the rooms of which are insufficiently lighted and ventilated by windows measuring only 4 by 2½ feet. The wards measure each 20 by 20 by 14 feet. The windows, four in each ward, two in front and two back, are very small, and no appliance exists for roof ventilation. These rooms contain each eight beds, giving 700 cubic feet per bed.

Owing to the many defects in the hospital, a new adobe building, 70 by 22 feet, (inside measurement,) has been erected for the accommodation of the sick. It contains two wards, each 30 by 22 by 14 feet, and a hall, 10 by 22 by 14 feet, extending through the center of the building, from front to rear, and is well lighted by windows, 4 by 8 feet. The building, however, is still in an unfinished state, owing to a want of material and skilled workmen. Before the walls had attained the required height, the citizen mason who had superintended the work was discharged, and the completion of the building was left to the soldiers of the command. The remaining layers of adobe were laid by a man on extra duty and some prisoners. The rafters and planking for a flat roofing were put on, and it is here that the inexperience of the workmen is plainly to be seen. The roofing is composed of sand and impure gypsum, a material the proper use of which was unknown to the soldiers, and the result was that nearly 500 bushels more than requisite was used on the roof, causing the rafters and sheathing to sag and spring. The enormous weight of the roof, with the addition of collected rain in its hollowed center, thus imperil the walls by its immense side pressure.

The building is ventilated by six ventilators placed on the ridge, each presenting an orifice, 4 by 15 inches, which is increased in size as it enters the ward where the diameter is 12 by 15 inches. The wards contain 16 beds, allowing to each 1,155 cubic feet.

The old building is still occupied, and has been repaired and plastered. Even in the event of the new building being completed, the present hospital could not be dispensed with, the original purpose of the former being to have sufficient accommodation for the sick only, giving an abundance of air space and light. No provision is made for bathing. The dispensary is used as an office. The hospital sink is located about fifteen yards distant from the building. A small room is used as a dead-room and for the storage of lumber and wood. The grounds are well drained by means of grading, together with wooden pipes, which convey the water into the outer trench.

The post bakery contains an adobe oven, situated in the center of a room, 22 by 20 by 11½ feet, and supplies the garrison with excellent bread. The floor of the room is of gypsum.

The cavalry stables and corral are located inside the fort and within 200 yards of the officers' quarters. In summer the effluvia is often distinctly perceptible on the parade ground, and mosquitoes and flies are attracted in great numbers, to the discomfort of the garrison. Refuse is removed in carts and deposited below the hill, where it is burned.

The post library contains 63 volumes of novels, histories, and scientific works.

A good supply of water is obtained from the Rio Grande, about one mile distant, and distributed about the post by water-wagons. Though turbid, the water is of good quality.

The fort being placed upon a slope, leading to the river, the natural drainage is all that can

be desired. The soil, also, being loose and gravelly, water disappears rapidly from nearly all parts of the post.

There are no systematic arrangements for bathing, either in summer or winter; the men avail themselves of the river during the hot months, at their own discretion. In the cold months, the wash tubs of the laundresses are used for that purpose by the men.

Attempts have been made to cultivate gardens, but with little success. With the exception of the very small quantity of vegetables raised, none have been used by the troops. It has been recommended that potatoes be provided for winter use; but the chief commissary of the district reports that his department will not countenance such purchase.

The furniture of the barracks, though meager, is quite sufficient for the wants of the men. There are no benches or chairs; the men rolling up their bedding each morning to the head of the bunk, employing the foot of it as a seat.

Communication from here to Sheridan, the nearest railroad station, is by wagon. As a rule it is regular, but liable to irregularities from snows, floods, and Indians. The mails have been very regular, arriving and departing six days in the week. A letter from the post to St. Louis, Missouri, usually occupies ten days in its transit.

Means of transportation are government wagons, old and needing repairs, drawn by six mules, and inadequate to the wants of the post.

The Mexicans who occupy the vicinity of the post subsist by agriculture and their flocks and herds. Some few are rich; but the greater part are very poor and lazy, with barely sufficient energy to earn enough to meet the wants of their large families. The Navajoes and Apaches are seldom seen in this vicinity, and can hardly be classed among the inhabitants.

No cases arising from malarial influence can be said to originate directly at the post; the few which are brought under treatment are derived from the troops who may have been stationed in Arizona and Texas. Pneumonia occurs somewhat frequently, and is apparently epidemic in character, more cases, however, occurring among the inhabitants than the troops. Rheumatism is apparently more prevalent among the inhabitants than almost any other form of disease. Soldiers who have served any considerable period in this district are also sufferers from it; still, in the acute form, it submits readily enough to treatment.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Craig, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	49.5	61	1	21	2	7	.....	1	6	1
1869.....	63.5	57	5	10	1	5	1	.....	6	.....

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Craig, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	118.33	281	1	10	70	11	10	19	22	43	2
1869, (10 months).....	103.4	56	.....	9	18	.....	2	.....	3	4	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT STANTON, NEW MEXICO.

REPORT OF ASSISTANT SURGEON J. R. GIBSON, UNITED STATES ARMY.

Fort Stanton, New Mexico, is in latitude $33^{\circ} 29' 27''$ north, longitude from Greenwich $105^{\circ} 28' 19''$ west, and situated on the Rio Bonito, a mountain stream, having its source in the White Mountains, and, running easterly to join the Rio Ruidose, twenty miles distant. The post has an approximate altitude of 7,500 feet above the level of the sea. The Capitan Mountain lies north, distant about 15 miles. The Sierra Blanca is to the southwest about 20 miles. The country is settled to but a limited extent by a scattered population of Mexicans and Americans.

There are no towns in the vicinity excepting three small Mexican villages, one distant 9 miles, with a population of 100; the others are distant, respectively, 60 and 55 miles, and are somewhat larger.

The post was originally constructed in the year 1855 for the purpose of holding in check the band of Mescalero Apaches, who roamed the country. On the occupation of the Territory of New Mexico by the Texan troops, Fort Stanton was abandoned and fired by the United States troops in the year 1861, and, with the exception of the walls of the buildings and corrals, the post was destroyed. In the year 1862 a garrison of volunteer troops reoccupied the post, and by covering the walls with rafters and earth roofs made the quarters tenable. In this condition the post was occupied until 1868, when repair and reconstruction were commenced.

The valley of the river at the site of the post is from one-half to three-quarters of a mile wide. Its banks ascend gradually until the plain of the valley is reached, which, at the site of the post, is about 75 feet above the bed of the stream.

The geological formation exhibits outcroppings of new red sandstone and magnesian limestone. Gold ore is found in limited quantity in the Jicarillo Mountains northwest, distant about 30 miles from the post. Pines, cedars, and cottonwoods abound. The game consists of bear, deer, antelope, wild turkeys, and quail. Trout are abundant in the stream.

The climate is mild; the average temperature during the warm season—greatest, 92° ; lowest, 43° F. During the cold season—greatest, 39° ; lowest, 2° F. The average rain-fall during the year is between 18.30 and 20.16 inches. The prevailing winds are southwest and northwest.

The post was originally laid out in a rectangular form. In the middle of one side of the square, that next and parallel to the river, is situated the commanding officer's quarters. On the side facing this are two sets of company quarters, and one building in the center is designated for use as adjutant's office, guard-room, and cell. In each of the remaining sides of the square are three buildings, viz: One set of company quarters, a store-house, and one building designated as four sets of officers' quarters. All the buildings of the post are constructed of undressed stone, and originally shingled roofs. As before mentioned, these dilapidated walls were rudely and temporarily repaired on the reoccupation of the post, and with earth roofs, (earth floors in the barracks,) constituted the quarters of the troops from 1863 until the present time.

The post is now undergoing repairs, and will be restored to its former condition, and upon an improved plan. Two companies are quartered in new stone barracks, and a third company occupies temporary barracks, which are old and dilapidated. These barracks are warmed by fireplaces, and well ventilated by means of chimneys and cupolas. The squad-rooms afford 1,000 cubic feet of space per man, and are furnished with double bunks in single tiers, containing bedsacks, &c. Attached to each set of barracks is a wash-house for ordinary daily use.

Sinks, consisting of pits, are dug in the rear of each set of barracks and quarters.

From each set of company quarters, giving the building an L-shape, a wing is prolonged, used as kitchen and mess-room.

The laundresses and married soldiers are living in temporary quarters, the old walls of a former company barracks, having been roofed in with earth. Two laundresses occupy temporary frame shanties.

The officers' quarters are in two buildings, sufficient for a full garrison of company officers and

staff. Each building is 90 by 35 feet, divided into eight rooms, with two halls, four rooms opening into one hall. In rear of each of these buildings is another, divided into eight rooms, with no halls, intended for use as dining-rooms and kitchen for four sets of quarters. Both main buildings and rear are constructed of stone, undressed, finished inside with plaster; they are one story, shingled roof, heated by fireplaces and lighted by windows. In the exterior set of quarters there are two windows to each room; in the interior one each. Ventilation is procured by the windows and doors only, each room having two doors, one communicating with the hall, and the other between the two rooms. The buildings are not supplied with water; a water-course circuits the parade ground about 20 feet in front of the quarters and barracks. There are neither water-closets nor bath-rooms. Privies are constructed at a distance on the flank of the officers' quarters.

On the east side of the square or parade is located the quartermaster and commissary store-house, the dimensions of the entire building, externally, being 110 by 30 feet. It was originally intended for quartermaster store-house, and is too small for the purpose for which it is now used.

The guard-house is located on the south side of the parade or square, constructed of stone, 100 by 35 feet, and is divided into four apartments. The most eastern is the adjutant's office, 25 by 18 feet; then the library-room, 18 by 16 feet; then the guard-room, 20 by 18 feet; next the prison cell, 25 by 18 feet.

The prison-room is lighted and ventilated by grated apertures. Each room in the building is heated by a fireplace, excepting the prison cell, which is not heated. The guard-house is well adapted to its purpose.

The hospital buildings are four in number, (the original plan,) consisting of one oblong building, (part of which is demolished,) designed as a ward; parallel with this, and at an interval of about 10 feet, two smaller buildings, the united length of which, with the interval between them, equals the length of the ward; these two buildings are used, one as dispensary and office, the other as store-room. The kitchen is detached, making the fourth building, and is placed in the rear of the wards. An entirely new plan is proposed for the hospital. The buildings now in use will then be demolished.

The present hospital is warmed by fireplaces, and chimneys are its principal means of ventilation. The only ward is an adobe building with mud roof, 28 by 18 feet in the interior, and in the rainy season is untenable for the sick. Ten beds can be placed in this building. This number includes also those occupied by the attendants, giving to each man 1,000 cubic feet of space. As there is no bath-room connected with the hospital, portable baths are used in the ward. An excellent sink, built of adobe, is in the rear of the hospital, with water drainage and urinals in the rear of the sink.

The post bakery is a temporary shanty, erected over a brick oven. The stables are temporary sheds inclosed in corrals, located northeast of the post, and 400 yards distant from it. The library contains about 125 volumes, embracing historical works and standard novels.

Water is carried into and through the post by means of an aqueduct which taps the river about three-quarters of a mile above the post, and, passing in front of the bake-house, enters the southwest corner of the square. Running on the exterior of the four sides of the parade, it again diverges at the northeast angle of the square and passes as a single aqueduct by the hospital buildings, and thence to the corrals, where it makes a detour and drains into the river. There is also a force-pump and section of hose under charge of the acting assistant quartermaster. Water buckets are always ready in case of fire at the post.

The slopes from the plateau form the natural drainage of the post to the river.

Gardens are cultivated by each company on duty at the post; also, one by the hospital. The area of the company gardens is nearly two acres, that of the hospital garden half an acre. Almost every variety of vegetables can be cultivated except the sweet potato and tomato.

Two cows are kept for the garrison and one for the hospital.

The nearest supply depots are at Fort Union, New Mexico, 207 miles distant. The route of supply is generally via Fort Sumner, 271 miles. The shortest route (207 miles) is via Anton Chico and the Gallina Mountains. This route has but little water on it, and in the driest seasons trains go via Fort Sumner and Pecos River, a distance of 301 miles; road good, and open at all seasons. All supplies are transported by wagon.

The prices of milk, butter, eggs, &c., are usually high; milk, from 15 cents to 25 cents per quart; butter, 75 cents to \$1 per pound; eggs, 75 cents to \$1 per dozen; chickens, \$1 each; fresh vegetables in summer from 5 to 7 cents per pound.

The surrounding country is not inhabited within a distance of 60 miles, excepting by a few scattering Americans and Mexican families. The region is known as the Apache country, which tribe is in open hostility.

During the fall of 1868 many cases of remittent fever, with a tendency to run into a continued fever of a typhoid nature, were under treatment at this post. Several cases of typhoid fever also occurred. A few cases of simple catarrh and rheumatism have been under treatment in the winter season.

Statement showing mean strength, number of sick, and principal diseases at Fort Stanton, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	160.16	104	3	4	25	.....	6	2	10	1	5	3
1869	111	50	.....	5	7	3	2	.....	5	.....	2	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WINGATE, NEW MEXICO.

REPORT OF ASSISTANT SURGEON R. S. VICKERY, UNITED STATES ARMY.

The exact location of this fort has never been accurately determined, but by the latest official map it is latitude 35° 20' north, longitude 108° 25' west. It is laid down on some maps as Ojo del Oso, or Bear Spring, and is nearly on the site of a former temporary post called Fort Fauntleroy and afterward Fort Lyon, which was abandoned in 1862, at the time of the Texan invasion of the Territory.

This post was formed about the beginning of August, 1868, by the arrival of troops with the Navajo tribe of Indians, who were moved by General Sherman from the reservation of Fort Sumner, New Mexico, where they had been for some years, back to this, their old country. At the same time old Fort Wingate, sixty miles southwest, was abandoned, and the troops moved to this point. The present fort is west-northwest of Albuquerque, on the Rio Grande, about 150 miles from it by the road, and about 45 miles southeast of old Fort Defiance. It is on the Pacific slope of the mountains, about 23 miles west of a slight elevation called the Dividing Ridge, and is situated on gently rising ground at the south side of a valley, about two miles in diameter, opening to the north. The valley is open and grassy, with some pine timber and scrubby oak scattered through it, and has well-wooded hills back of it. The mountains around are mostly red sandstone and clayey rock. The surface soil is clay and decayed sandstone mixed with gravel, the latter being in larger proportion near the head of the valley.

The wild animals found in this region are antelope, black-tailed deer, black bear, large gray wolf, coyote, wild cat, fox, (dark gray,) beaver. On the Nutria Creek, a tributary of the Zuni River, about twenty miles to the south, are prairie dogs, kangaroo rats, pouch rats, and field mice, (white footed.)

Birds: Wild turkey, wild duck, (teal,) large raven, blackbird, blue jay, (Canada,) wood bluebird or rusty bluebird, woodpecker, (speckled,) woodpecker, red-headed, large, (slate-colored body with black spots,) woodpecker flicker, sparrow-hawk, (small,) hawk, (several varieties,) owls, (several species,) mourning-dove, fly catcher, meadow lark, magpie, snowbird, Rocky Mountain bluebird, Rocky Mountain swallow.

There is very little game in the neighborhood of the post, it having been thinned out of late years by the Navajo Indians.

The climate is dry and equable; breezy and pleasant even in the hottest weather. There are no very high winds, except in March. Mean annual temperature, 52.08° ; highest 9th July, 2 p. m., 93° ; lowest 22d December, 7 a. m., 6° . Average difference between dry and wet-bulb thermometer in summer, 10.59° ; in winter, 4.43° . Rain-fall, summer of 1869, 7.58 inches; in winter, .67 inch. Snow, 11.10 inches. Rainy season, July, August, and September. The summer rains mostly from same directions. In March and April there are occasional high, dry winds from southwest and west, bringing much dust with them, and going down generally at sunset. The nights are nearly always calm. The coldest winds in winter are from northwest and northeast, partly because the fort is not sheltered from these directions.

Spring begins about the middle of March. There are light snow showers and frosts occasionally until the end of April, or early in May, making the season for planting late. Frosts sometimes set in in the latter part of September, keeping late corn from ripening fully.

The stream from the spring crosses the east angle of the plan. The buildings of the post are near the head of the valley, and are all temporary log-houses, with the exception of the store-house and one of the officers' quarters, which are built of adobe, and are permanent.

The post was begun on a circular plan, which has been disapproved at district headquarters, as giving too much space to defend, and as being too expensive. This plan is shown in Figure 28.

1, 2, 3, 4, 5, 6, officers' quarters; 7, store-house; 8, cavalry quarters; 9, infantry quarters; 10, guard-house; 11, 12, infantry quarters; 13, store-house; 14, chaplain's quarters; 15, 16, 17, 18, officers' quarters; 19, 23, 27, 30, sally-ports; 20, 22, post trader; 21, hospital; 24, 26, cavalry quarters; 25, cavalry stables; 28, 29, infantry quarters; 31, stream; 32, wash-house.

A square plan has been sent up for the approval of the Secretary of War, which will cover the same site now occupied. Good, permanent buildings will be commenced on the "square plan" as soon as the weather permits.

The men's quarters are built of logs, each company's forming one range of houses, with earth roofs and floors. The squad-rooms are too crowded, but it could not be avoided, as nearly all the work was done by soldiers, and had to be completed in three months, that they might have shelter before the winter snows.

This evil, however, is being remedied daily by the number of men being lessened by discharge. The four sets of quarters consist of twenty-four rooms, each 20 feet square; the ventilation is by windows measuring 4 by 3 feet, and by air spaces, 4 inches wide, extending the whole length under the eaves, which are kept open when the weather permits; open fireplaces are in each room, which are also furnished with rough bunks, bedsacks filled with hay, and blankets. Each company has its own kitchen, measuring 20 by 20 feet, and a mess-room of the same dimensions. The sinks are 100 yards behind each company quarters, and they are frequently filled and changed.

There is one married soldier in each company, and each has a detached log or frame building near the company quarters, measuring about 20 feet square.

There are ten sets of officers' quarters, all temporary; one is of adobe, the others are log or frame structures.

An adobe building 100 feet square, inclosing a plazita 60 feet square, is used as a store-house.

The guard-house is a log building containing two rooms, each 18 by 20 feet; one is used as

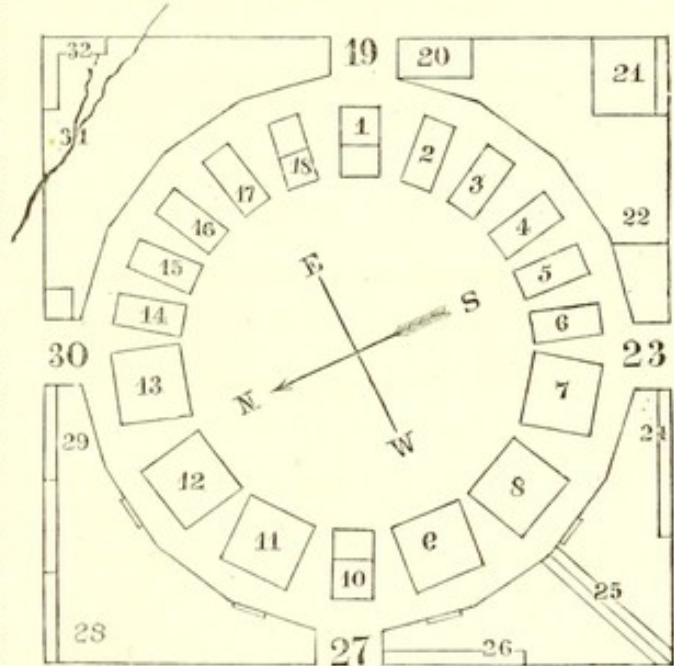


Figure 28.—Scale, 300 feet to 1 inch.

guard-room, the other for prisoners. Both rooms are warmed by open fires, and ventilated by two small windows, and additional openings made under the eaves in the prisoners' room; the average occupancy is 15 men.

The hospital is a temporary log building, with additional frame building recently put up. A permanent hospital is to be built in a few months. The present one is 80 by 20 feet in dimensions, and 10 feet high, with earth roof; it is warmed by open wood fires, lit by windows, and ventilated by the same with the addition of open spaces under the eaves; the ward is 40 feet long by 20 feet wide, and adjoins the dispensary and wash-room, each of which measures 20 by 10 feet; the steward's room and store-room are next in order, and of the same size. The capacity of the ward is twelve beds, though it at present contains but eight; and the superficial area per bed is 100 feet, air space 1,000 feet. The wash-room adjoining the ward is furnished with a bath-tub, which is usually used in the ward. The water-closets are 20 yards in the rear of the hospital; these are properly policed, and, when necessary, filled up and new ones made. The additional new frame building is 40 by 20 feet, and divided into three apartments, two of which are used as surgeon's rooms, and the third is the hospital kitchen, which is also used as mess-room. The sick were in hospital tents previous to their removal to this hospital, which, though rough and small, will answer until a permanent hospital is built.

The post bakery is a stone building with two ovens.

A building of upright logs, not plastered, is the stable. It is 312 feet long by 24 feet wide; refuse is transported by wagons every morning to a ravine one-half a mile from post and burned. There are post and company libraries, and in addition there are many papers and periodicals taken by the men.

The water supply of the post is from a pure, cool, and abundant spring, situated back of the post, and high enough to be conducted to any part of it; the water contains a little lime, and is all that can be desired. The permanganate of potash test shows it to be nearly free from organic matter. Water buckets and barrels are the present means of extinguishing fire.

The slope of the ground everywhere gives good natural drainage. At the men's quarters the substratum of clay, coming near the surface, made the ground rather damp; but by cutting a new channel for the stream, thereby turning it off further, this has been much improved. This is nearly all the artificial drainage that has been found necessary as yet. The west side of the post is well drained by a small stream running in a deep channel. An acre and a half of land is allotted to one company, and one acre to each of the other companies, for garden purposes. The soldiers are assisted by some Navajo Indians in the cultivation, and good crops of vegetables, except potatoes, have been raised. One and a half ounces of desiccated potatoes are issued to each ration. No tea is used, nor mixed vegetables, which the men dislike.

The nearest city is Santa Fé. A new road has been opened, almost due east, to the Rio Grande, crossing that river at San Felipe about 28 miles north of Albuquerque. Distance to Santa Fé, via Albuquerque, 208 miles; to the same place, via San Felipe, 170 miles—a saving of 38 miles. The mails arrive once a week from Santa Fé, via the latter route. They are regular, though sometimes interrupted for a week or two in the spring by floods and snows. It requires about seven days for a letter to reach department headquarters, and from nine to ten days to Washington. Kit Carson, on the Kansas Pacific railroad, 542 miles from Fort Wingate, is the nearest railroad station.

The inhabitants of the surrounding country are the Navajoes, numbering about 7,500, who are generally of good physique, and better looking and more intelligent than most tribes of Indians. They were moved to this place from a former reservation, and about two months afterward the most of them were removed to old Fort Defiance, about 45 miles to the northwest. Fort Wingate. These Indians receive from government, clothing, and a daily ration of half a pound of beef and half a pound of corn; they have small flocks of sheep and goats, and some ponies; they cultivated in 1869, 4,000 or 5,000 acres of corn. Some of them work for the quartermaster and for private parties at this post; they are industrious and quick to learn, even some of the mechanical arts. The squaws make excellent woolen blankets, woven in a way peculiar to their tribe.

The treaty provides that a school-house shall be built and a teacher supplied for them.

The nearest Pueblo village is Zuni, about 40 miles south of the post. These Indians are an agricultural and a very peaceful people, living in fortified towns or pueblos. They keep horses,

cattle, sheep, goats, &c., and raise corn, and some vegetables and fruits, such as peaches and apples. They visit the post occasionally to trade. Much syphilitic disease exists among the Navajoes, and in the summer of 1868 an epidemic of small-pox raged, of which many died.

The prevalent disease at the post and vicinity during the past year has been of a venereal character. In the summer and fall cases of diarrhœa occurred; also, of intermittent fever, which probably was caused by the crowded state of the squad-rooms at that time. With good, permanent, and roomy buildings, there is no reason why the sanitary condition of this post should not be as good as that of any post in the country. A few cases of intermittent fever, and diarrhœa and dysentery of malarial origin, occur each fall. There were some cases of typhoid and typho-malarial fever in the fall of 1868, supposed to be from much turning up of the soil and exposure of the men while building quarters. Almost the only pulmonary disease is a little pneumonia each winter, of a mild type. Some few cases of rheumatism occur, acute and chronic, the latter generally a manifestation or consequence of constitutional syphilis.

Statement showing mean strength, number of sick, and principal diseases at Fort Wingate, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	195.08	158	4	28	40	5	23	1	5	10	.....
1869.....	169.91	193	3	10	31	7	48	2	17	6	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BASCOM, NEW MEXICO.

INFORMATION FURNISHED BY ASSISTANT SURGEONS GEORGE S. ROSE AND W. H. H. MICHLER, AND ACTING ASSISTANT SURGEON H. DUANE, UNITED STATES ARMY.

Fort Bascom is located on the east bank of the Canadian River, in San Miguel County, New Mexico, latitude $35^{\circ} 23' 20''$ north, longitude $107^{\circ} 27' 20''$ west from Greenwich; elevation above the sea about 4,000 feet. Fort Sumner, nearly due south, is distant 80 miles. Fort Union, the nearest mail post, is 145 miles to the northwest, and the border of the Llano Estacado is about 15 miles to the eastward.

The fort is on a plateau about 20 feet above the river bottom, and 500 yards from the bed of the river, which, at this point, is about 25 feet wide and 2 or 3 feet in depth during ordinary stage of water, but which is subject to great and sudden overflows, having been known to rise 15 feet in twenty-four hours. On the opposite side of the stream is a bluff from 50 to 60 feet in height, beyond which the country is rolling and broken.

The soil of the plateau is sandy and alkaline, nothing thriving except prairie grass, soap weed, and cactus; that of the bottom is alluvial and fertile. Cotton was successfully cultivated in 1864. Timber consists of cottonwood and cedar. Wild animals are deer, puma, wild cat, wolf, fox, prairie dog, beaver. Birds are duck, blackbird, quail, partridge, and turkey. The only fish caught in the river are trout and catfish. The climate is mild; mean temperature for 1869, 58.38° F.; extremes, 103° F., and 8° F.; rain-fall, 9.97 inches; snow-fall, 2.55 inches.

The post was established by the following order:

[General Orders No. 20.—Extract.]

HEADQUARTERS DEPARTMENT OF NEW MEXICO, SANTA FÉ, NEW MEXICO, August 11, 1863.

1. A military post, to be garrisoned by one company of infantry and one of cavalry, will at once be established at or near the mouth of Utah Creek on Red River, otherwise known as the South Fork of the Canadian. Unless other-

wise directed, this post will be known as Fort Bascom, to perpetuate the memory of the gallant Captain George N. Bascom, of the United States Sixteenth Infantry, who fell in the defense of our colors at the battle of Valverde, February 21, 1862.

2. Captain P. W. L. Plympton, Seventh United States Infantry, is designated as the commander of Fort Bascom.

3. While Fort Bascom will be an outpost to New Mexico during the present rebellion, its advanced pickets watching the roads from Arkansas and Texas, it will be of the greatest importance in preventing the predatory incursions of the Comanche and Kiowa Indians.

By order of Brigadier General Carleton:

B. C. CUTLER,
Assistant Adjutant General.

No reservation has been declared, but one square mile is held as reserved.

The post covers an area of 1,000 by 500 feet, inclosed by an adobe wall, and trench. Its general arrangement is shown by Figure 29.

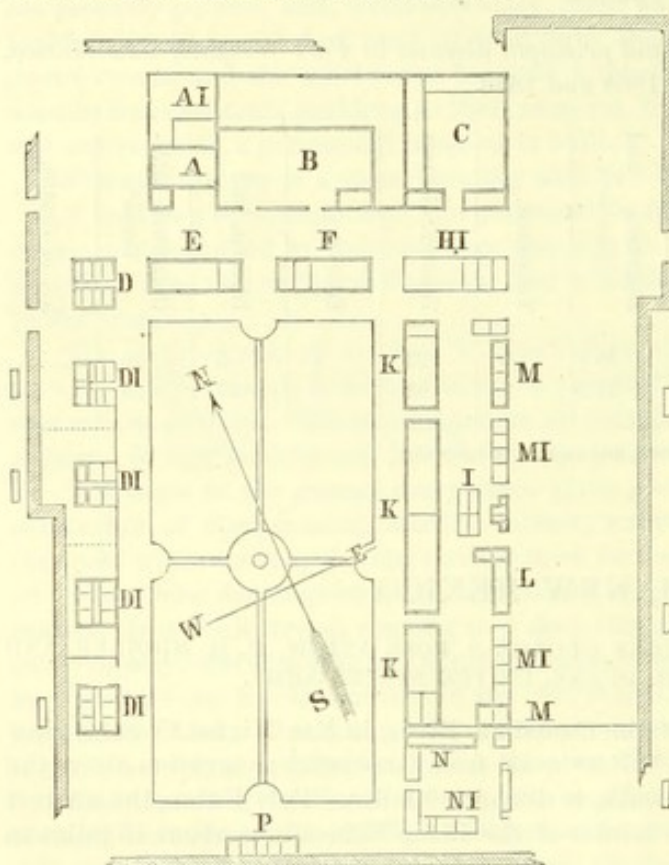


Figure 29.—Scale, 264 feet to 1 inch.

ing is bad, and leaks whenever it rains. The company sinks are 75 yards in the rear of the barrack; and about 25 yards distant, and in rear of the quarters, are situated the cook-houses, mess-rooms, company laundry, and post bakery.

On the northwest side of the garrison are the officers' quarters, five in number, constructed of sandstone, and roofed with poles and earth. Each set of quarters is divided by a wide covered passage-way, leaving two rooms on each side. The rooms are small, 15 by 9 feet, badly constructed, and very inconvenient; the roofs leak badly, rendering the quarters very uncomfortable during wet weather. The commissary and quartermaster's buildings are on the north side of the garrison, constructed of adobes, and roofed with poles and earth. The buildings are large and convenient, and are in good order, with the exception of the roofing, which leaks.

The post hospital, situated in the southeast corner of the garrison, is built of adobe, and is 80 feet long and 20 feet wide. The hospital grounds are about 75 yards square, and are separated from the company grounds by a low adobe wall. The building is divided by a hall, 10 feet wide, making two wards, 30 by 20 feet, and 16 feet high. Each ward is heated by two large fireplaces, and ventilated by common roof-ventilators. The floors are made of earth, and the roofing of poles

A and AI, cavalry stables; B, cavalry corral; C, quartermaster's corral; D and DI, officers' quarters; E, quartermaster's storehouse; F, commissary's storehouse; HI, storehouse; K, barracks; L, mess-hall; M, MI, laundresses' quarters; N, old hospital; NI, new hospital; P, guard-house. Houses, the walls of which are indicated by double lines, are finished and occupied, the remainder, marked I, with single lines, are incomplete or unfinished.

The buildings are not in a state of completion according to the original plan. The barrack, situated on the southeast side of the garrison, is an adobe building, roofed with poles and earth, and divided by four covered passage-ways into four rooms, each 100 by 20 by 13 feet. Each room is warmed by three large fireplaces, and the floors, constructed of earth, are hard and dry. The barrack is generally comfortable, and in good order; it easily accommodates two full companies, allowing at least 500 cubic feet of air to each man. The circulation of air through the doors and windows, with the addition of the fireplaces, ventilates the building thoroughly. The roof-

and earth. The beds in one ward are separated from each other four feet, allowing 1,100 cubic feet of air space per bed. The other ward is used as steward's room, dispensary, and store-room. There is no mess-room, bath-room, or quarters for matron connected with the hospital. The sinks are situated 70 yards in rear of the wards, and are constructed on the same plan as those of the companies.

The water supply is from the river, casks being placed outside of the wall in the rear of the various buildings, and filled every day by water-wagons. Small adobe water-houses have been erected to shade the water during the summer months. When the river is low, during the winter and fall, the water is clean and good, but during the summer, when the river is high, overflowing its banks, the water is muddy and loaded with organic matter, so much so that it becomes putrescent, standing in the water-casks, within twenty-four hours. The casks are cleaned every day, and alum used to settle the water. No deleterious effects from the river water have as yet been observed.

The drainage is entirely surface; none other is required, as the post is so situated that there is a natural drainage into the river.

No cows are kept for the garrison, and but one for the hospital. Two company gardens, on the bank of the river, are cultivated by a detail of each company. There is no hospital garden.

There are no inhabitants in the vicinity of the post.

The sanitary condition of Fort Bascom is very good. There are no prevailing diseases, and malarial, pulmonary, and bowel affections are seldom met with. Rheumatism exists to some extent and is of syphilitic origin.

Communication has been regular by private conveyance or government wagons, with very little danger from Indians, though occasionally delayed from floods and snow. A weekly mail is received and sent, varying from seven to fifteen days to department headquarters, and from twelve to twenty days to Washington.

Statement showing mean strength, number of sick, and principal diseases at Fort Bascom, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	133.58	305	22	112	.....	23	32	11	.....
1869.....	105.91	139	10	54	1	9	11	9	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

SANTA FÉ, NEW MEXICO.

INFORMATION FURNISHED BY SURGEON C. T. ALEXANDER, UNITED STATES ARMY, AND ASSISTANT SURGEON D. L. HUNTINGTON, UNITED STATES ARMY.

The city of Santa Fé is pleasantly situated on an extensive plateau on the western slope of the Rocky Mountains, at an elevation of about 7,000 feet above the level of the sea, and in latitude 35° 41' north, longitude 106° 2' west. To the north and east rise the foothills and peaks of the Rocky Mountain range; on the south, the plateau is gradually lost in spurs of mountains shooting out of the main range, and on the west it terminates somewhat abruptly in the valley of the Rio Grande. The city is reached from the north by the stage road from the terminus of the Kansas Pacific railroad, this terminus being about 400 miles distant. Fort Union, on this same road, lies to the east about 100 miles. To the south runs the main road to Albuquerque and Southern New Mexico, and less important roads leading to neighboring towns. The Rio Grande runs in a south-westerly direction from Santa Fé, about 18 or 20 miles distant at the nearest point. A small mountain stream, a tributary of the Rio Grande, called the Rio de Santa Fé, nearly bisects the town.

The present site of the city of Santa Fé was originally held by some tribe or band, probably of the ancient Aztecs, Toltecs, or Anahues, and remains of their buildings are still to be seen within the limits of the present city. In the early part of the seventeenth century a Spanish settlement was made under the name of the City of the Holy Faith of Saint Francis, the abbreviation of which is still retained.

The geological features of the country about the town are mainly tertiary, and indications of volcanic action are apparent on every side in the remains of craters and trap dikes. In certain localities where the primitive rocks have been exposed, discoveries of silver, gold, and copper have been made, but whether in quantity and quality sufficient to make it an object to work mines, is yet doubtful. There are beds of bituminous coal, of an excellent quality, about 25 or 30 miles to the southwest.

The soil of Santa Fé and vicinity is dry, light, and sandy, yet very fruitful. Irrigation is almost entirely relied upon, and extensive systems of acequias or canals surround the town, the water for this purpose being taken from the Santa Fé River, which has sufficient fall to afford facilities for the irrigation of the soil for miles around. Good crops of wheat, corn, beans, red pepper, and many of the vegetables are raised. Potatoes cannot be successfully cultivated in this vicinity. Until recently, but few fruits or berries have been raised, but late experiments in the culture of apples and the smaller fruits have been quite successful. The grape does not mature well, the frosts are too late and early.

The country for miles about Santa Fé is destitute of trees. The large growth is said to have been cut away, at an early date in the history of the place, for fuel and for better security against hostile Indians, and a subsequent growth of large trees has not appeared, though stunted cedars and pines are very common. This want of vegetation detracts much from the natural beauties of the town and vicinity. On the hills toward the mountains are found large pines and cedars. The piñon, a species of pine, furnishes the almost sole supply of fire wood. It is brought for miles on the backs of donkeys and sold by the load, in the plaza, at from twenty five cents to one dollar, according to the season of the year or severity of the winter. Coal is not brought to market.

The natural drainage of Santa Fé is excellent, and is materially assisted by the above mentioned system of acequias. Still little attention is paid to the subject, and many of the narrow streets and lanes of the city are excessively filthy.

The river water is very extensively used for drinking purposes, and is excellent. Good water, but a little impregnated with lime, may be obtained by wells at a depth of from 10 to 40 feet.

The population of Santa Fé is about 6,000, of which the larger portion is Mexican and Indian, or an admixture of the two. The American element is rapidly increasing, and already has the chief influence in matters of trade and politics.

The place is irregularly built of adobe, and, when seen from the approaches to the town, has an exceedingly uninviting appearance. The houses are generally built on the Spanish plan, a quadrangle with an interior court-yard, the entrance being through a gateway, generally kept closed. The older portions of the town are built upon narrow lanes and passage ways, rather than upon streets. The better portion is the more recent and inhabited by the American residents. The plaza holds a conspicuous place as a business center, and about it and in its vicinity are the civil and military offices, Santa Fé being the headquarters of both the civil and military establishment. For many years Santa Fé had been the business center for New Mexico and Arizona, but of late the increasing facilities for transportation have had the tendency to create other centers, and to some degree Santa Fé has lost some of its commercial importance.

The climate is exceeding salubrious. The winters, though long, are not generally severe, the thermometer rarely falling below zero. The snow-fall is variable, but heavy falls are rare, and the snow remains upon the ground but a short time. The summers are late, and excessive heat is unknown. The mountain peaks are covered with snow, often until June, and render the air cool and chilly. The yearly mean is 60° F. The highest temperature reached in 1869 was 97°; the lowest was 6°. The trees leaf about the middle of May, and shed their foliage early in October. July and August are the rainy months proper, during which showers, accompanied with thunder and lightning, are of daily occurrence. There is generally more or less rain during the spring months, but a storm of long continuance is rare. The rain-fall in 1869 was 3.60 inches; snow, 3.16 inches.

North winds prevail, bringing, in winter, snow or hail, and in spring, rain. The southeast wind prevails from the middle of June to the first of August, which season is known as the rainy season, after which it is perfectly dry, until a fall of snow, which may happen any time after the middle of October. High winds prevail in February, March, and April. The summer, fall, and early winter months are the pleasant seasons of the year, during which the bright sunny days, and the transparent, clear atmosphere are unequaled.

The buildings formerly composing Fort Marcy, which was abandoned as a post in 1867, are still used in connection with the military headquarters, as quarters for guards, escorts, and detachments, and for store-houses; they are in fair repair and answer well the purpose indicated.

The quarters formerly allotted to officers and the barracks are occupied by the enlisted men of the band and detachment, also affording room for offices and store-rooms. These buildings are warmed by fireplaces, and well lighted. In the band quarters the air space per man is 1,000 cubic feet, and in the detachment quarters 936 cubic feet; in the former single bunks are used, while in the latter double bunks are furnished, and the bedding is both good and in sufficient quantity; each detachment has its own mess-room; the kitchen is good, and the cooking is performed by men belonging to the detachment, and is inspected by the officer commanding.

The quarters of married soldiers and laundresses are those formerly occupied by officers, and the officers' quarters are the same as those occupied by the officers of the post, and are also used as offices for the non-commissioned staff. There are two sets of officers' quarters, built of adobe, one story high, plastered in and out, and have dirt roofs; there are three and four rooms to each set, with hall in the center. The rooms are 18 by 18 by 10 feet. The kitchens and servants' rooms are 14 by 14 by 10 feet. A porch extends the entire length in front of both sets.

The buildings are heated by fireplaces, and lighted by windows, and ventilated by one door and one window to each room; they are supplied with water from a well in the yard; there is no water-closet or bath-room. The offices and store-houses are located on the east side of the parade ground; they are built of adobe, with dirt roofs, and are in bad condition, one office, with two rooms, used as quartermaster and commissary offices. There are two commissary store-houses, each 114 by 18 by 10 feet, and two quartermaster's store-houses, one 105 by 24 by 10 feet, and the other 132 by 24 by 10 feet.

The guard-house is but little used; it is well ventilated, and is warmed by fireplaces, and lighted by a large window; its average occupation is not one during the year.

The hospital is located upon grounds 201 by 120 feet, or 24,120 square feet in extent. The buildings are of adobe, and are of sufficient capacity to receive the usual per cent of sick enlisted men, and well adapted for the purpose. They are built in the form of a square, measuring 77 feet on a side, and inclosing a court-yard, 47 feet square. The plan of the hospital is shown in Figure 30.

A, ward, 15 by 32 feet; A, ward, 15 by 17 feet; A, ward, 14 feet 6 inches by 15 feet; C, surgery, 15 by 15 feet 6 inches; E, steward's room, 15 by 15 feet; H H, halls; K M, kitchen and mess-room, 14 by 25 feet; S, store-room, 15 by 15 feet; V, matron's quarters, 15 by 22 feet; V, matron's quarters, 15 by 15 feet; V, matron's quarters, 14 by 14 feet; W H, bath-room, 14 by 15 feet.

Nearly all of the rooms have windows and doors opening both to the outside of the building and to the court-yard within. The hospital is warmed by fireplaces, which, in connection with the windows, are the only means of ventilation. The dispensary is large and convenient, and furnished with all the necessary fixtures. In the large wards, the air space per bed is 798 feet; in the smaller wards, 840 feet; the average occupation is three men. As there is no bath-room, a spare room is used for the purpose, in which there is a large bath-tub for cleaning purposes, and can be used for vapor baths, &c. There are two water-closets outside of the hospital. A

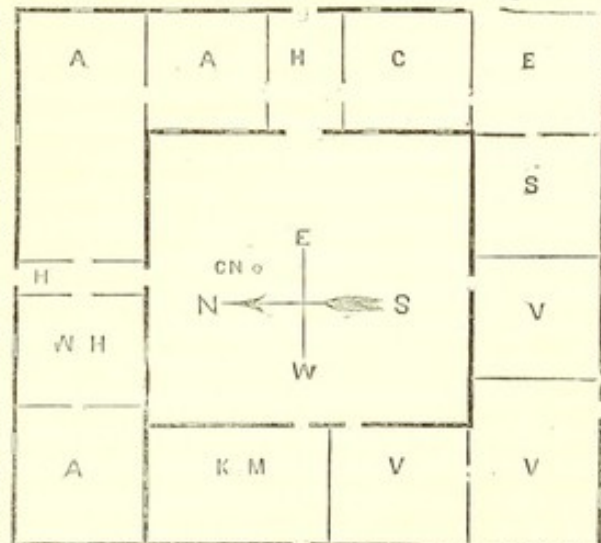


Figure 30.—Scale, 25 feet to 1 inch.

spare room is used as a post-mortem room, which is sufficiently adapted for the purpose. The hospital diet is very good, following the diet table as nearly as the necessities of so small a hospital will allow. The food is well cooked and daily inspected, and served to convalescents on table set in kitchen; to the sick, in the wards.

The post bakery is in good condition and well adapted. As there is no laundry at this post, all washing is done outside.

The stables and corral are separate, distant from the quarters 100 yards. Refuse is transported to the distance of one-quarter of a mile or more, and deposited on waste land.

The water is procured from wells sunk upon the premises, and is of excellent quality. These wells, by the aid of buckets, are the only means of extinguishing fire.

The drainage is mostly natural, modified and improved by acequias and surface drains; it is good. All drainage is toward larger arroyos, west and northwest of the post; all slops and offal are carried off in carts beyond the reservation. Excreta are used to fertilize the garden.

The post garden has an area of about two acres, and supplies in part the garrison and hospital; it is cultivated by details of men for that purpose, and produces vegetables (except potatoes) sufficient for the detachment and hospital.

As milk can be bought cheaply in town, no cows are kept at the post.

Medical supplies are obtained upon requisition on the medical storekeeper, United States Army, of the district of New Mexico, and are received in good condition and kept in a store-room of the hospital, well adapted for the purpose.

The mails are received daily, except Fridays, and regularly most of the time. Letters go to department headquarters in six or seven days, and to Washington, in nine or ten days.

Mexicans who till the soil are poor, indolent, and improvident, and, consequently, are low and demoralized. Their disposition is mild and inoffensive, but when aroused they are treacherous, vindictive, and dangerous.

The principal Indian tribes in and about the vicinity are known as the Pueblos, most probably the remains of the ancient Aztecs, resident in this country and in old Mexico before the conquest by Cortez. They are all docile and industrious, living in their own communities and governed by their own system of laws. They are principally engaged in agricultural pursuits; but some communities are engaged in the manufacture of a rough leather ware and baskets. They constitute a very well-behaved and worthy class of the population. They dress mainly in their own style, and associate but little outside of their own villages. The Utes, Northern Apaches, and Navajoes are frequently seen in and about Santa Fé, to which point they come at intervals on business with the agents.

This region is exempt from many of the diseases incident to more populous districts, and those which prevail may be generally traced to imprudence or irregularity of life. From February to May, pneumonia, rheumatism, and erysipelas prevail to some extent; but when occurring in persons of good physical condition are easily managed. As a general thing the bronchial affections are not severe or frequent. Asthmatic patients generally do well in this climate, though at first the symptoms are aggravated.

Santa Fé, from June to February, is a good climate for consumptives or persons predisposed to phthisis; but such persons, to receive benefit from the climate, must come here during the first stages. Cases in which the disease is fully developed, seem to fail more rapidly than in other climates. During the more inclement seasons of the year consumptive patients should spend their time in the southern portion of the Territory, where will be found a milder and more equable climate.

Syphilis is the disease of the country, and prevails extensively in all classes of society; it is of a mild type, and anti-syphilitic treatment is generally well borne and effectual. The prevalence of this disease for generations among the native race may account for its mildness on the ground of acquired immunity. Skin diseases and affections of the eye and ear are common, and can generally be traced to a specific cause or to neglect of cleanliness. Strangers coming to Santa Fé are liable to a mild acclimating fever, assuming the typhoid type and running a course of from seven to fourteen days. No cases of typhus or of malarial fever originating here have been noticed.

Epidemics of small-pox occasionally rage, but the ignorance and superstition of the people

relative to the protecting powers of vaccination is rather the cause of its severity than any unusually severe type of the disease.

In parturition the Mexican women generally prefer women of their own race, who are believed to be especially skillful in such cases; but the treatment is only barbarous, consisting of a violent kneading and pounding of the abdomen, the result of which is seen in the unusually large number of cases of peritoneal inflammation. As a race the Mexicans are hardy and bear exposure and hardship well. The children grow up with little or no attention or care; the stronger ones survive, and the feeble ones perish in the first year. The menstrual period is developed at a very early period, often so early as the eleventh and twelfth year.

The women become mothers at an early age, and at a correspondingly early age pass the critical turn of life, not unfrequently in the twenty-eighth or thirtieth year.

Diseases of the uterus are frequent, and can generally be traced to imprudence at or after childbirth.

The Mexicans have many remedies for diseases, but they generally partake of the nature of charms or useless superstition. Decoctions of various herbs are favorites in all diseases. The Chili or red pepper and peppermint are used on all occasions. In gonorrhœa, the iron and grease weeds are very generally employed, and seem to be very effectual. The manifestations of secondary syphilis are commonly treated by sweating baths. Several of the hot springs near this locality are reputed to have great efficacy in such cases.

Want, hardship, and exposure, with often lives of vice, all tend to shorten the term of a Mexican's life. Both sexes show age prematurely, and their ignorance of their own ages makes it impossible to do more than conjecture the probable years of a seemingly old person.

FORT UNION, NEW MEXICO.

INFORMATION FURNISHED BY SURGEON D. C. PETERS AND GENERAL C. GROVER, UNITED STATES ARMY, AND OTHERS.

Fort Union is situated in latitude $35^{\circ} 54' 21''$ north, longitude $104^{\circ} 57' 15''$ west, at an elevation above the sea of about 6,750 feet. Santa Fé is 100 miles southwest. The nearest railroad station is Kit Carson, on the Kansas Pacific, distant about 250 miles. Las Vegas, 28 miles distant on the Santa Fé route, is the nearest large settlement. The post is in a beautiful valley, about 25 miles long by five and a half wide, which has been carved out of the cretaceous plateau. On the east the ascent is gradual; on the west is an abrupt bluff cut through by many ravines.

About five miles to the northeast is a small range of mountains, called Turkey Hills, composed of red and white sandstones, well timbered, and rising from one to two thousand feet above the level of the plain. The Taos Mountains, a spur of the rocky chain, are about 40 miles distant. Nine miles north of the post is an old volcanic crater, the rim of which is circular, and well defined. The depression is shallow, and thickly grassed; the sides are covered with masses of rough basalt.

The grazing in the valley is good, the grass being principally gramma. No minerals of value have as yet been discovered within 80 miles of the post, the nearest mines being at Elizabethtown, New Mexico. There is no running stream, proper, within five miles. Water, of excellent quality, is obtained from springs a quarter of a mile west of the post. Four miles south is a pond fed by springs, from which ice is obtained in winter for the use of the post.

Five miles northwest of Las Vegas are a number of hot springs, which "appear at the junction of the carboniferous and the gneissic rocks. The lowest spring issues from the granite just beneath a mass of limestone. The bed of limestone is quite hard and cherty, with a dip southeast 40° to 45° ; the underlying rock is rotten gneiss."*

These springs have, for years, been famous among the inhabitants of this country for their efficacy in relieving rheumatism and chronic syphilitic complaints, and are known as the "*ojos calientes*." The temperature is about 140° F.; the water is very clear, and contains carbonates

* Report of Dr. F. V. Hayden, United States Geological Survey of Colorado, New Mexico.

of soda and potash. When rendered more accessible, by extension of railroads, it is probable that these springs will be much resorted to.

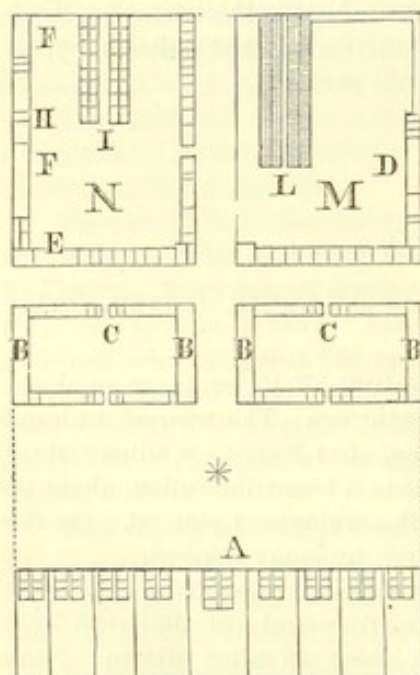
The indigenous trees of the vicinity are the pine, piñon, and scrub oak, with cottonwood and willow on the streams. The soil is sandy. By irrigation a great variety of vegetables can be raised near the fort; but the farmers are mostly Mexicans, who are too indolent to do more than procure the necessities of life. Wheat, corn, and oats are raised; potatoes do not thrive, and no fruits are cultivated.

The climate is dry; in winter, cold and bracing. The prevailing winds are from the west. Mean temperature, for 1869, 50.97° F.; extremes, 95° F., and 1° F.

Fort Union was established in August, 1851, as a check upon the northern tribes of Apache and Utah Indians, who were at that time hostile. It was, at first, placed immediately under the bluff's west of its present site, at a point now included in the ordnance reserve.

In the fall of 1861 General C. Grover, United States Army, built a bastioned earthwork southwest of the present post, about three hundred yards from the springs, and removed the stores and troops to it. The quarters were constructed of logs and adobe behind, and forming a part of the parapet. This was done in anticipation of an attack from the Texans, the post being the main supply depot for the Territory. The reservation, nearly square, contains 51½ square miles. There is, also, a timber reservation of 50 square miles.

The arrangement of the main part of the present post is shown in Figure 31.



A, officers' quarters; B B B B, squad-rooms; C C, mess-rooms; D, forage-rooms; E, bakery; F, quartermaster's store-room; H, issuing room; I, quartermaster's stables; L, cavalry stables; M, cavalry corral; N, quartermaster's corral.

All the buildings are constructed of adobe.

The barracks are one story high, with flat tin roofs, which, in this climate, do not answer, for the reason that where artillery is used, the firing springs the nails and solder, and severs the attachments. The adobe settles and causes the tin also to loosen; the tin rusts; the high winds detach it; and, in every respect, it is more expensive and less serviceable than shingles.

The squad-rooms are ceiled; each measures 72½ by 26½ feet by 12 feet high, and contains twenty-one movable single bunks, giving 1,098 cubic feet per man. Each has three ventilators, being round tin pipes ten inches in diameter, and three and a half feet long, extending above the roof, and located in the ceiling twenty-three feet from each other.

There are eight of these squad-rooms, intended to accommodate four companies; when so occupied, the allowance of air space would be about 500 cubic feet per man.

The officers' quarters are well constructed and arranged, with commodious yards and out-houses. The quarters for the commanding officer contain eight rooms; each of the others, six. All have large porticos.

The hospital is located on the open prairie about 300 yards from the post. It consists of three houses parallel to, and 6 feet 5 inches from, each other, each house being 81 feet long and 37 feet wide.

A hall, 140 feet by 11½ feet, traverses the middle of these buildings perpendicular to their long axis. There are six wards, each 29½ by 19½ feet, and 12 feet high, containing 10 beds, giving 690 cubic feet air space to each.

Each ward has two windows in one end, and a square opening in the ceiling which can be closed at pleasure. They are warmed by stoves. The arrangement of the wards is bad in a sanitary point of view.

The hospital has two cisterns, each 24 feet in diameter, and 27 feet 3 inches deep.

The guard-house is built of stone, inclosed by an adobe wall which supports the roof, there

being a space between the walls four feet in width. There are two cells, each 9 by 4½ feet by 7½ feet high, giving 300 cubic feet air space. The ventilation is by a trap in the iron door.

There is no laundry, chapel, nor school-house. There are no facilities for bathing at the post, either for summer or winter.

The water is hauled by water-wagons from the springs above referred to. The drainage is entirely superficial, but is very satisfactory.

The means of communication with the nearest railroad is by the mail coach, which runs six times a week; time to department headquarters, five days.

The inhabitants within fifteen miles of the post number about 3,000, the majority being Mexicans. The sanitary condition of the post is very good.

Statement showing mean strength, number of sick, and principal diseases at Fort Union, New Mexico, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial diseases.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	272	434	28	84	1	98	2	53	5	69	3
1869.....	208.58	418	4	63	.....	54	.....	41	2	101	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP SUPPLY, INDIAN TERRITORY.

REPORT OF ASSISTANT SURGEON J. A. FITZGERALD, UNITED STATES ARMY.

Camp Supply is situated on the neck of land between Wolf and Beaver Creeks, about a mile and a half above their junction to form the North Fork of Canadian River, in latitude 36° 30' north, longitude 99° 30' west. Fort Dodge, the nearest military post, lies 86 miles north-northwest. Fort Hays, the nearest railroad station, is 166 miles distant. The Cimarron River is 30 miles to the north. The country in the vicinity is rolling prairie, with much sand near the streams. The soil is a sandy loam, and good gardens can be made. Grass is abundant and good.

The climate is warm. Temperature during the summer months frequently reaches 100° F.

The prevailing winds are from the south and west, and are almost constant, varying in force from a gentle breeze to heavy gales; and during the autumn and early spring months they are very disagreeable from the quantity of sand and dust suspended.

There is good hunting in the vicinity; antelope, buffalo, deer, bear, rabbits, wild geese and ducks, pinnated grouse, plover, quail, snipe, turkeys, and reed birds being found.

The post was established in November, 1868, as a base for troops operating against hostile Indians. The fort consists of a stockade, 150 feet square, situated about 700 yards from Wolf Creek, the peninsula being at this point about 2,000 yards wide. The buildings are of rough cottonwood logs, that being the only available timber. The men were at first quartered in "dug-outs," being excavations about 4½ feet deep, with log walls above the surface, 3 feet high, and covered with earth and warmed by fireplaces. A few common tents gave shelter to two companies. The officers occupied tents, but in the spring of 1869, log huts were built for their accommodation. A stockade inclosure, covered with paulins, was used as stables and forage rooms, and was at some distance southeast of the main stockade. During the latter part of 1869, the arrival at the post of recruits increased the command to 600 men, and immediately steps were taken for the construction of suitable quarters for the officers and men, and stables for the stock.

The barrack, containing five sets of company quarters, is 90 feet long, 18 feet wide, and 9 feet high; a kitchen to each set, measuring 15 by 15 feet, is attached. The dormitories are warmed by stoves, but none of them are too well lighted. Bunks are constructed of poles and boards; and bedsacks filled with hay, with the ordinary blanket, comprise the bedding. The arrival of recruits has made it necessary for one of the companies to take up their quarters in the old dug-outs, having first erected new buildings above ground, similar to those just described. The company quarters give not more than 220 cubic feet of space per man. Married soldiers are quartered in small log huts built above ground. Quarters for laundresses are five in number, and recently constructed. The officers' quarters have been increased in number by the erection of five complete sets, 70 feet long, 15 feet wide, and 9 feet high, with kitchen attached, 20 by 12 by 9 feet. The commanding officer's quarters are in dimensions 31 by 15 by 9 feet, and have a kitchen 24 by 12 by 9 feet. The buildings above-mentioned and described are of unhewn logs, set upright in trenches to form sides, and have a covering of logs and earth. The guard-house and bakery are similar buildings, the first being 31 feet long by 15 feet wide and 9 feet high; the bakery 16 feet square by 9 feet high. The guard-house is ventilated by windows and doors, and warmed by stoves. The quartermaster and commissary store-houses occupy the east, west, and south sides of the main stockade, by which their outer walls are formed; the rooms are excavated 3 feet below the surface; the log walls rise about 7 feet above the same, and are roofed with paulins. The several offices are excavations about 4 feet in depth, with log walls extending $3\frac{1}{2}$ feet above the surface, with a roofing of earth. They are warmed by fireplaces, and lighted by openings for windows. The forage-house, 40 by 15 feet, is also similarly constructed. New store-houses are indispensable.

The hospital consists of tents framed and floored, and warmed by stoves. The dispensary is a log hut, with a hospital tent, framed and floored. A log hut is also used as a store-room.

Five sets of stables have been erected, measuring 150 feet long, 24 feet wide, and 9 feet high.

The post is supplied with water from Wolf Creek, half a mile distant, and is found to be of good quality. The water of Beaver Creek is highly alkaline. Water has been obtained from wells, from ten to twelve feet deep, but it was quite alkaline in character, and much inferior to water obtained from Wolf Creek.

The drainage of the post is naturally bad, the surface being basin-like in character; but as the soil is loose and sandy, with the subsoil entirely sand, there is never any standing water in the vicinity. No gardens have been cultivated.

There are no settlements at the post. The nearest Indians are the Arapahoes and Cheyennes. Their physical condition is good, though somewhat impaired by venereal taint. The prevailing diseases at the post are mild intermittents, diarrhœa, and catarrhal affections. There is a weekly mail, comparatively regular, but liable to interruptions from snow, floods, thieves, and Indians. Time to department headquarters from seven to ten days.

Statement showing mean strength, number of sick, and principal diseases of white troops at Camp Supply, Indian Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (2 months).....	236	75	7	24	2	1	2	8	.....
1869.....	135.33	96	21	29	1	2	3	4	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Statement showing mean strength, number of sick, and principal diseases of colored troops at Camp Supply, Indian Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (2 months).....	104	17	1	5	1	.....	1	1	2	.....
1869.....	175.08	194	19	65	7	2	.....	16	17	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT SILL, INDIAN TERRITORY.

REPORT OF ACTING ASSISTANT SURGEON H. S. KILBOURNE, UNITED STATES ARMY, DATED SEPTEMBER 24, 1870.

Fort Sill is situated on the Comanche, Kiowa, and Apache reservation, Indian Territory; latitude 34° 40' north, longitude 98° 25' west; elevation above the sea, 1,700 feet. The post is near the confluence of Medicine Bluff and Cache Creeks, on the south bank of the former. Fort Smith, Arkansas, is 275 miles east; Fort Richardson, Texas, 110 miles south; Camp Supply, 190 miles northwest; and Fort Arbuckle, 75 miles east. The post is situated at the eastern extremity of the Wichita Mountains. Mount Scott, the highest peak and eastern spur of the range, is 9½ miles in a right line from the post. Several hills belonging to the range intervene, among which are the noted Medicine Bluffs, one mile west by north. Washita River is 30 miles north; Red River, 45 miles south. Fort Sill was located by General Grierson in June, 1868, under the name of "Camp Wichita," and was first occupied by four companies of the Tenth United States Cavalry in January, 1869. It was selected by Major General Sheridan as a base of operations against the Cheyennes and Kiowas, in his winter campaign of 1868-'69, and from that date has been the military center of the reservation of Comanches, Kiowas, and affiliated bands of the Wichitas, Keechies, Wacoos, and Caddoes. The military reservation upon which the post is situated is six miles long (east and west) by three miles broad, (north and south,) and is a quadrangle. Within its boundaries are included the confluence of Cache and Medicine Bluff Creeks, and the timber and bottom lands which fringe and skirt those streams, the hills called Medicine Bluffs, the Indian commissary buildings, lime-kilns, quarries, &c.

Cache Creek flows through the reservation from the north, through a valley ranging in width from one-half to three miles, having on each bank a belt of timber from 100 to 500 yards wide. It takes a southerly course, and discharges its waters into Red River, 45 miles from the post. The region through which it flows is well covered with fine grass. Medicine Bluff Creek rises in the northeastern portion of the mountains, and flows through a broken and abrupt region to its junction with the Cache; there are small areas of fertile bottom lands along its course.

The Wichita range of mountains extends from the northwest corner of the military reservation westward for about 50 miles. The width of the chain is from 5 to 15 miles. The highest peak is Mount Scott, at the northeast extremity of the range; it has an elevation of 1,135 feet above the waters of Medicine Bluff Creek. Mount Webster, at or near the western extremity, has nearly the same elevation.

West Cache Creek, the main branch of the main Cache, rises by numerous small streams from the southern slope of the Wichitas, and joins at a point about 10 miles from Red River.

The Indian reservation is of an irregular form, averaging 83 miles in width (north and south) by 120 miles in length, (east and west.) Its boundaries, as determined by the War Department, are as follows: On the east the 98th meridian, on the west the 100th meridian, on the north the Washita River, on the south the Red River; (the north fork of Red River forms the main western

boundary.) This region appears, I think, on Dana's geological map of the United States as within the limits of the region covered by the great marine lagoons of the cretaceous period. But, as the rocks and marls are non fossiliferous, it is inferred that we are not within the ancient shore line of these waters. The vast deposits of gypsum and selenite mentioned by Colonel Marcy as found by him west of the 100th meridian on Red River would seem to indicate that we are east of the cretaceous. The surface soil of the bottoms is a dark sandy alluvium. The Cache flows between abrupt clay banks from 5 to 50 feet in height.

The surface of the prairie is loam and marl, with various admixtures of sand and gravel. Black sand is washed out of the soil near the post by rains. The subsoil is a dingy red clay, with sand. The bed-rock is a light gray limestone, which is ordinarily far below the surface, but crops out occasionally in the hills and at points along Cache Creek; it makes a good quality of lime and fine building material. Quarries have been opened within one mile of the post, which furnish the rock in any desirable quantities.

The soil of the creek bottoms is very fertile, producing all varieties of plants belonging to this latitude. I have seen no finer agricultural region in the West than the slope between the Wichitas and Red River. Several mineral springs have been found, which will be described under the proper heading.

The largest and finest forest trees are the oaks, cottonwood, and pecans, found in the bottoms. The two former are sufficiently numerous to furnish lumber for building purposes. There are three varieties of the oak, also hackberry, ash, black walnut, elm, and mesquite; among the small trees and shrubs are dogberry and willow. Among the fruits are the wild plum, wild grape, and blackberry; strawberries are found in small quantities. The edible plants are what is known as the prairie pea, the artichoke, and the fruit of one sort of cactus, of which latter there are several varieties. The taraxacum and chenopodium, the latter in large quantities, are seen about the post. There are also a large variety of flowering plants.

The following is a list of wild animals found on the reservation and vicinity: Buffalo, bear, elk, antelope, white-tailed deer, panther, gray wolf, wild rabbit, coyote or prairie wolf, wild cat, otter, squirrel, coon, and a few others of small size.

Among the birds are the wild turkey, wild goose, wild duck, (four varieties;) prairie hen or grouse, snipe, quail, meadow lark, blackbird, and swallow. Cache and Medicine Bluff Creeks furnish the following kinds of fish in small quantities: Catfish, white fish, sunfish, eels, and garfish; the latter stream has also a few trout, in the mountains. Thirteen sorts of game have been killed, besides fish, in one week, among the head-waters of West Cache Creek, where all the above varieties are plentiful in their season.

Both Cache and Medicine Bluff Creeks furnish a plentiful supply of water for all purposes the year round. There are several springs of good water on the military reserve, and one on the post reserve. The latter is the largest, and is situated on the north bank of Bluff Creek opposite the post; this spring is of sufficient size to furnish water to the post for drinking and culinary purposes. It is proposed to raise the water to a reservoir with an engine for supplying the new post. No wells have been sunk. Several mineral springs have been found on the military reserve.

A bituminous substance resembling coal tar exudes from the soil at a point near the east line. There is a salt spring one mile northwest of the post. Several small springs, holding a small quantity of iron in solution, are found on the southern slope of Medicine Bluffs.

A meteorological register has been kept at this post since April 1, 1870, the necessary books, instruments, and apparatus not being in order until that date. The monthly mean temperature is as follows: April, 62.85°; May, 75.73°; June, 73.97°; July, 81.81°; August, 79.23°. The monthly extremes are as follows: April, highest, 88°; lowest, 40°. May, highest, 94°; lowest, 64°. June, highest, 101°; lowest, 64°. July, highest, 105°; lowest, 64°. August, highest, 106°; lowest, 62°. The amount of rain-fall in April was 3½ inches; no rain in May; in June, 4.60 inches; in July, 4.55 inches; in August, 3.03 inches; total, 15.90 inches. The average annual rain-fall is large.

The map shows that the region lying between the Wichita Mountains and the Red River is a network of streams, receiving their water supply from the southern slope of those mountains. The northern slope towards the Washita River has but two inconsiderable streams, (Elk and Rainy Mountain Creeks.) It is probable that more than two-thirds of the mountain rain-fall is drained

off by Cache Creek. This fact is due either to the greater inclination of the southern slope or the influence of the chain on prevailing winds; perhaps to both causes. Vegetation usually commences about the 1st of April. Foliage appears early in May. The warm season is from May to October, inclusive. The winters are mild, the mercury rarely falling below the freezing point in the daytime. Ice forms not to exceed one-half inch in thickness.

The prevailing wind is from the south the year round. In warm weather a daily breeze rises from the south about three hours after sunrise, and blows with more or less constancy until sunset. A cold north wind, the "norther," appears occasionally at all seasons, and prevails steadily from two to four days at a time, with a temperature of from 10° to 30° lower than the seasonable one. The mercury falls rapidly under its influence, and occasionally the extreme is reached within an hour. The changes of temperature here are generally less marked and sudden than in central Texas. Snow-storms have come most frequently from the northeast. The number of the latter is few, and the amount of snow inconsiderable. Snow fell twice in the winter of 1869-'70, not to exceed two inches in depth.

Fort Sill is situated in the center of the post reservation. The latter is an area of one square mile, situated in the center of the United States military reserve. The ground occupied by the buildings is a plateau of irregular outline, containing an area of about one-half mile square. The sides of this plateau slope in all directions. Its elevation above low-water mark is about 50 feet. All buildings excepting the commissary store-house are to be built of the gray limestone previously described. This stone is easily quarried and worked, and when laid into walls presents a bright and fine appearance. The general plan of the post is a square. Its capacity, when complete, will be six companies of cavalry. The lots for each barrack are 200 feet square; those for the officers are each 200 by 106 feet. The number of buildings intended for use as barracks is three. These buildings, of which the walls are now completed, are constructed of gray limestone, unfaced. The inner surface of the walls will not be plastered. Each building is double, and of one story, each division having capacity for the accommodation of a company of one hundred men. The buildings are to be warmed by stoves; they are well lighted by windows on all sides, and ventilated from the ridge. The walls are one and a half feet thick; the external dimensions are 200 by 30 by 12 feet. Two wings, each 60 by 30 by 9 feet, with porches, 10 feet deep, in front and rear. The air space per man is about 388.57 cubic feet, calculated on the basis of one hundred men to each barrack. In the one building now occupied bunks are in two tiers, each for the accommodation of four persons. There are no wash or bath-rooms in the plan. The wing of each set of company quarters contains a mess-room, 27 by 40 feet, a kitchen, 17 by 17 feet, and a store-room, 15 by 17 feet. Laundresses and married soldiers are quartered in tents.

The number of buildings for officers' quarters on the plan is eleven; the walls of six of them are now complete. These buildings are of the same material and style as the barracks, but they are to be lathed and plastered. They are all one story high, double, excepting the quarters of the commanding officer, and each is intended for the accommodation of the officers of one company. Each building contains four rooms, two kitchens, two halls, and a covered porch between the main building and wing, (kitchen.) The outside dimensions are 52 by 34 by 9½ feet; wings, 18 by 30 by 9½ feet; a porch, 10 feet deep, front and rear. There are in each set of quarters two rooms, each 15 by 15 feet, a hall, 8 by 30 feet, a covered porch, 10 by 15 feet, and a kitchen, 12 by 14 feet. The quarters of the commanding officer are of the same style and shape as the others; the dimensions are, exteriorly, 52 by 40 by 10 feet. They contain four rooms, 18½ by 18 feet, a hall, 10 by 36 feet, a covered porch, 10 by 22 feet, and a kitchen, 14 by 18 feet—a porch on all sides. Each room has a fireplace. There are no special arrangements for ventilation. There are no bath-rooms in the officers' quarters.

The buildings for headquarter offices, quartermaster's and commissary's store-houses are located on the south side of the parade ground on the same line. Their dimensions are as follows: Quartermaster's and commissary's store-houses are each 200 by 30 by 12 feet, outside measurement. Each store-house has an office, private office, issuing room, and entry in one end. There is also an ordnance building, 75 by 25 feet, and a second quartermaster's store-house, 120 by 25 feet. The building for the headquarters offices is of the following dimensions: 80 by 30 by 12 feet, outside

measurement. It contains a hall and four rooms, each 17 by 26 feet, and a porch in front and rear, 10 feet deep.

The guard-house is located at the southeast corner of the post, near the commissary and ordnance buildings. Its dimensions are 46 by 46 feet, exterior measurement; the foundation walls are to be three feet in thickness; the upper wall is two feet thick. It contains a hall and four rooms, and has a basement containing four cells for prisoners. Ventilation is by the ridge above and grated windows below. The plan appears to be adequate to the needs of the post, and well adapted to its purpose.

The hospital will be located in the northwest corner of the post; it will be constructed of the same material as the other buildings; its capacity will be twenty-four beds. The plan is the one furnished from the Surgeon General's Office for a building of that size.

The places for post bakery, laundry, chapel, and school-house are yet undetermined.

The stables are located in rear of the barracks, at a distance of 300 feet. They are three in number; each has a capacity for a squadron. Dimensions, 200 feet square. The plan is a square, inclosed by a wall, furnished with sheds on the inside, and open in the center.

The total number of volumes of all kinds in the library is now about five hundred.

The water used for washing and bathing and for general purposes is obtained from Medicine Bluff Creek, a few yards above the post. Except at high water the quality of this water is good, and suitable for all purposes; the impurities, during a high stage of water, are mostly clay, sand, and some organic débris washed down by the stream. Much of the drinking water is obtained from the large spring opposite the post, previously mentioned, and from two smaller ones, one just above and one just below the present post, and from a private well on the premises of the post trader. The water of the creek is supplied by means of water-wagons (tank on four wheels drawn by eight mules) in liberal quantity. The water thus furnished is kept in covered barrels. There are no cisterns or reservoirs at the post.

The efficiency of the natural drainage, both in the new post and of the ground now occupied, is nearly complete. There is a spot of low ground of about 50 yards square in area, lying between the two posts, which is not drained; a small amount of labor is only needed to drain it toward the creek.

There is no special arrangement for bathing, except at the hospital.

The post garden has an area of about 5 acres. The hospital has no garden as yet. At the present post two officers only have gardens; the area of each is about one-quarter of an acre. Each of the four infantry companies and two of the cavalry of the garrison have cultivated gardens of about two acres area each.

Vegetables, except canned articles, have not generally been supplied by the commissary. It is proposed hereafter to keep a supply on hand. There is no market capable of supplying the post with vegetables, butter, &c., within 50 miles.

Medical supplies are obtained from the medical purveyor at St. Louis, Missouri.

The nearest railroad station is at Fort Harker, Kansas, distance 334 miles. The means of communication with that post are trains, public and private. Communication is somewhat irregular, being liable to interruption by high water in the Washita, Canadian, and Arkansas Rivers—rarely from the attacks of Indians. Mails are usually regularly received twice weekly. Occasional interruptions occur from high water. The line is one of light wagons from Boggy Depot, Indian Territory, to Fort Sill; at the former place connection is made with the main line from Fort Smith, Arkansas, to Fort Concho and El Paso. The time required to communicate with department headquarters is about ten days.

There are no inhabitants on the Indian or military reservations excepting those authorized by law; these include contractor's men, drovers, and persons adopted into the Indian tribes; also, employés of the Indian agent.

The prevailing diseases during the past year, ending June 30, 1870, have been intermittent fever, acute diarrhœa, acute dysentery, and acute catarrh. The malarial influence is predominant at all seasons, and the majority of cases of acute disorders are complicated with it. The water used at the post is not an appreciable cause of disease. The origin of malaria is regarded as being both climatic and endemic. At Fort Arbuckle, in the same latitude, 75 miles east, malarial

diseases are much less frequent than at this post. The amount of low, moist ground in the vicinity of the post, the nature of the subsoil, and rapid alternations of heat and moisture are regarded as the endemic causes. An epidemic catarrh of mild form has prevailed once during the past year. The graver forms of pulmonary diseases are not common. Bowel affections and rheumatism of the muscular variety are common. Acute rheumatism is rare. Two cases of congestive fever have occurred at the fort, with one death. Malaria has been the bane of the post; probably one-half of the entire garrison have been attacked with some form of malarial disorders.

Work on the new post of Fort Sill was commenced in the summer of 1869, and during that year one building, the commissary warehouse, was completed. This building is constructed of hewn timber, laid one piece upon another, horizontally. All other buildings are of stone. The number of buildings now completed and occupied is nine, as follows: Quartermaster store-houses, two; commissary store-house, ordnance building, headquarter offices, (partly occupied by the library,) one barrack building, quartermaster corral, and two small dwellings adjacent. The walls of the following-named buildings are now nearly completed, viz: Two barracks, six sets of officers' quarters. The former lack only the partition walls, as do the latter.

Foundations for the following-named buildings have been excavated, viz: Five sets of officers' quarters and guard-house. The following have not been commenced: Hospital, bakery, and chapel. The work of construction is still in progress, but with a diminished force of laborers. At the old post the men are quartered in tents, and the officers in log houses.

The commanding officer occupies a frame house.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Sill, Indian Territory, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (four months).....	194.75	90	57	7	2	1	6	15	.....

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Sill, Indian Territory, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (six months).....	401.83	387	6	256	63	6	1	7	19	9

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT GIBSON, CHEROKEE NATION, INDIAN TERRITORY.

REPORT OF ASSISTANT SURGEON ALFRED DELANY, UNITED STATES ARMY.

The reservation upon which Fort Gibson is situated has not been defined or declared; its survey is in progress. The fort is located on the east bank of the Neosho or Grand River, 3 miles north-east of its confluence with the Arkansas, latitude 35° 48' 10" north, longitude 95° 3' 15" west, and 600 feet above the level of the sea. Tablequah, the territorial seat of government, is 17 miles distant in a northeasterly direction. The nearest military post is Fort Smith, Arkansas, 65 miles dis-

tant, in a southeasterly direction, on the dividing line between Arkansas and the Territory. The site is the western terminus of a high rolling prairie, which extends in an easterly direction from the fort to the Menard Mountain, distant about 3 miles. On the north side of the fort the prairie descends rapidly to a narrow strip of bottom, which has a river margin of $1\frac{1}{2}$ miles. On the south side it generally slopes to a plain, which is fifty feet below the fort, and distant about 400 yards. This plain extends back from the river more than 300 yards, where it is terminated by a ridge of land, the commencement of the prairie. To the south and west this plain is continuous with an extensive river bottom, which extends to the Arkansas River, 3 miles, and along this river, in a southeasterly direction, more than 4 miles to the "Bayou Menard;" it has an average breadth of 3 miles, and contains several lakes. The southern half of this plain is covered with forest trees and a very dense undergrowth.

On the west side of Grand River lies another extensive bottom, irregularly triangular in form, which is limited by the Arkansas River on the southwest, the Grand River on the east, and the Verdigris River on the west; it has an average breadth of 2 miles, and is heavily timbered. Coal is discovered in all parts of the country, but no veins or mines have been opened or worked. The soil is sandy, underlaid by limestone, and varies in depth from a few inches to several feet. There is scarcely an acre of land, except upon the ranges of high hills along the Grand, Verdigris, and Illinois Rivers, that is not arable and susceptible of cultivation; the soil will produce abundantly all kinds of cereals, vegetables, fruits, cotton, and tobacco. The principal crops now raised are corn, wheat, potatoes, and oats; fruits (apples, pears, and peaches) of the finest quality are very plentiful. Timber is scarce, growing only in the bottoms along the rivers and bayous, and on the mountains, but there very densely. It consists chiefly of oak, walnut, hickory, pecan, and cottonwood. Wild prairie grass grows rank and heavy, and is cut for hay in large quantities. None of the cultivated varieties, or clover, have been sown. The country is well watered, and abounds in springs; near the post, however, water is only found at great depths, and is strongly impregnated with lime. There are innumerable salt springs of the purest quality on the Illinois, Grand, and Canadian Rivers, some of which are extensively worked. The climate is variable. The summers are very warm, and the winters, though usually mild and pleasant up to the end of December, are occasionally very severe. The variations in temperature are often sudden and extreme. Spring and autumn are delightful, and are highly propitious to agriculture. The annual average range of the thermometer is 80° ; in summer rising above 100° , and in the winter falling to 2° . The mean temperatures are as follows: Spring, 61.04° ; summer, 79.41° ; autumn, 61.06° ; winter, 41.13° .

The prevailing winds during the summer months are from the southeast and south-southeast, blowing, in some months, twenty-eight out of thirty days from one of these points. These winds traverse the extensive "bottom" above described before reaching the fort. As a general rule the garrison is protected from the prevailing winds by the elevated prairie ridge.

The fort is 600 feet above the level of the sea, and more than 100 feet above ordinary low-water mark in the Grand River. The present site of the fort was occupied by volunteer troops during the war of the rebellion. The barracks, though erected twenty-five years ago, were never occupied by regular troops until after the close of the war. It was in contemplation at one time to locate the fort at Webber's Falls, 35 miles southeast from here. In a sanitary point of view, it would be a preferable site to the present one, being high, and far removed from swamps or bottom lands. It is manifest that had a site been selected to the windward of these bottoms, one source of disease would have been avoided.

The majority of the buildings now occupied are new. The officers' quarters, the barracks, and guard-house, are arranged on the three sides of a square, and a new hospital building will be erected on the vacant side.

The barracks are built of dark yellow sandstone, and are two stories high. In the lower story are the mess-rooms and kitchens; in the upper story are the squad-rooms and orderly-rooms. This building is divided into two distinct barracks by solid partitions, and each is occupied by one company. Each squad-room is 63 feet in length by 21 feet in breadth; $19\frac{1}{2}$ feet to the eaves, and $23\frac{1}{2}$ feet to the ridge, giving 28,444 cubic feet of air space. There are fourteen double bunks to accommodate 56 men, thus allowing to each man over 500 cubic feet of air space. The windows and doors are large. Each squad-room has seven windows on the south side and six windows and a

door on the north side; the latter open on a veranda, 12 feet in width, which extends the whole length of the building. The orderly-rooms are each 14 feet long and 21 feet wide. The mess-rooms and kitchens have the same dimensions as the rooms in the upper story. There are no cellars nor store-rooms. The upper floor is approached by the veranda, there being no stairway within the walls. These squad-rooms are open to the ridge, are well lighted, and are provided with open fireplaces. The colored troops of the command, numbering 18 men, are encamped on the southern slope of the prairie, about three-quarters of a mile northeast of the fort; they are provided with wall tents, and have constructed a log stable to accommodate their horses.

The sinks of the garrison are simply trenches, with frame shelters erected over them; they are regularly disinfected, and, as occasion requires, fresh earth is thrown in.

The quarters for married soldiers are located about 300 yards south of the garrison, and outside of the limits of the reservation; they are very old log buildings, and much out of repair. It is purposed to abandon them as soon as suitable quarters can be constructed.

There are five sets of quarters for officers. The commanding officer's quarters are built of dark sandstone, one story and a half high, with an English basement. This house contains thirteen rooms, including the attic and basement. Those of the first floor and basement are built on opposite sides of a hall, 10 feet wide, extending through the building. All the rooms are large, well lighted, and, excepting those of the attic, have open fireplaces. The other sets of quarters are built in pairs. They are frame, with stone foundations. Two of them have basements; the remaining two have, in lieu thereof, a small cellar each. There are six rooms in each house, including the kitchen. These quarters are substantially built houses, having high, airy rooms, open fireplaces, and large doors and windows.

The store-house of the chief quartermaster and commissary of the district is a handsome stone building, 150 feet by 42 feet, and one story high; about 50 yards south of the officers' quarters is a narrow stone building, 50 feet long, used as offices by the district and post commanders.

The commissary store-house stands 50 feet south of the barracks and parallel to them. It is a substantial stone structure, 30 feet by 36 feet, two stories high, and has a cellar. This building is dry, freely ventilated, and is admirably adapted to the purpose for which it is used.

In addition to the buildings described may be mentioned the saw-mill, the blacksmith shop, and the officers' mess-hall. An ice-house has been erected which will hold sufficient ice to supply the demands of the garrison throughout the summer season.

The guard-house is a substantial frame building, recently erected. It is sufficiently lighted by windows, and warmed by wood stoves. There are no special arrangements for ventilation.

The hospital is located on a gentle slope about 117 yards south of the barracks. It consists of two log huts of the following dimensions: 36 feet long, 15 feet wide, $8\frac{1}{2}$ feet to the eaves, and 15 feet from floor to ridge. Each hut is divided into two rooms, making in all four rooms, which are used respectively as dispensary, store-room, kitchen, and a ward of four beds, for the sick of the colored troops.

The plan of the hospital is shown in Figure 32.

A, ward; D, dispensary; K, kitchen; S, store-room; Z, covered passage.

Three hospital tents, spread over a frame and floored constitute a ward for the sick of the white troops. The huts and the tent ward are provided with open fireplaces. This hospital is ill adapted to the needs of the post, and a contract has been awarded for the construction of a frame hospital to accommodate twelve patients, after the plan contained in Circular No. 4, Surgeon General's Office, 1867.

In the present hospital, the dispensary and office are in the same room, which is fitted up with counter and shelves. The wards are furnished with sixteen iron bedsteads, and have an air space of 317 cubic feet per man.

The post bakery is a new frame building, situated in the vicinity of the barracks.

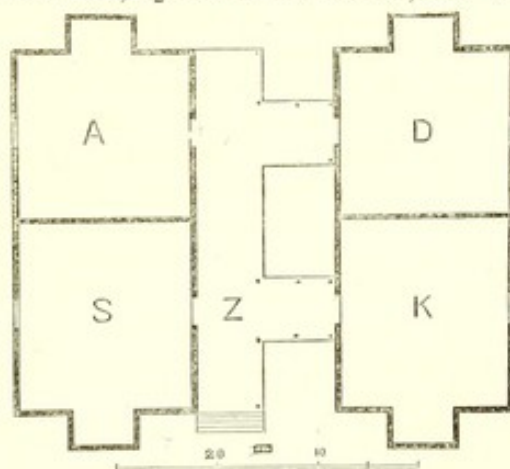


Figure 32.—Scale, 21 feet to 1 inch.

The stable is located on the northwest side of the officers' quarters, and to the leeward of them, as well as the men's quarters; it is built in the form of a square, and consists simply of sheds divided into stalls. Refuse from the stable is carted to the distance of over a mile from the post. The companies are in possession of good libraries which are liberally patronized by the men, both in garrison and hospital.

Two cisterns, one in front and the other in the rear of the barracks, each having a capacity of 8,000 gallons, are chiefly depended upon for the supply of water, though many prefer, for drinking, the water of the Grand River, which, when confined to its sandy and rocky bed, is beautifully clear, very agreeable to the taste, and remarkably free from organic matter. For cooking purposes, however, the cistern water is usually employed.

There is no system of sewerage at the post. The configuration of the surface on which the fort is located, being a gradual declination to all sides, secures good drainage. All refuse at the post is collected and carted away daily.

The cemetery is situated about a mile and a half from the garrison. The post garden consists of about ten acres of land, from which the garrison and hospital are amply supplied with all kinds of vegetables, especially potatoes.

Rations procured from the commissary are of good quality. Extra articles of food are purchased by the company fund from neighboring farmers.

Medical supplies for the post are obtained upon requisition from the medical purveying depot at St. Louis, Missouri, and are generally received in good condition. They are, for the want of suitable store-rooms, difficult to keep well preserved.

The nearest quartermaster and subsistence depots are at Fort Leavenworth, Kansas, 297 miles distant. The route of supply is by the Arkansas River, which is open about six months in the year, and the best method of transporting supplies is by steamboat. Communication between the post and the nearest town is by boat, when there is sufficient water in the Arkansas River.

Fort Gibson has been called the "charnel-house of the frontier," and it may reasonably be supposed that when the fort was located on the plain to the south the ratio of sick was greater than at present; for, while citizens and others who live in the village on the site of the old fort, and those who live in the bottoms bounded by the Arkansas and Verdigris Rivers, suffer almost constantly from malarial fevers or in some other manner manifest symptoms of malarial poisoning, the troops suffer much less, and are usually able to attribute an attack to special exposure. The quartermaster's employes, who occupy quarters built on the slope to the south of the fort and about 35 feet above the village plain, suffer less than the villagers, but vastly more than the troops.

The Grand River is subject to an annual rise, which usually takes place in June or July. The bottoms are then subject to an overflow. When the water subsides the soil is left saturated with moisture, and the reeking, slimy surface, rich in decomposing vegetable matter, sends forth that poison which is supposed to be the cause of malarial fevers.

The prevailing diseases are of malarial origin in the majority of cases. Remittent and intermittent fevers constantly engage attention. Remittent fever is especially severe in its character, and yields only to prompt treatment. Pneumonia of an asthenic type is a common and fatal disease with the Indians; death frequently occurs within forty-eight hours of the onset of the disease. This great fatality is attributed to the depressed condition in which the disease usually finds these people, who are enfeebled by chronic malarial poisoning, poor and insufficient diet, and the general insalutary condition in which they live. Lazy, filthy, and intemperate as they are, poorly housed, fed, and clothed, it is a matter of no surprise that they should succumb to a disease attacking an organ so important to life.

The ordinary treatment of malarial fever by quinia is usually found sufficient. It is not often necessary to employ larger doses than are commonly administered in more northern localities. It is considered highly important, however, promptly to arrest an intermittent to prevent its assuming a more pernicious type or lapsing into a remittent. The law of recurrence at the septenary periods is recognized here, and quinia is administered at those periods with the view to prevent a return. Remittents are prone to become continued; active lowering treatment is badly borne, even when the symptoms would seem to strongly indicate it; prompt cinchonism only is trusted to, and, unless some organ is specially assailed, no other treatment is employed. Malaria complicates most of the

diseases which occur, and the administration of quinia in dysentery and pneumonia is very frequently necessary. Pneumonia is the most fatal disease the physicians of the vicinity have to encounter. It is either typhoid from its commencement, or rapidly assumes that character. The intemperate and half-starved Indians furnish the most cases. It is usually ushered in with a chill, during which the brain or lungs, or both, are fatally congested. In other cases it runs a more protracted course, and the lungs pass through the various conditions denominated stages of the disease. The most frequent condition, however, is simply congestion, with commencing so-called exudation. The treatment must be supporting from the onset, and especially addressed to the malarial element of the disease.

All affections of the respiratory organs are sufficiently common, and peculiarly unmanageable. The sudden and extreme variations in temperature seem to be the cause of the prevalence of this class of diseases. The percentage of cases of disease of this class among the troops has not been greater than in localities of a more equable temperature.

The settlement of Fort Gibson, adjoining the post, has a population of about 300. The nearest Indians are the Cherokees and Creeks.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Gibson, Cherokee Nation, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	164.66	229	125	17	6	9	5	2	14	1
1869.....	145	251	79	47	2	24	11	.....	16	.....

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Gibson, Cherokee Nation, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	45.33	49	19	10	1	2	3	5	.....
1869, (three months)	16.66	8	5	.....	.....	.....	.....	1	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT SMITH, ARKANSAS.

REPORT OF ASSISTANT SURGEON J. MORRIS BROWN, UNITED STATES ARMY.

Fort Smith is situated in the western part of the State of Arkansas, in latitude 35° 23' north, and longitude 94° 30' west from Greenwich. It is on the right bank of the Poteau, at its junction with the Arkansas River. Fort Gibson is northwest, distant 60 miles. Fort Arbuckle is 200 miles southwest, and Fort Sill is distant 350 miles. To the northeast, and adjoining the reservation, is the city of Fort Smith, a thriving place, having a population of 5,000, and being the head of navigation of the Arkansas River. Little Rock, the nearest town of any importance, is southeast, distant 200 miles.

Fort Smith was established in 1817, by Major Bradford, of the rifles, for the protection of trading posts, and is one of a cordon of posts established along the boundary of the Indian Territory during that period.

The reservation contains about 300 acres, besides about 150 acres between the State line and the Poteau River. The adjacent country outside the limits of the city is very much broken; the soil in the vicinity is very fertile, cotton being the staple product. Large quantities of corn are also raised. Fruits, both large and small, are in abundance, as are also almost all kinds of vegetables. Coal abounds, and traces of iron are found in the vicinity.

The climate is temperate, the temperature ranging from 5° to 95° F.; the mean temperature is 56° F. The prevailing winds are from the southwest. The spring and fall winds blowing over the valley of the Poteau cause an increase of malarial disease. The winters are usually short and mild. The warm season begins in April and continues until November, the early part being generally rainy.

The fort is situated on the northern portion of the reservation, about 300 yards from the Poteau, and about 100 feet above its level. It is built of stone, irregularly pentagonal in shape, in dimensions 600 by 650 feet, and contains about ten acres.

The barrack is a brick building, one and a half stories high, with verandas in front and rear. It contains two rooms, each 56 by 29 feet, and was intended for one company. It is warmed by fireplaces and lighted by windows, of which there are six to each room. There are no special means of ventilation. The air space per man is 818 cubic feet. Wooden bunks are used, with the ordinary supply of bedding in sufficient quantity, but of very poor quality. There are no wash or bath-rooms nor water-closets connected with the barracks. Kitchens and mess-rooms are in the basement of the building, and are of sufficient capacity for one company.

A number of small frame buildings located outside of the walls are occupied as quarters by married soldiers. They are in a very poor condition.

The officers' quarters are contained in a two-story brick building, with verandas in front and rear, and comprise sixteen rooms, each 15 by 17 by 14 feet, and 8 kitchens in the basement. These are divided into sets of quarters, two lower rooms and a kitchen being usually a set. They are heated by stoves or fireplaces. Each room is lighted and ventilated by means of two windows. There are no bath-rooms nor water-supply connected with the building. Vaults in the rear are used as privies, there being no water-closets.

One small building outside the walls is used for offices. The quartermaster's store-house is north of the fort about one hundred yards; it is a frame one-story building, 200 by 50 by 30 feet. The commissary store-house is a two-story stone building located within the fort, and measures 46 by 45 by 36 feet. A number of smaller buildings about the post are also used for the same purpose. The quartermaster's store-house being situated on lower ground—between the fort and the river—is very damp, and therefore not well adapted to the purpose.

The guard-house, situated at the entrance of the garrison, is a one-story brick building, 30½ by 27½ by 22 feet, warmed by fireplaces and lighted by four windows, which are its only means of ventilation. The building is divided into four rooms, two for the guard and two for prisoners, one being divided into three cells. Owing to imperfect ventilation, the guard-house is ill adapted for the purpose. The average number of prisoners is six.

The buildings, which have been in use for about twenty years as a hospital, have recently been abandoned, and the one now occupied for that purpose is a two-story stone structure, 46 by 45½ feet, (inside measurement,) and 36 feet high, and situated at the northwest corner of the garrison. The first story is used for a kitchen and dining-room; the second contains the ward, dispensary, and store-room.

The ward, 45½ by 26½ by 12 feet, contains twelve beds, allowing about 1,200 cubic feet of air space to each. It is warmed by fireplaces, lighted and ventilated by windows, of which there are four, each 6 feet 10 inches by 3 feet. There are no bath or wash-rooms, water-closet, nor dead-house attached to the hospital. With some repairs the building will answer its intended purpose very well.

The post bakery is a log building, distant from the fort about one-fourth of a mile, and is well adapted, having a capacity for 1,000 rations.

The stables, granaries, and shops are frame buildings erected during the war, and located about a quarter of a mile from the garrison.

The library, containing 140 volumes of a miscellaneous character, is kept in a small frame building located between the officers' quarters and hospital.

The water supply for the garrison is obtained from the river; for culinary purposes rain-water is used, a large cistern furnishing all that is required. There are several wells at different points about the garrison, but the water is not used for any purpose whatever.

The post being situated on high and rolling ground, the natural drainage is perfect, and no artificial drains and sewers are required.

The river affords excellent advantages for bathing during the summer months, but in winter no facilities are provided. The national cemetery is situated something over a fourth of a mile from the garrison, has an area of about ten acres, and contains 1,785 graves, having been in use some twenty years. The post garden contains fifteen acres of ground, which is cultivated by the troops. Potatoes, cabbages, turnips, onions, and almost all small vegetables are raised, and in sufficient quantities to supply the command.

Communication is had with St. Louis, Missouri, by stage and railroad, via Springfield, Missouri, distant about 550 miles, and is occasionally interrupted by floods. The river affords means of communication with Little Rock, Arkansas, and all points east and south of the post; though, on account of low water, it is very irregular in spring and summer. Stores received from St. Louis are usually about three weeks on the route. Daily mails are received from the East. A letter to department headquarters requires from four to five days.

The residents of the surrounding country in the State are principally farmers. To the west lies the country of the Cherokee and Choctaw Indians, who are generally an idle, lazy, and shiftless people.

The general sanitary condition of the post is good, the prevailing diseases of the past year depending entirely on malaria.

Statement showing mean strength, number of sick, and principal diseases at Fort Smith, Arkansas, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869, (8 months)	107.75	114	82	5	5	3	2	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

LITTLE ROCK, ARKANSAS.

REPORT OF ACTING ASSISTANT SURGEON W. A. CANTRELL, UNITED STATES ARMY.

The post of Little Rock, which is embraced within the corporate limits of the city of Little Rock, the capital of the State of Arkansas, is situated on the Arkansas River, about 300 miles from its mouth, in latitude 34° 43' north, longitude 92° 10' west from Greenwich.

The Territory of Missouri, including the present State of Arkansas, was organized by the act of Congress of June 4, 1812; and the Territory of Arkansas was established by act of Congress of March 2, 1819, the whole Territory at that time comprising a population of scarcely more than 1,000, exclusive of Indians. Arkansas Post was the capital, being a village of two or three hundred persons, mostly of French descent.

From the general topography of the country this point had been a regular place for crossing the Arkansas River by the Indians from time immemorial; for although the river was not fordable here nor anywhere else for many miles, yet the hills set into the river on both sides, and gave

the spot a marked and distinctive character, and the great Indian trail, pursued in their wanderings and expeditions southward and northward, passed over the present site of the city.

Here in the course of time two or three families settled for the double purpose of cultivating the soil and trading with the Indians, who were frequently passing; and a tribe of whom, the Quapaws, stayed in grounds in the immediate vicinity. Little Rock was then the extreme frontier of the United States, beyond which no other place was occupied by white men. The city takes its name from a prominent and well-defined rock that projects upon the river at the spot where the wharf now runs down to the water's edge, an object which, at an early period, formed a noteworthy landmark for boatmen on the river, as it was the first rock which they discovered in ascending the stream from its confluence with the Mississippi, and it was called "La petite Rochelle" or "the little rock," in contradistinction with another much larger rocky promontory which projects upon the river three miles higher up on the opposite side.

The steep, rocky bank upon the river, which originally rose sheer from the water's edge, gradually increases in height, in ascending the stream, from twenty to about sixty feet, and extending southward and westward within the city limits, the land attains a still higher elevation, being at its highest point about 150 feet above the level of the river, the ascent being everywhere gradual. The surface is a slight deposit of vegetable mold superimposed upon strata of sandstone, excellent for building purposes, very hard, and of light gray and brown colors, and upon slate which approaches the surface in the northwestern part of the city, and is there exposed in thick layers upon the bank of the river.

West and south of the city the country is broken and diversified with irregularly-shaped hills, covered with pine woods. Granite and millstone grits form the capping of these hills, while the cuts in the valleys reveal sandstone and reddish and dark underlying shales; while eastwardly extends the expanse of the alluvial lands of the Arkansas River, on both sides of the stream, which is bounded on the north by prairie lands at some twelve or fifteen miles distant. The slate, which forms the substratum on the bank in the western part of the city, has been formerly quarried for making tiles and for other similar purposes; but the work has been discontinued. Nine miles north of the city are situated mines of argentiferous lead, which have been worked at intervals for over a quarter of a century.

The climate of the post is good, and the place is healthy. It is not subject to winds nor to extremes of heat and cold, the mean annual temperature being about 61° F. It had never suffered from epidemics of any kind until the year 1866, when 31 cases of cholera occurred in the city, while among the troops, who had been removed from the garrison to the adjacent country, it raged to an alarming extent.

The reservation, comprising 36 acres of ground, is situated in the southeastern part of the city, and was purchased in 1836. Two years later the building of the post commenced. Five large brick buildings, consisting of an armory, commanding officer's quarters, a barrack for one company, ordnance store-rooms and work-shop, and quartermaster's and commissary store-room were erected. Also a magazine, brick stables, and outhouses.

The post was continuously occupied as a military station until the war of the rebellion. On February 18, 1861, the post was evacuated, and the governor of Arkansas, with his militia took charge of and held the post until it was retaken by the United States forces under command of Major General Steele, on the 10th of September, 1863.

The barracks now used by the enlisted men are composed of nine framed buildings. Each of these buildings lately constituted a ward of the Little Rock General Hospital. They are each 160 feet long and 30 feet wide, and were removed in sections over the space of a quarter of a mile to the arsenal grounds, where they are placed in parallel lines, fronting north, and in the rear of the officers' quarters. Each building will accommodate one company, giving ample room for offices, dormitories, mess-rooms, kitchens, and store-rooms. They are well ventilated and lighted. The dormitories are warmed by stoves and lighted at night by candles. Air space per man, 468 cubic feet. Each one is supplied with a sufficient number of neatly painted two-storied bunks; the majority of them are single bunks, a few being double. The sinks are located 200 yards in rear of the barracks. A kitchen with mess-room adjoining is partitioned off of the rear end of each barrack. The rooms are large well furnished, and adapted to the purpose. One barrack is occupied as

quarters by laundresses and married soldiers. Three frame buildings, situated 80 feet in rear of the men's barracks, are also used as married soldiers' quarters.

The armory, a large two-story brick building with tower, has been tastefully altered into officers' quarters, containing twenty rooms, with kitchens in the basement, so arranged that an officer may have his quota of rooms entirely private from others under the same roof.

Two brick and two framed buildings are used for the storage of public property.

The guard-house is built of brick, and ceiled at the level of the eaves with boards; ventilated and lighted by two grated windows and one iron grated door. The building contains a guard-room, $23\frac{1}{2}$ by $26\frac{1}{2}$ feet, and $10\frac{1}{2}$ feet high, and five cells, each $10\frac{1}{2}$ by $4\frac{1}{2}$ feet, and $10\frac{1}{2}$ feet high. The cells are ventilated by means of apertures in the doors.

A similar building to the barracks, located in the extreme southeastern part of the grounds, is used as a hospital. It affords abundant room for dispensary, office, clothes-room, store-room, dining-room, bath-room, kitchen, steward's quarters, and two large well ventilated and lighted wards, holding twenty-five beds.

The building is warmed by stoves, lighted by windows, and ventilated through the ridge. The wards, one 67 by 23 feet; the other 22 by 23 feet, give 1,157 cubic feet of air space per bed. A small room adjoining the rear of the hospital building is used as a bath-room. There are no water-closets. The dead-house, framed, 15 by 16 feet, is in the rear of the hospital, and still further in the rear are the hospital sinks.

The post bakery is a frame building, 45 by 23 feet, containing a double oven with a capacity for 800 rations.

The post is supplied with excellent water from five wells, sunk from 30 to 60 feet beneath the surface. The water obtained is cool, clear, and soft, being entirely free from all impurities. The wells, together with a large cistern, abundantly supply the demands of the post. As a means of subduing fire, two barrels of water are placed on the roof of each building.

The ground upon which the post is situated being rolling, the natural drainage is excellent. Some artificial drainage is obtained by means of boxed trenches.

Statement showing mean strength, number of sick, and principal diseases at Little Rock, Arkansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	456.33	1,794	1	891	230	.....	243	.....	56	1	108	6
1869	480.25	1,928	3	1,150	228	1	160	1	46	.....	79	4

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

JEFFERSON BARRACKS, MISSOURI.

REPORT OF SURGEON JOSEPH R. SMITH, UNITED STATES ARMY, DATED AUGUST 13, 1870.

The post of Jefferson Barracks, St. Louis County, Missouri, is situated on the west bank of the Mississippi River, 475 feet above the level of the sea,* in latitude $38^{\circ} 28'$ north, longitude

* Major Abbott, of the Engineer Corps, has computed, from monthly means of barometric observations, the altitude of this post as follows:

Willett's Point, on the Atlantic coast, being the lower station of observation, the altitude of this place is 466.5 feet.

Yerba Buena Island, on the Pacific coast, being the lower station of observation, the altitude is 495.7 feet.

The observations at this post, however, serving as data in computing the above, are not strictly accurate.

Railroad levels and former barometric observations show this place to be over 470 feet above mean tide, and I give 475 feet as the altitude, not as being absolutely accurate, but as near as is known, and near enough for practical purposes.

90° 17' west. It is west of south of the city of St. Louis, whose southern boundary, now formed by the river Des Peres, an insignificant stream, at times dry, is three miles distant. The Iron Mountain railroad, passing along the river bank directly through the post, commences at St. Louis and terminates at Belmont, Missouri, where a ferry across the river to Columbus, Kentucky, connects this road with railroads to Mobile and New Orleans. To the south and west, partially incircling the post, at a distance of about ten miles, runs the river Maramec, emptying into the Mississippi.

The greater part of the barracks was erected in the year 1827 by the labor of soldiers. The more modern portion, including the bake-house, quartermaster's store-houses, water-works, (steam-engine and reservoir,) have been erected within a period of time varying from eight to fifteen years.

When the post of Jefferson Barracks was established the neighboring land was a wilderness; St. Louis, the nearest town, (Carondelet is now South St. Louis,) was but a trading village. The Mississippi River, from want of means of navigation, was an obstacle as much as a facility to intercourse, and troops for this post arrived from the East via Chicago and thence down the Illinois River in bateaux, instead of using the now well-traveled highway of the Ohio River. At that time this post was a frontier station, established for the protection of the neighboring population, and was of considerable military importance, an importance which it long maintained. Here at different times during its long military history have assembled expeditions for distant military service, and prior to 1861 scarcely a regiment existed in the United States Army but at one time or other had been here represented, either wholly or by some portion of its organization. The veterans who here commanded in early days have passed away, but far the greater part of the distinguished soldiers yet remaining of our army have some kindly recollection of life and pleasure within these walls; and the names of Grant and Sherman are both associated with the place as having been at one time their military residence. With the progress of years, however, civilization rapidly advanced westward. The valley of the Mississippi, from the outskirts, became the center of a teeming population, when military necessity no longer required the presence of a large body of troops.

During the great civil war extensive pavilion wards were erected for the accommodation of the sick at suitable spots upon the military reservation, and the post was transformed into a large hospital, which in turn became a depot for recruits. For a short time after the war it was again used as a garrison, was soon thereafter abandoned, and finally, in the fall of 1867, was transferred to the Engineer Department, by order of General Sherman, to be used as an engineer depot, garrisoned by one company of the Engineer battalion.

The original military reservation, of which the present engineer reservation formed the middle part, contained between 1,700 and 1,800 acres, extending along the river bank about two miles, and embracing some of the most beautiful sites on the river in the vicinity of St. Louis. The present engineer reserve contains about 450 acres of land, is four-sided, and not far from rectangular, the sides running nearly north and south and east and west. It is bounded on the north by a reservation devoted to the use of the Ordnance Department, on the east by the Mississippi River, on the south by the National Cemetery, and on the west by a series of improved lands. Its river front, or eastern boundary, is about 700 yards long, and its northern and southern boundaries about 1,700 yards. Its western boundary being of nearly the same length as its eastern, its surface rises abruptly from the river, and is generally from 50 to 150 feet above the level. It is rolling, and abounds in what are called "sink holes," circular or oval depressions from 20 to 200 feet in diameter, and from 25 to 75 feet in depth; some of these communicating subterraneously with the river, some of them constantly containing water.

Locust trees of many years' growth shade the parade ground, but are fast yielding to the ravages of time and decay. Young saplings of elm and maple have been set out to supply the place of these old trees, whose place a few years will see vacant. The remaining ground has been mostly cleared of underbrush, leaving large-sized oaks scattered here and there, singly and in clumps, converting the grounds into a great lawn. The vicinity of the reserve presents also a rolling surface. As I have before stated, immediately to the north and south, government land, viz, the ordnance property and the cemetery, adjoin the post, but a mile or two distant north and south, and contiguous to the west, cultivated fields cover almost entirely the face of the country, and attest to the prosperity of the State. The few uncultivated portions are covered by a low growth

of trees and bushes. Grapes have received much attention of late years, and vineyards and orchards are interspersed among the farms devoted to the different cereals. The west side of the river for some distance above and below this place presents no low bottom land, the limestone formation abutting on the river, or at a short distance therefrom. The river is here about a mile wide, with sandy bottom, ever-changing bars, and changing channel; its depth varies, according to the season of the year and the differing years, from 8 to 48 feet. In the spring and early summer the water is deepest, from the spring rains and the thawing of the snow, which latter, taking place later in the distant mountains where the river rises, extends the season of high water here into the summer. Coincident with the low water of later summer and autumn is the prevalence of malarious diseases; in fact, the sickly season of the valley.

Immediately across the river, in the State of Illinois, is an extensive bottom land of several miles in width, of varied wood and prairie, and subject to overflow in the highest stages of water. In one of the statistical reports published by the Medical Department, I find it stated that on the river this bottom "is skirted with forests, varying in breadth from half a mile to a mile, while the remaining space to the high ground consists principally of prairie covered with a luxuriant growth of grass. This prairie is checkered with numerous lakes, and, as the evaporation of water during the latter part of summer exposes the surface of the subjacent soil, a fruitful source of disease is engendered, the influence of which is sensibly felt at the barracks." * * * "At least three-fourths of the persons at this post have had fever this season, (1839,) while at the distance of one mile from the river, a dense forest intervening, there has scarcely been a single case." This is a correct topographical sketch even now, save that farms have replaced parts of the forest there described; but the connection above reported between disease at this post and a source across the river has ceased to exist. For the past two years and three-quarters careful observation has shown that easterly winds coming from the direction of the bottom land above described have not been accompanied by a greater amount of disease than westerly or other winds, nor a change of wind therefrom, by any diminution of disease. I may also add that while during the past year (1869) malarious fevers have been rife here, they have equally prevailed throughout the surrounding country; and I have been called to see professionally many cases of intermittent and remittent fevers occurring several miles in the interior.

The soil in this vicinity is fertile, consisting of vegetable humus, of not generally great depth, resting upon a silico-calcareous clay. This layer increases in depth with its distance from the river. Much of this clay is very tenacious, and the sand hard and sharp, so as to be suitable for the manufacture of fire and other brick. Below the clay we come upon a member of the carboniferous system, known by Western geologists as the St. Louis limestone. This stratum is exposed in horizontal layers, dipping at an angle of about 20° to the northeast. It is estimated to be 250 feet in thickness, and underlies the coal beds of Missouri, from which it is separated in stratigraphical order by a ferruginous sandstone. This thick stratum of limestone is not of uniform composition, but consists of different beds, calcareous, silico-calcareous, and silico-magnesian. It is extensively quarried in the vicinity, and used, according to its quality, for building purposes, for sidewalks, and for the manufacture of lime. Fossils have been found in this formation, and described by Shumard, belonging to crinoidea, zoöphytes, brachiopoda, acephala, gasterpoda, fishes, mollusca, bryozoa, and trilobites. Of these, *Palœtrinus multipora*, *Lithostrotion canadense*, *Echinocrinus nerci*, *Poteriscrinus longidactylus*, and *Atrypa lingulata* are the most characteristic.

The main supply of water for the post is from the Mississippi River. Several springs flow near the river bank, but their water is not used. The only ponds in the vicinity are those heretofore referred to as contained in sink-holes, and those across the river. They are standing water, the center of more or less vegetation, and, as far as I have seen, have exerted no unfavorable sanitary influence.

The climate of this place is variable but not insalubrious. Since the war of the rebellion meteorological registers have not been kept at the post. Daily observations of temperature have been made since I have been stationed here, and from these it appears, that since October, 1867, the maximum shown by the thermometer has been 98°, and the minimum 1°. The exposure of the thermometer was on the north side of a hurricane house, overhung by a porch, to a limited extent,

and freely exposed to the air. The examination of former meteorological records shows the extreme recorded range of the thermometer at this post to be from 102° to 18° , a difference of 120° . The extreme range of the mercury at St. Louis is given by Loomis as 133° , from a maximum of 108° to a minimum of 25° . The mean annual temperature of the post, as calculated from observations for 26 years, from 1827 to 1854, is 55.43° ; and the mean annual fall of rain, calculated from 15 years, observations, (from 1840 to 1854,) is 37.83 inches, divided as follows: In the spring, 10.56 inches; in summer, 12.88; in autumn, 80.2, and in winter 6.37.

The post is on the same isothermal line as Washington, District of Columbia, on the Atlantic coast, and San Francisco, California, on the Pacific, the three places being also in nearly the same parallel of latitude, but while, in most other respects, the climate of Washington and Jefferson Barracks are alike, in nearly all other respects, viz., humidity, amount of rain-fall, range of temperature, and distribution of heat and rain during the year, the climates of Jefferson Barracks and San Francisco are dissimilar. Here the dew point is habitually high, the greatest amount of rain falls in June, and the least in January; the fair days are to the cloudy in nearly the proportion of three to two, and the days devoid of rain and snow to days of rain and snow in about the proportion of thirteen to four, days of rain being seven times more frequent than days of snow; January is the coldest month and July the warmest, the mean temperature of the former month being $32^{\circ} 58'$, and of the latter 78° , a difference of $35^{\circ} 42'$. The wind blows most frequently from the south and least frequently from the northeast; the northwest wind blows with the greatest force and the northeast with the least.

The post occupies about the middle half of the river front of the reservation. The railroad runs along the river bank, 50 feet distant therefrom, and a line of buildings consisting of shops, store-house, &c., runs along the railroad. From this point the ground rapidly rises, attaining an elevation of nearly 40 yards in 100, and on the summit of a ridge extending back several hundred yards and into the valley on either side is situated the main part of the post. Most of the buildings are built of limestone, some of brick, and a few of wood. Surgeon De Camp reports that the post was originally built for twenty-two companies; it has just been repaired and put in order to accommodate a garrison of one company. Three sides of a rectangle are occupied by buildings; the fourth side, toward the river, being open. One building is occupied by the enlisted men as quarters. It is of limestone, substantially constructed, and of most excellent finish. It fronts the parade ground to the east, and is about 120 by 36 feet. It consists of two stories and a basement, the ceiling of the basement being below the level of the ground in front, but the whole of it being open to the west and south. Covered porches, 10 feet 6 inches wide, extend the whole length of both stories on the east and west sides. The first and second stories are occupied by the men as day quarters and dormitories combined, while the basement contains the kitchen, storerooms, cooks' rooms, and dining-room. Originally constructed for officers' quarters, the dividing partitions have been torn down, and each story is now a single room partially divided, the two stories differing in size only by the different thickness of the walls and a slight variation in height. The room on the first or lower floor is $116\frac{1}{2}$ by 33 by 10 feet. Three large chimneys occupy portions of the room, one near the center, and one between the center chimney and either end, and diminish the capacity by nearly 1,000 cubic feet. Short stanchions and a heavy longitudinal beam support the weight of the upper stories, and two transverse walls, with two permanent openings in each, running almost to the ceiling, aid in supporting the weight from above and partially divide the room. These avenues of communication in the transverse walls are 8 feet 8 inches in height, by 7 feet in width. Ten windows on each side and two at each end give light to the apartment, while three doors on each of the long sides afford the means of entrance and exit in front to a brick pavement near the level of the parade ground, in the rear, by a wooden porch communicating below by three stairways, the ordinary route to the mess-room. The floor of the room is wood. In winter this room is heated by six large coal stoves, the pipes entering the upper part of the chimneys, whose fireplaces below are closed up by fire-boards. The only means of ventilation other than doors and windows are semicircular openings of about 7 inches radius, pierced in the bottom of each fire-board. It is difficult to see how these apertures could satisfactorily serve for ventilating purposes. At night oil lamps are used to give light. This room would furnish an actual available space of about 37,179 cubic feet. Forty-two men are assigned to this room, which allows

885 cubic feet per man. The highest number of men ever assigned to this room, fifty-three, would still enjoy each over 700 cubic feet of air space, which is ample.

The second story resembles the first, which it slightly exceeds in size, being 8 inches higher; while the diminished thickness of the walls, as not required to support such great weight, gives a few inches increase in its other dimensions. The doors and windows are the same in number as in the lower story, the windows, however, being 6 inches narrower, while the chimneys and partitions are the same in each story. The dimensions of the second-story room are 10 feet 8 inches by 33 feet 8 inches by 116 feet 6 inches, which would give of clear space 40,680 cubic feet. Forty-three men are assigned to this room, who thus have an allowance of 946 cubic feet per man. This room does not communicate with the room below. Its doors open upon a covered porch, whence three stairways lead below.

The basement is occupied as kitchen, mess room, store-room, and cook's quarters. The kitchen is 24 feet 9 inches by 32 feet 4 inches by 7 feet 6 inches. It is insufficiently lighted and ventilated, having an abundance of windows on one side only, the west. It occupies the entire width of the basement, and is provided with an excellent range, sink, tables, hot and cold water, and all that is needed for cooking purposes. The remainder of the basement is 89 feet in length. It is irregularly divided by a longitudinal partition running north and south, of which the foundations to the chimneys that run through the upper stories form a large part. This part is of course very thick. The remainder is partly of wooden lattice-work. The portion east of this partition furnishes store-rooms and cook's rooms. Its ceiling is nearly a foot below the level of the ground upon the east, and it is but dimly lighted; five windows on the east, opening into narrow grated areas. The west half is the mess-room, and is 14 feet wide by 7 feet 6 inches high. A very thick transverse wall, with a large permanent opening of communication, supports the superstructure, and partially divides the room. Its furniture consists of eight tables and sixteen benches. It is lighted and ventilated by windows and doors, all of which are on the west side. It has seated 130 men at meals. The table is bountifully supplied with good food and a good service. Being crowded, low, ill lighted and ventilated from one side, I regard it as poorly fitted for its purposes. The men sleep on bedsteads made of iron, with longitudinal wooden slats. Their bedding consists of a sack filled with straw, and blankets, and is good in quality and sufficient in quantity. The washing arrangements, or lavatory, are to the rear of the mess-room, and under the porch. They consist of a trough furnished with basins, the water being supplied from pipes connecting with the reservoir.

There is but one privy, a plain board building, situated about 75 feet to the southwest of the quarters, in a sink-hole about 15 feet below the level of the ground. Beneath the building is a large brick vault emptying into a large sewer running to the river. The waste water from the company kitchen follows this course.

The long buildings running east and west were built for soldiers' quarters, and the southwest one was used as such by this command until January last. It was well suited for this purpose, being 369 by 20 by 10 feet, with an abundance of doors and windows on the north and south sides, the direction of the prevailing summer winds, conveniently divided into smaller rooms by transverse partitions, and with ventilating openings in the roof and floors. Basement kitchens and mess-rooms were the greatest objections to its use as soldiers' quarters. The building now used as quarters, which has been above described, required a great deal of change from its former condition as officers' quarters to fit it for its present use. Immediately previous to its occupancy last winter it was entirely torn to pieces inside and renovated, and is now, in general repair and finish, superior to the majority of officers' quarters at military posts. I regard it, however, as faulty in many respects as barracks, and indeed as inferior to the barracks deserted in its favor. The former barracks were cooler in summer, the long rows of north and south apertures promoting the circulation of the prevailing southerly winds—no mean item where the summer climate is as warm as this. The mess-room of the new quarters is very faulty, narrow, and contracted, ill lighted and worse ventilated. In this respect the basement of the abandoned quarters had much the advantage, although the fact remains that basement quarters are never to be commended, and basement kitchens underneath dormitories are particularly objectionable on account of the heat and smell. The quarters now occupied are uneconomical in regard to space, having reference to the arrangement of the beds and the cubic space allowed each, and the heating of the rooms in

winter with the least expenditure of fuel per man. These barrack rooms are nearly 30 feet wide. The unit of construction as to width recommended by Sutherland and other members of the royal commission appointed by the English government for improving the sanitary condition of barracks and hospitals was 20 feet; and when the room was so much lower than 12 feet as not to give 600 cubic feet with 5 feet breadth to each bed, (I quote from the language of their report,) "it would be better to make up the unit of cubic space by increasing the bed space along the walls than by making the room wider." This same principle has been recognized by sanitarians in our own country, and our most perfectly proportioned pavilion hospitals during the late civil war were but 25 feet in width, even when upwards of 1,200 cubic feet were allowed per man. These new quarters are two stories in height. Where land for building purposes is plenty, barracks and hospitals should both be built but one story high. Three stories are worse than two, and two than one. Worse than all the above-mentioned objections, the new quarters are without adequate, or, indeed, any special provisions for ventilation. In all the foregoing particulars the barracks formerly occupied had the advantage over these for which they were abandoned, and the same amount judiciously expended upon them in improvements and repair that was expended on the present quarters would have resulted in barracks more suitable in a sanitary point of view. These faults were incident to the original construction of the altered building, and this is another illustration of the difficulty attending the attempt to transform into suitable barracks or hospitals old buildings not erected therefor.

When I first learned that it was contemplated to make the change of quarters here commented on, I deemed it my duty, although not consulted, to represent to the commanding officer of the post some of the disadvantages attending it; and while the building was undergoing the alterations proposed, again expressed my opinion in the matter. As the late transfer of the post to the Engineer Corps would seem to indicate its permanent devotion to military purposes, it would not seem unreasonable to expect to find its soldiers' quarters, planned and altered since such transfer, conforming to the strictest sanitary requirements; and therefore the more reluctantly do I specify the faults too conspicuous to escape notice.

The laundresses and married soldiers are quartered in one of the long buildings formerly used as soldiers' barracks, and in two small but comfortable frame buildings a few hundred yards south of west therefrom. The main building is of stone, well finished inside, of one story, with basement kitchen, and so divided by partitions as to give nearly every family a large room of nearly 380 feet area. In this room a bed-room is partitioned off, its separating wall not quite reaching the ceiling, while accommodations for cooking and washing are provided in the basement. I have never elsewhere seen laundresses so well provided for.

At the northeast and southeast corners of the parade, and facing thereon, are situated the buildings used as officers' quarters, for which they were originally built. Between them there are no buildings, the parade ground being open to the river side. They are two in number, substantially built of limestone, well finished inside, two rooms deep, two stories in height, with basement and attic. Like the soldiers' quarters, the ground in the rear being lower than in front, the basement is dark and subterraneous in front, but clear and level with the surface in the rear. On the front covered porches, 10 feet 5 inches wide, extend the whole length of both stories. In rear a similar porch is built to the lower story. The building on the south side is divided into two double sets of quarters, two halls running through the building, with communicating rooms on the east side of each hall, and chimneys between the rooms. The north building is differently divided; a hall in the center, with rooms on each side, give one double set of quarters, while each end affords a single set of quarters consisting of a hall with communicating rooms on one side. The rooms are generally about 16 feet square and 10 feet high; on the lower floor they have folding doors. Coal grates and stoves warm them, and windows and doors light and ventilate. Water is supplied by hydrants from the reservoir, but the fall is not sufficient to force the water into the upper floors. A pump in each yard communicates with cisterns. Bath-rooms are provided in but a part of the houses, and privies are built about 60 feet in the rear, covered ways leading thereto; the privy vaults are of brick and mostly above ground; they communicate with sewers leading to the river, and are flushed by the waste hydrant water. They answer well their ends. The north row of quarters have been put in good repair during the past year. The south set are not in first-rate repair.

The adjutant's and commanding officer's office adjoins the north row of officers' quarters; quartermaster's and commissary's office and store-houses, and the smith's shop, are on the railroad, and well built of limestone; other store-houses, and a carpenter's shop, of wood, are in the same vicinity. All of these are well suited for the purposes to which they are devoted. The buildings not heretofore described and occupying the remainder of the quadrangle of buildings are fitted up as store-houses for engineer property, or are vacant.

The guard-house is immediately north of the quadrangle above referred to, and distant about 100 feet; it faces the north, and is 47 feet 8 inches by 22 feet, and two stories high, with a covered porch to the second story, 10 feet 4 inches wide.

Figure 33 shows the general arrangement of the guard-house.

1, lower floor; 2, second floor; C, cells, each 8 by 3 feet by 7 feet 8 inches high; I, implement-room; P, prison-rooms, 20 by 10½ feet and 20 by 23 feet; G, guard-room, 19 by 20 feet; V, veranda.

The cells have brick walls, arched ceiling, and iron doors, the upper half grated. They are destitute of windows; the height of the lower story of the building generally, between the beams, is 10 feet 6 inches. The rooms in the second story are 11 feet 9 inches high. The whole building is warmed by fireplaces and stoves, and lighted and ventilated by windows on all sides, in abundant proportion; the capacity of its prison-rooms, exclusive of cells, is 6,670 feet. The guard-house is sufficiently large, and well suited for the purpose. The average number of prisoners occupying it daily during the past six months has been 10½; the maximum number of occupants has been 16.

There is no hospital belonging to this post, or on the engineer reserve; the former post hospital for Jefferson Barracks is now on the ordnance reservation, and is used as a hospital by permission of General Callender, the commander of the St. Louis arsenal. It is built of brick, on an elevated ridge of land running nearly east and west, about 95 feet above the river, and a little more than 200 yards north of the barracks. About four acres of ground constitute its inclosure; that which is in front, or to the south, being in grass and sprinkled with large oak trees, while that to the north is cultivated for a garden, and contains a stable, cow-house, and chicken-coop.

The hospital is a single building, 122 feet 9 inches by 24 feet 4 inches, and two stories high, with basement and attic. The wards for the sick are on the first and second stories, which are similarly divided, and contain rooms of corresponding size.

For general arrangement of the basement and the first floor of the hospital see Figure 34.

1, basement; 2, first floor over the basement; A, ward; B, bath-room and water-closet; C, closet; D, dispensary; E, steward's rooms; F, mess-room; K, kitchen; L, laundry; M, matron's room; S, store-rooms; X, furnace-room.

It will be seen that the center of the first floor is occupied by two principal rooms or wards extending the whole width of the building, or 21 feet 11 inches from wall to wall; each room

is 35 feet 2 inches long and 10 feet 1 inch high. Four windows on each side give light. The doors are in the corners, in semi-circular walls, running from one room to the next, forming a vestibule between, into which a door from the outside porch gives admission. Fireplaces are at each end, and heat-registers in the floor. These wards are intended for the accommodation of six patients each, giving 1,300 cubic feet of air space per man. The hospital has been rated and reported as one for fifty beds, and this number of patients could be comfortably accommodated by making use of all the available space. It is more than ample for the necessities of this post.

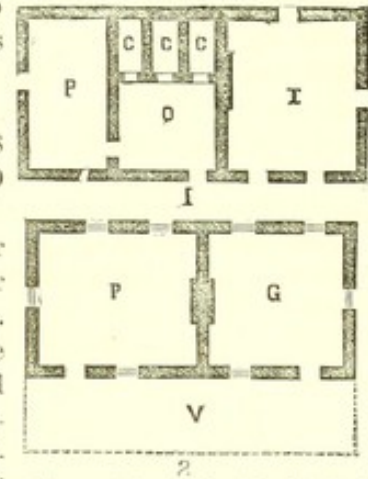


Figure 33.—Scale, 30½ feet to 1 inch.

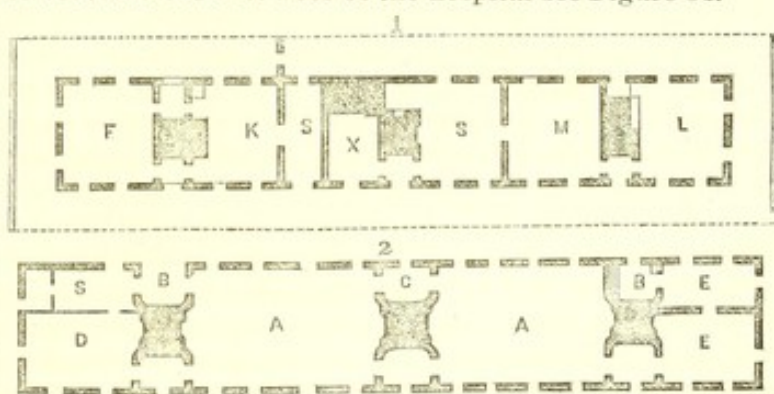


Figure 34.—Scale, 35 feet to 1 inch.

In the vestibules, at the corners of the wards, are situated the lavatories and water-closets, three in number. Fixed bath-tubs and wash-bowls are provided with hot and cold water. The water-closets contain sinks, with hydrants and one urinal, the contents flowing through a system of sewerage to a large sink hole, 300 feet distant from the hospital, which communicates subterraneously with the river. Separate sinks are placed in the basement, and a vault is also dug a few yards in the rear of the hospital for the use of the well. No separate dead-house exists. The dead are laid out and post-mortem examinations made, when necessary, in one of the vacant rooms.

The furnace, a large circular iron stove in a masonry chamber, occupies a central position in the basement, and pipes therefrom terminate at registers in the first and second stories.

The mess-room and kitchen are commodious and well furnished, with a range, hot and cold water, and the necessary articles of that department. Dumb-waiters run up from the basement to the first and second stories of the building. The laundry is fitted up with a washing trough, hot and cold water, and a large stove; the adjoining room is occupied by the laundress.

The attic is divided similarly to the lower stories, and is intended for store-rooms and attendants' apartments; the height from floor to ceiling is 7 feet; the other dimensions are the same as the lower stories.

Oil lamps are used for lighting the hospital at night. Gas-pipes are laid through the building, and gas-works, consisting of a reservoir, and furnace, and retort, were purchased and placed in the rear of the hospital garden. They were never, however, put in position or connected or used, although this could now be done at little expense. The only means of ventilation are by fireplaces, windows and doors. The hospital source of water supply is that of the post. Iron pipes bring the water from the main reservoir and distribute it throughout the building. A smaller reservoir is constructed in the upper portion of the hospital in a purposely built room at the east end. This reservoir room, and on the second floor the room beneath almost inclosed in glass windows, answer well for a conservatory. Two cisterns of 600 barrel capacity collect the water from the hospital roof. Pumps raise the water from the cisterns.

The subject of permanent hospital accommodations at this post is now to be considered. As already reported, the hospital building now used by the Engineer Department is used as such by the sufferance of the Ordnance Department. So long as it can be so used no new one is required. It is impossible for me to say when the necessities of the Ordnance Department may require the hospital building for other uses, especially in view of recent legislation providing for the sale of the arsenal grounds in St. Louis, and the transfer of the arsenal to the grounds on which the hospital is situated adjoining the reserve. In this contingency the post would be left without any hospital accommodations. I commend the matter to the attention of those having power to decide and act. To avoid complication or conflict it would be well to turn over to the Medical Department for permanent occupation as a hospital—general or other—the building under discussion, with the few acres now included in its inclosures; or, if this is deemed impracticable, a new permanent hospital should be built for the use of the post.

The post bakery is a stone building near the commissary store-house on the railroad. It has ovens capable of supplying 1,000 men with bread, and is admirably suited for its purpose. The bread furnished therefrom is habitually of indifferent quality, owing, in my opinion, partly to the want of skill, and still more of attention, on the part of the bakers, who are enlisted men.

No laundry for the post exists. The washing for the enlisted men is done at their quarters by the authorized laundresses.

The chapel is a neat wooden building, 72 by 28 feet, plainly finished; it is, however, of no use, as no chaplain is assigned to the post, and no religious services have been held for a year past. Formerly it was also used for school purposes, but there is now no children's school or provision for the education of children at the post.

The stables are built in the valley to the south of the barracks, from which they are about 100 yards distant. They are built of wood on the simplest plan, namely, a long building, with windowed stalls and forage rooms. They are erected for the use of the horses of a light battery. Their refuse is used to manure the gardens.

The post library is in the building occupied as laundresses' quarters, and contains 254 volumes. The room is also provided with a number of newspapers. A company library contains 94 volumes.

The main water supply is from the Mississippi River. A steam-engine on the river bank forces

water through an iron pipe into four large iron tanks of 60,000 gallons capacity, contained in a brick building immediately west of the barracks, whence, after settling for a longer or shorter time, it is conducted by iron pipes to hydrants conveniently distributed throughout the post. These tanks can be filled daily if necessary, and the supply and use of water be practically unlimited. Ten large cisterns, of 600 gallons capacity each, collect the rain water from the roofs. Four of them are situated near the corners of the parade ground, and six of them in the rear of the different quarters. They furnish an amount of water more than sufficient for drinking purposes for the whole command. River water is, however, habitually used, being preferred by almost every inhabitant of the post. As first pumped from the river it is very muddy, but becomes quite clear after standing 24 hours. As is well known, it ordinarily causes diarrhœa to those first using it, but in a short time becomes a healthy and highly acceptable drink. Ice is put up every winter at the post, mainly floating ice in the river seized while passing. Some winters the ice floating down the river gorges a few miles below this place and ceases its motion, in which case the surface of the river soon solidifies, and ice of a better grade is secured. It is issued to the men for drinking purposes, and with its addition I know of no better water to drink than that of the Mississippi.

The main pipe conducting the water from the river to the reservoir, and which runs up the center of the parade ground below the surface, is tapped for the attachment of large hose to be used in case of fire. Abundance of hose is also provided, and hooks and ladders are conveniently placed for instant use. Patent fire extinguishers are also placed at well-understood spots. They act by the discharge of water saturated with carbonic acid, which is generated by the reaction between carbonate of soda and sulphuric acid. These are very proper precautions, and, in case of fire early discovered, would doubtless prove sufficient. The fall is so little, however, and the head of water from the reservoir so feeble, that in case of a well-developed fire this means of extinguishing would be, in my opinion, practically useless.

The natural drainage of the post is most efficient. The ridge on which the barracks are built slopes in every direction, and the valleys on the north and south run down to the river, thus furnishing a natural outlet for both surface drainage and artificial sewers. Down these valley sewers are constructed into which other sewers from the rear of the quarters and the privies empty, carrying the fluid refuse of the place. Former privy vaults dug in the ground, when within a few feet of the surface, have been filled with soil.

At the reservoir are fitted up seven bath-rooms for the use of the enlisted men, which are compulsorily used twice a week in summer and winter, and oftener if desired. The rooms are warmed in winter, and hot and cold water is supplied. They are open at all seasons of the year and at all hours. During the summer months a certain proportion of the men prefer swimming in the river.

The Jefferson Barracks National Cemetery adjoins the post on the south. It is laid out in rectangular plots which are assigned to soldiers belonging to different States, colored soldiers, prisoners of war, and children. It contains 20 acres and 10,894 graves.

A post garden and a hospital garden are cultivated; the former by the labor of enlisted men detailed for that purpose; the latter by the hospital attendants. The former, including a large portion devoted to corn and potatoes, embraces nearly 25 acres, and furnishes an abundance of all kinds of vegetables to enlisted men and officers. The latter, of near two acres in extent, supplies the hospital with plenty.

Taking for a standard the only true measure of the salubrity of a place, viz., the amount of sickness and mortality, this is a healthy locality. During the twelve months ending June 30, 1870, there have been 117 cases of disease at this post, in a mean strength of 134, and no deaths, or a ratio treated of .872 per 1,000 of mean strength. Of these cases 2 (inguinal hernia) were discharged on surgeon's certificate of disability; the remainder were returned to duty; 59 of these cases, or 50 per cent., were of intermittent fever, and of these 59, 39, or 66 per cent., occurred in the months of August and September. Venereal diseases constituted over 10 per cent. of all diseases.

The duties of the engineer soldiers at this post are very similar to those of infantry soldiers, and their standard of mental attainments the same. Many of those in the company, when I first served here, and of those enlisted in the past three years, have been discharged soldiers from other arms of the service, and no discrimination as to educational requirements has been displayed in

accepting candidates. Some of them are unable to write their own names. (Since writing the foregoing I have been informed by the commanding officer of this post that all candidates for enlistment unable to read and write have been rejected since 1868.) The men regularly mount guard, police the post, do general fatigue work, and are habitually instructed in infantry drill. During the past year miniature earthworks have been thrown up, siege operations imitated on a small scale, and a drill taught on ponton-boats. During a portion of the year certain branches have been taught at an evening school, but I have failed to discover any enthusiasm exhibited by the command in regard to this privilege. An excellent band of six brass instruments has been formed among the enlisted men of the company, and their well selected and performed music is no inconsiderable element in the social enjoyment of the post.

To sum up, then, for the past year this has been and is a healthy post. No epidemics have prevailed, or deaths occurred; the enlisted men are well instructed in military duty; enjoy an abundance of good food, and the solicitous care of their officers; are subjected to no hardships, excessive labors, or punishments, and are maintained in a strict state of discipline. Their quarters and the post generally are kept in a state of excellent police, and proper means taken, as occasion requires, to preserve the good sanitary conditions which now obtain.

Statement showing mean strength, number of sick, and principal diseases at Jefferson Barracks, Missouri, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Veneral diseases.	Rheumatism.	Phthisis.	Catarhal affections.*	No. of deaths.
1868	127.5	191	1	42	39	1	.....	25	5	1	31	1
1869	127	120	.....	62	15	2	4	13	1	.....	5	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

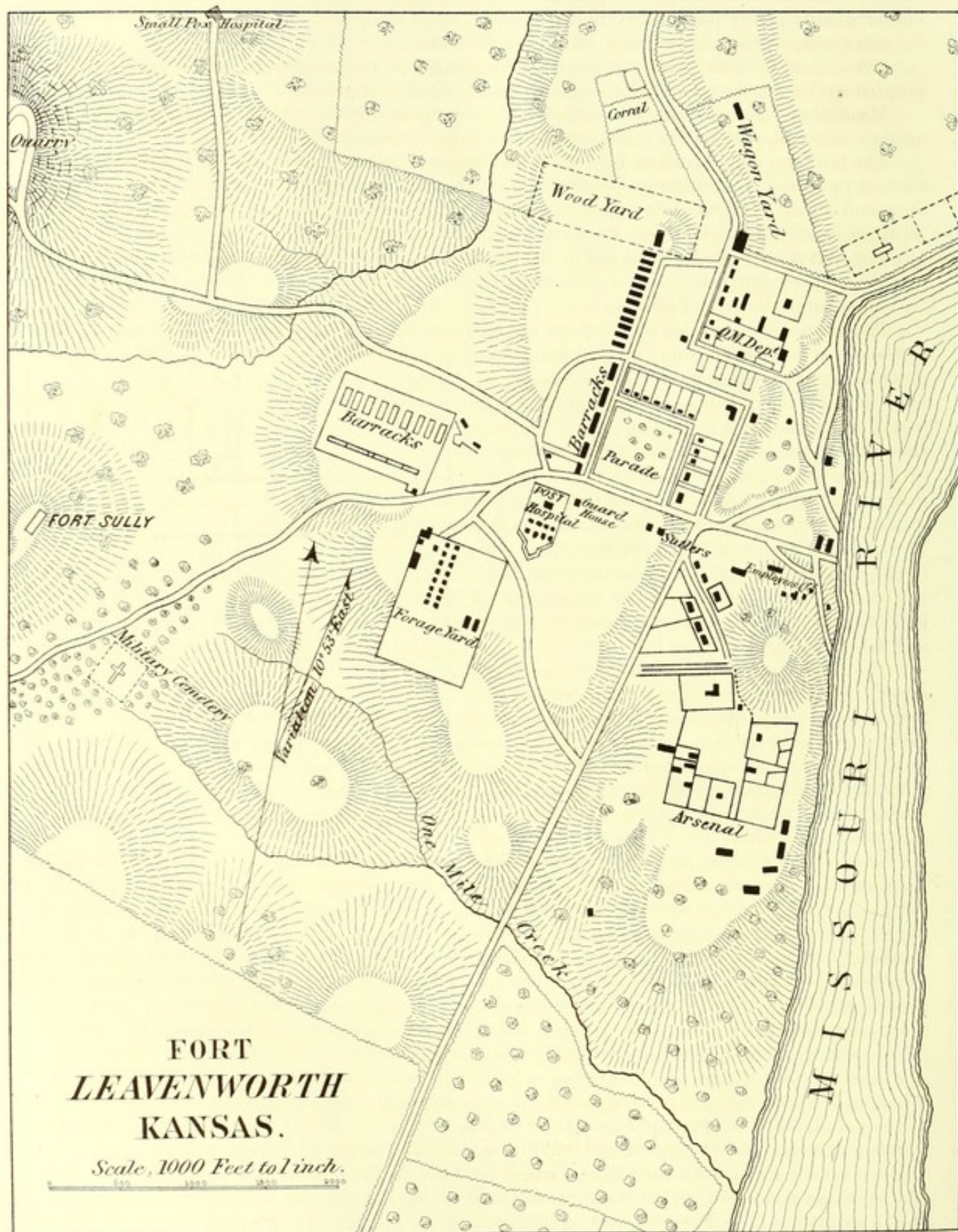
FORT LEAVENWORTH, KANSAS.

REPORT OF SURGEON D. L. MAGRUDER, UNITED STATES ARMY.

Fort Leavenworth is situated on the right bank of the Missouri River, about 500 miles above its junction with the Mississippi, latitude $39^{\circ} 20'$ north, longitude from Greenwich $94^{\circ} 33' 30''$ west. At this point the river is about 300 yards wide, with deep and rapid current. The reservation has not yet been declared. The amount of land held as reserved contains about 6,840 acres.

The fort is situated on the highest point of the undulating prairie, and about 150 feet above the surface of the river, commanding an extensive view of the surrounding country in all directions except towards the west, where it is bounded by a bluff about 200 feet in height.

The soil is very productive, yielding fine crops of cereals annually, without artificial fertilization. The surface is a rich mold, under which is a sandy loam about 20 feet in depth, lying on a stratum of magnesian limestone, 8 feet in thickness. The strata beneath the limestone, from above downward, are clay, 20 feet; blue limestone, 2 feet; blue pipe clay, soapstone, slate, sand conglomerate, and limestone alternating in strata until a depth of 710 feet is reached, when a vein of bituminous coal, 27 inches in thickness, is found. A company has sunk a twelve-foot shaft down to this vein, immediately upon the right bank of the Missouri River, at the extreme southern limit of the military reserve. This company has been granted the right, by Congress, to exclusive mining privileges, for all coal or other minerals underlying the whole military reservation, on both sides of the river, (about 8,000 acres in area.) The company proposes to furnish coal from this vein at 20 cents the bushel, a reduction of 30 cents upon the present price of coal in Leavenworth



PLATE, N^o 6.

French, Langran & Ogilvie, Lith.

City. About fifty feet below the present vein, it is asserted that there is to be found another of similar quality nearly four feet in thickness, which it is said this company intends working also. No other mineral products of value have been found here.

The climate is variable and subject to sudden changes of temperature, but appears to be well adapted to the production of large crops of cereals, roots, and grasses.

Mean temperature for the year 1869, 51.19° F.; extremes, 96° F. and 6° F.; total rain-fall, 28.31 inches; snow-fall, 8.30 inches. The prevailing winds are from the south.

The post was established in May, 1827, by Colonel Henry Leavenworth, commanding a detachment of the Third United States Infantry. At first it was extremely unhealthy, a large part of the command being prostrated by malarial fevers. The post was evacuated in May, 1829, and re-occupied in 1830, being then and for several years known as Cantonment Leavenworth.

The post was originally arranged in the shape of the letter L, but now occupies three sides of a parade, 495 by 490 feet.

The plan is shown in Plate No. 6.

The barracks for enlisted men consist of three two-story frame buildings, with porticoes above and below on the eastern front; each building being intended for two companies, and each set of company quarters having barrack, orderly, and mess-rooms, besides kitchen and store-room. Figure 35 shows the general arrangement of the building.

1, first floor; 2, second floor; A A, laundresses' quarters, 19 by 15 feet; B, bed-rooms, 9½ by 13 feet; C C, halls, 6 by 15 feet; D D, dining-rooms, 31½ by 39 feet; E E, kitchens, 18 by 20½ feet; F F, store-rooms, 10 by 18 feet; H H, sergeants' rooms, 13½ by 16¾ feet; I I, dormitories, 52 by 39 feet; K K, porches. Height of rooms—first floor, 10 feet; second floor, 11 feet.

The only means of ventilation in the dormitories are fireplaces, windows, and doors. On the 20th of June, 1870, the number of men sleeping in each room was as follows: In No. 1, 115; No. 2, 62; No. 3, 71; No. 4, 72; No. 5, 41, and No. 6, 38, the allowance of air space varying from 193 to 586 cubic feet per man. Small detachments of recruits are constantly arriving, and occasionally large numbers are sent off. In the winter a strong barrack odor is present, day and night. In summer, when doors and windows are left open, this is not perceptible.

There are twenty-five sets of laundresses' quarters, twelve of which are in the men's barracks and the remainder in frame cottages, or rather shanties, which are badly ventilated, cold in winter and hot in summer. The north side of the parade is occupied exclusively by officers' quarters, consisting of fourteen sets, as follows: One large two-story frame building, (commonly called "Syracuse Cottage,") contains four sets of captains' quarters; two log cottages, one and a half stories high, with basement, each containing two sets of captains' quarters; one large two-story double brick house, occupied usually by the commanding officer; one two-story frame Cincinnati cottage, one room deep; and lastly, two frame cottages, one and a half stories high, with basement, containing two sets of captains' quarters each. On the east side of the parade is a long block built of stone, one story and a half high, with basement, which contains two sets of field officers' quarters. Near it and on the same side are two Syracuse cottages, similar in all respects to that on the north side of the parade, each containing four sets of quarters; next to the last mentioned is a large brick building, two stories high, partitioned and divided into twelve sets of officers' quarters, and beyond this a similar building intended for quarters for enlisted men, but which is now divided off into offices, above and below. This building was used for office purposes, at the time headquarters of the Department of the Missouri were at this post. Outbuildings are attached to all the officers' quarters, and there is a cistern in the rear of each set. None of them have water-closets or bath-rooms.

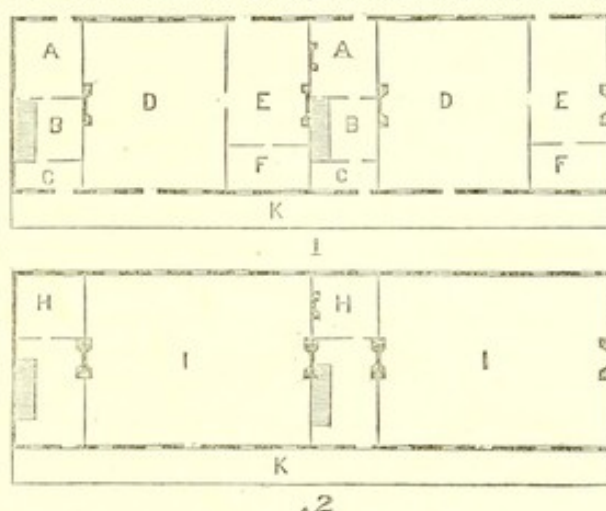


Figure 35.—Scale, 45 feet to 1 inch.

The guard-house is a massive structure of stone, two stories high, the arrangement of which is shown in Figure 36.

1, ground floor; A, general prison-room, $46\frac{2}{3}$ by 20 by $8\frac{5}{6}$ feet; B, porch, 45 by 12 feet; H, prison-room, $46\frac{2}{3}$ by 20 by $8\frac{5}{6}$ feet; 2, second story; B, porch; D, room for officer of the guard; E, cells,

7 by $4\frac{5}{6}$ by $11\frac{7}{12}$ feet; F, hall, 50 by $4\frac{5}{6}$ feet; H, prison-room, 23 by 23 by $11\frac{7}{12}$ feet; H, prison-room, $15\frac{1}{2}$ by $14\frac{1}{6}$ by $11\frac{7}{12}$ feet; K, guard-room, 23 by 23 by $11\frac{7}{12}$ feet.

There are no means of ventilation other than small windows and grated doors. The cells have no ventilation except by the doors.

The post hospital is a two-story brick building, the plan of which is shown by Figure 37.

1, first floor; 2, second floor; A, wards, each $24\frac{1}{2}$ by 20 feet; D, dispensary, 17 by 20 feet; M M, mess-rooms, 20 by 12, and 25 by 27 feet, respectively; K, kitchen, 16 by 20 feet; O, office, 9 by 11 feet; S, store-room; X, pantry.

The wards contain thirty-three beds, giving 410 cubic feet air space to each. Earth-closets have been sent to this hospital.

The post is well supplied with good water. A steam pump is located upon the river bank which throws the water into a reservoir that is higher than any point in

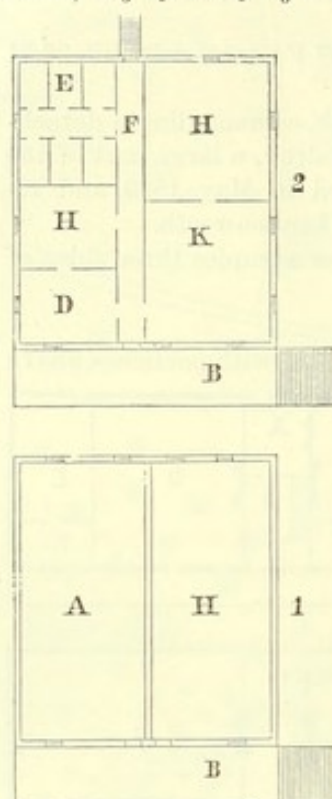


Figure 36.—Scale, 36 feet to 1 inch.

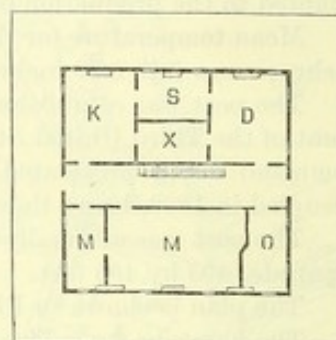
the garrison. Under-ground pipes then conduct the water to the stables, where drinking troughs have been erected, and to the yards of the quarters of two or three of the officers. A water-wagon supplies all places where the pipes do not reach.

Each of the officers' quarters, as well as each barrack for the enlisted men, is supplied with a good cistern, which furnishes, in ordinary seasons, most excellent drinking water throughout the year. There are at the post two steam fire-engines, one under the control of the depot quartermaster, and one at the United States arsenal.

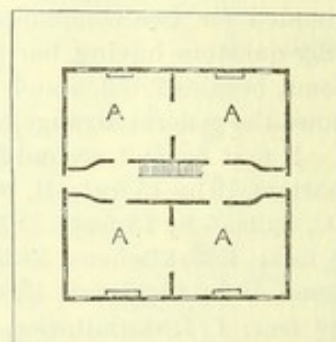
The drainage of the post is very good; natural declivities conduct the water off in all directions from the garrison, and no sewerage has been required. The sinks throughout the garrison consist of vaults dug in the rear of all the habitable buildings, which, when they become too foul, are filled up and new ones dug. Disinfectants are used regularly in all of these, particularly in the summer months, to keep up a constant acid reaction. All refuse at the post is carted about a mile from the garrison and thrown into the Missouri River.

The post garden has been cultivated by detailed soldiers, but during the year 1869 nothing was done in the way of raising vegetables. The hospital garden is cultivated by convalescents and occasional details from the companies, and furnishes vegetables to the hospital in abundance.

The general sanitary condition of the post is good. Malarial diseases prevail in the fall, but they are not of a congestive or malignant type, and yield readily to treatment.



1



2

Figure 37.—Scale, 47½ feet to 1 inch.

Statement showing mean strength, number of sick, and principal diseases at Fort Leavenworth, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	501	763	156	99	22	75	37	3	177	3
1869	362.16	520	167	91	21	32	14	4	53	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT RILEY, KANSAS.

INFORMATION FURNISHED BY SURGEON GENERAL J. K. BARNES AND ASSISTANT SURGEONS G. M. STERNBERG AND L. Y. LORING, UNITED STATES ARMY.

Fort Riley is situated on a high plateau of prairie on the left bank of the Kansas River, immediately below the confluence of the Smoky Hill and Republican Forks, latitude 39° north, longitude $96^{\circ} 30'$ west; elevation above the sea about 1,300 feet; above the bottom land on the east between 50 and 60 feet. From 300 to 600 yards to the northwest is a ridge of secondary or rotten limestone bluffs, from 150 to 200 feet high, from which the post is separated by a small ravine which serves as a drain. To the south and southwest the plateau slopes rapidly toward the Kansas River. On this slope runs the Kansas Pacific railroad.

The valley of the Kansas at this point is nearly three miles wide, the distance from the river to the foot of the plateau on which the post is built being about 2,500 yards. The soil of the bottoms is a pale yellow loam, and very fertile.

The post was established in the spring of 1852, and was at first known as Camp Center, it being very nearly the geographical center of the United States, but was finally called by its present name after General B. C. Riley, United States Army.

The mean temperature for the past 14 years has been 54.49° F.; hottest day July 18, 1859, 109° F.; coldest day January 13, 1862, 29° F. Average difference between wet and dry bulbs 4.98° . Average rain-fall from October 1 to April 1, 5.69 inches; average rain-fall from April 1 to September 31, 17.83 inches. The climate, although subject to great and sudden variations in temperature, is healthy. In summer cool and pleasant nights are the rule, and owing to the dryness of the atmosphere the heat is not oppressive. The winter months are pleasant, except during the prevalence of a norther, and there is little snow-fall. The month of March and the fall months are windy and disagreeable.

The principal wild animals in the vicinity are the deer, antelope, gray wolf, coyote, wild cat, beaver, rabbit, jack rabbit, otter, raccoon, weasel, skunk, gopher, and black and red squirrels.

The birds are prairie chickens, ducks, snipe, doves, blackbirds, plover, mocking bird, hawks, catbird, meadow lark, blue jay, snowbird, woodpecker, and martens.

The fish are catfish, buffalo, whitefish, gar, and sunfish.

The post is built around a parallelogram 553 by 606 feet. The barracks for enlisted men consist of six two-story buildings of hammered magnesian limestone, each intended for one company, and measuring 88 by 40 feet, with piazzas in front and rear for both stories. The first floor is subdivided into rooms for kitchen, dining-room, orderly-room, &c. The second floor consists of one room 85 by 37 feet, and 11 feet 9 inches high, lighted and ventilated by six windows on each side, each 6 feet 6 inches by 3 feet 8 inches. At each end of the dormitory is a fireplace, which, however, is not used, stoves having been substituted. Each dormitory contains 37,740 cubic feet, which gives 539 cubic feet to each man on an average occupancy of 70. The latrines are from 100 to 300 feet distant, and have walled vaults about 20 feet in depth.

The guard-house is a two-story stone building, 43 by 20 feet, and totally unsuited for its purpose. Its arrangement is shown in Figure 38.

The quarters for married soldiers consist of nine log huts, two frame cottages, and one two-story frame building. The officers' quarters consist of six buildings of hammered stone, two stories in height, and measuring 60 by 40 feet, five being intended for two sets of quarters each, the sixth for the commanding officer. All of them have a piazza in front and rear for the lower story. The kitchens are separate buildings in the rear, each with a good cellar underneath. All the quarters are well finished.

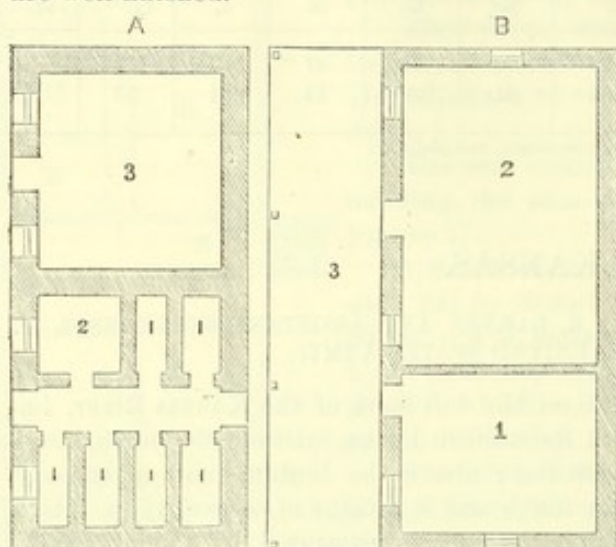


Figure 38.—Scale, 18 feet to 1 inch.

having basements or cellars about two-thirds their extent. The north end of each building is subdivided into several rooms designed for offices and sleeping apartments. The remaining portion constitutes one large room for storage purposes. The cellars are commodious, being well adapted for vegetables, &c. Each building is supplied with a hoist. The offices and other small rooms are plastered and whitened. On the top of the roof of the quartermaster's building is suspended a bell in a belfry, by which the employes are directed to go to and return from work. The ordnance building is a one-story stone building, 117 by 18 feet.

The magazine attached to the post is a brick structure, 16 feet square and one story high, with a rock foundation.

The hospital is a large building of magnesian limestone, situated 336 feet east of the middle of the east side of the garrison, and fronting toward the north. It is located on a point of land included between two ravines—one beginning at a point 243 feet to the northwest, and the other at a point 110 feet to the southwest of the building, and both extending east toward the Kansas River. It consists of a main building and wing, and the arrangement is shown by Figure 39.

1, ground floor; 2, upper floor; A, wards; D, dispensary, 20 by 17½ feet; O, office, 18 by 21½ feet; S, store-room, 17½ by 21½ feet; B, bath-room, 17½ by 21½ feet; K, kitchen, 18½ by 19½ feet; M, mess-hall, 17½ by 21½ feet; P, porch; Z, covered porch. Height of room in the main building 12 feet; in the wing, 11 feet 10 inches. The rooms in the second story are 9 feet 10 inches high.

The ward occupying the ground floor of the main building measures 20 by 17½ feet; those in the wings are each 21½ by 17½ feet in size. The upper story rooms are 17½ by 20 feet. The rooms in the second story of the main building are used as wards, two having a cubic capacity of 3,744 feet each, the other two each 3,364 feet. The windows to the rooms on the first floor are each 3 feet 8 inches wide, and 6 feet 6 inches high, having twenty-four panes, and are 3 feet 2 inches from the floor. The windows on the second floor are each 3 feet 8 inches by 4 feet 6 inches—having sixteen panes, and are 2 feet 5 inches from the floor. All of the windows have green shutters. Each

A, first floor; 1, cells, 3 by 7 feet; 2, cell, 7 by 7½ feet; 3, prison, 16 by 7 feet; B, second floor; 1, guard-room, 14 by 17 feet; 2, guard-room, 16½ by 25½ feet; 3, porch, 10 feet wide.

A broad stairway leads to the porch in the second story, the porch being covered by an extension of the roof of the building. The commissary and quartermaster store-houses are two frame buildings, one story high,

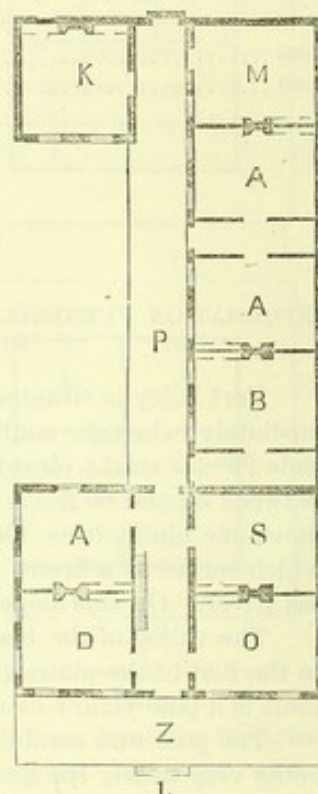


Figure 39.

of the eight rooms comprising the main building has a fireplace, mantelpiece, and closet, casemates to the doors and windows, and washboards, the wood-work being grained.

Above the second story is an attic extending the length of the building, unfinished, with a square hole opening into the hall and four apertures in the main wall at each end of the building. The hall has a door at either end, forming entrance and exit. The hall on the second floor has a window at either end. In front of the hospital is a porch, one story high and ten feet wide, which extends the length of the building. It is raised from the ground about two feet and a half; has a shingle roof, which is supported by six wooden columns with banisters between.

The kitchen is a separate building, which is connected with the wing by a covered porch, ten feet wide, extending the length of the latter. The walls of the cellar form the foundation of the kitchen, which is well supplied with closets, cooking-range, &c.

The various rooms and halls of the hospital and the ceilings of the porches are plastered, and in some instances whitewashed. The floors are of yellow pine, and the wood-work generally is of pine.

A stone building, 12 by 14 feet and 16 feet high, is situated 115 feet east of the hospital, and is well adapted for a post-mortem room. It has one small window and a door. The privy is a building similar in extent, and situated 22 feet south and 92 feet due east of the kitchen. It is divided into two unequal sections, each having one door and one window and a seat. The vault underneath corresponds in area to that of the building, and is about 18 feet deep, with stone walls, but has no conducting shaft.

There are five stables built of stone, each 256 by 39 feet, running north and south, and parallel to each other. They are 62 feet apart, and contain over 100 stalls each.

Reading rooms and libraries are attached to the post. They contain over 700 volumes.

The water supply is from 19 cisterns, 5 wells, and from the river by means of water-wagons. The cisterns are about 30 feet deep by 12 feet in diameter, and have stone bottoms with cement walls. They receive the water from the various buildings, there being one to each barrack and to each double set of officers' quarters. They have no filterers, but the water is of good quality. The wells have an average depth of 58 feet. The water is alkaline and of poor quality. The wells are in bad repair, and the water is seldom used. The water from the river, when the latter is high, is soft and of good quality, when it is allowed to settle; but when the river is low it contains many impurities, and is very disagreeable.

There is no system of artificial drainage. The elevation and slope of the grounds, and the numerous small ravines and gullies giving very good facilities for natural drainage.

It has been the custom of the men to bathe in the river, where they are exposed to the sun's heat by day and to miasmatic influences in the morning or evening. It has been recommended that arrangements be made to allow the men to bathe near their quarters, but as yet nothing has been done in this respect.

Each company cultivates a garden, which supplies the garrison with vegetables. The hospital garden has been a failure for the last two years. Several cows are kept for the garrison, and one for the hospital. Each company has its library.

The surrounding country is being rapidly settled. Junction City, a flourishing town, lies three miles to the west. The nearest Indians are the Pottawattomies, who are on a reservation and are becoming civilized.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Riley, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (nine months).....	100.77	115	1	14	16	3	.....	.....	9	5	1	20	.....
1869, (eleven months)....	244.63	529	.....	94	143	14	1	5	24	15	.....	60	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Riley, Kansas, for the year 1868.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (four months)	490.5	291	38	29	26	22	24	11	1	57	6

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT HARKER, KANSAS.

REPORT OF SURGEON B. E. FRYER, UNITED STATES ARMY.

Fort Harker is situated on the open prairie in a reservation of sixteen square miles, latitude $38^{\circ} 45'$ north, longitude $98^{\circ} 15'$ west from Greenwich, and height above sea level 1,856 feet. A mile south, and flowing through a part of the reserve, is the Smoky Hill River, with a general course here of south-southeast. This river receives water from several small creeks in the vicinity, those discharging into it from the north draining large tracts of country. Its banks in many places are quite high and everywhere steep, and about one hundred feet apart, while its sandy bed is rarely occupied by water for more than one-quarter of its breadth, with an average depth of about two and a half feet, although at times the stream rises very suddenly and rapidly, coming up as much as six or eight feet in as many hours, and often subsiding almost as quickly. During these risings, which often occur from heavy rains west and north, the water brings down, mixed with it, enough mud to produce a good deal of turbidity; at other times it is clear, though holding in solution salts (principally chlorides) in quantities large enough to preclude its use for drinking purposes, although horses and cattle seem very fond of taking it, and apparently suffer in no way from so doing. The Smoky Hill River, as is the case with all the smaller creeks and streams, is fringed with a growth of timber, not generally extending more than twenty yards from its banks. Trees are seen here in no other place than on the water-courses.

Forty miles south is the Arkansas River, on which are Fort Zarah, (lately abandoned,) distant 42 miles; Fort Larned, southwest 75, and Fort Dodge, 130 miles. Tributaries to the Arkansas drain the country south of here to within ten miles of the Smoky Hill River. The Saline and Solomon Rivers, which are northward twenty and sixty miles respectively, flow through wide and beautiful valleys, which are rapidly being filled up by settlers.

The Kansas Pacific railway runs through the reserve about three hundred yards north of the post, and all regular trains east and west stop at the depot, which is but one-third of a mile north-east of the garrison. The following important stations are on the line of the Kansas Pacific railroad eastward: Topeka, 152 miles distant; Fort Riley, 93 miles; Junction City, 90 miles, and Saline, 36 miles. Fort Hays is 65 and Fort Wallace 180 miles west. The travel on the railroad has been somewhat interrupted in the winter by snow filling the cuttings, and by the washing away of the tracks and bridges by floods in the summer, though the delay has never been very long from these causes. The Indians tore up a few hundred yards of the track in the summer of 1869, forty miles west, but this damage was soon repaired. A mail is due here every evening from the west and each morning from the east. Letters reach headquarters of the department in thirty-six hours.

No official record can be found at the post showing the date of its establishment, or anything relating to its earlier garrison. It is said to have been commenced in 1864 by Iowa volunteers, who, it is thought, did duty here until the fall of 1865, when relieved by part of the Thirteenth United States Infantry.

The site of the post was, until January, 1867, a mile southwest of the present buildings, on the north bank of the Smoky Hill River, at the crossing of the old Santa Fé stage road, and up to November, 1866, was known as Fort Ellsworth. General Orders No. 22 of Department Headquarters, dated November 17, 1866, directed a change of name to that of Fort Harker. In December, 1866, a location for the new post of Fort Harker (named after and in honor of General Charles G. Harker, killed during the rebellion) was selected, and a move made to it as soon as the buildings were ready for the men, several of the officers living still at the old post and going to and fro to duty for some time, until their new quarters were ready for occupation.

The principal buildings composing the post are located near the center of the reserve, and are arranged on the sides of a rectangle 252 by 120 yards. The parade ground inclosed by the buildings is well laid out, and divided by graveled walks, and margined by a broad roadway. Trees have been planted, and are growing well.

The surface of the reservation and vicinity is generally rolling prairie, diversified on the southern and southeastern borders by bluffs which overhang the banks of the Smoky River. Grass grows here luxuriantly. On the higher prairie the "buffalo" grass only is found. On the low lands the "blue" variety reaches often a height of six feet.

The object of establishing the post appears to have been to furnish a point from which operations could be carried on against the Indians, who were very troublesome during the greater part of the rebellion. The Kansas Pacific railway had been commenced, was advancing west, and required protection for its working parties. Part of the duty of the present garrison of the post and of Fort Hayes is to guard several of the more unprotected stations on the railroad west of here.

After a move to the new site had been completed a depot of the Quartermaster's and Commissary Departments was established here, and two large store-houses were erected close to the railroad track for their use. From these depots, during the greater part of the years 1867 and 1868, all the posts on the Arkansas, and many in Colorado and New Mexico, were supplied.

On the 28th of June, 1867, epidemic cholera appeared, the first case occurring in the person of a herder and butcher working for the beef contractor. Several cases quickly followed in the garrison. No new cases occurred after the middle of August, the disease being stamped out by the efforts of the several medical officers on duty here at the time, and whose reports, published in Circular No. 1 of 1868, from the Surgeon General's office, give a full history of the epidemic. It is estimated that two hundred persons died at the post and in the vicinity.

Cholera has not since shown itself. It was feared, however, that possibly the disease would recur in the warm weather of the following year, (1868;) that, away from its original *habitat*, it might have formed, as it is believed to have done elsewhere, the elements necessary, as regards atmospheric and telluric conditions, to an endemic abode here, or that it might, as was doubtless the case in 1867, be brought from places east, and every effort was directed to keep the post and its garrison in the best sanitary condition to prevent it. The closest attention to cleanliness was given, a thorough state of police kept up, every sink in the garrison, both of officers and men, was disinfected daily just before sunset, and the food of the men regularly inspected.

The geological formation of this vicinity belongs to the cretaceous period, the strike of the strata extending from northeast to southwest, from above the Republican River, to below Fort Zarah on the Arkansas. The formation is rather monotonous, its rocks consisting for the most part of red sandstone, often very compact, and containing iron in large quantities, large beds of loose sand, conglomerate limestone, both of the shelly and compact varieties, and clay. Coal in variable quantities has been found, and also a fine variety of potter's clay. Fossils are not very numerous. A few teeth of sharks and saurians, and some vertebræ of fish, have been found about 20 miles west on the river. The limestone beds contain inoceramus and gryphæ. Leaf impressions, (all exogenous,) in a good state of preservation are somewhat numerous in the red sandstone. About sixty species have been collected, principally of the oak, tulip tree, willow, poplar, and sassafras, all directly allied to existing species of our forest trees. Several of the species found are believed to be new.

The soil here is a rich sandy loam, averaging from two to three feet thick, and is very fertile. It is underlaid by a bed of sand, varying from 4 to 12 feet.

The following gives a moderately complete flora of this vicinity. Several species, believed to

be new, remain to be described, and from some of them it will probably be necessary to construct new genera. The edible plants and those bearing edible fruit in the list are marked.*

TREES.

Ulmus americana, (white elm.)
Ulmus fulva, (slippery elm.)
Populus monilifera, (cotton wood.)
Fraxinus americana, (white ash.)
Juglans nigra,* (black walnut.)
Quercus alba, (white oak.)
Quercus castanea, (chestnut oak.)
Negundo aceroides, (box elder.)
Cercis canadensis, (red birch.)
Gymnocladus platycarpa, (coffee tree.)
Salix lucinda, (shining willow.)
Salix discolor, (glaucous willow.)
Morus rubra,* (mulberry.)
Prunus chicasa,* (white plum.)

SHRUBS AND VINES.

Rubus canadensis,* (dewberry.)
Rubus occidentalis,* (black raspberry.)
Ribes hirtellum,* (wild gooseberry.)
Ribesia aureum,* (buffalo currant.)
Sambucus occidentalis,* (common elder.)
Prunus virginiana,* (choke cherry.)
Vitis cordifolia,* (frost grape.)
Rhus glabra, (smooth sumac.)
Cepanthus occidentalis, (button bush.)

HERBS.

Anemone caroliniana, (wind flower.)
Delphinium azureum, (azure larkspur.)
Argemone mexicana, (prickly poppy.)
Sinapis nigra, (black mustard.)
Viola cucullata, (common violet.)
Portulaca oleracea, (common purslane.)
Malva papavera.
Callirhoe alcaoides.

Oxalis violacea, (violet wood sorrel.)
Oxalis stricta, (yellow wood sorrel.)
Psoralea floribunda.
Astragalus mexicanus,* (prairie pea.)
Lathyrus palustris, (marsh vetchling.)
Baptisia australis, (blue false indigo.)
Baptisia leucantha.
Baptisia leucophaca.
Tephrosia virginiana, (goats' rue.)
Tephrosia hispida.
Schrankia uncinata, (sensitive briar.)
Rosa lucinda, (dwarf rose.)
Oenothera sinuata.
Opuntia missouriensis,* (prickly pear.)
Helianthus, (a species of wild sunflower.)
Senecio vulgaris, (common groundsel.)
Troximon cuspidatum.
Hymen opappus, (a species of.)
Penstemon digitalis.
Penstemon pubescens.
Penstemon grandiflorus.
Verbena, (a species of.)
Lippia nodiflora.
Lithospermum hirtum, (hairy puccoon.)
Sida, (a new species.)
Lithospermum longiflorum.
Onosmodum, (a species of.)
Asclepias cornuti, (common milkweed.)
Asclepias tuberosa, (butterfly weed.)
Scilla fraseri, (wild hyacinth.)
Alium striatum.
Alium, (species not described.)
Tradescantia virginiana, (spiderwort.)
Tradescantia, (species not described.)
Yucca filamentosa, (Adam's needle.)
Chenopodium album, (lamb's quarters.)
Calystegia leucom, (hedge bindweed.)

The animals of the vicinity are as follows: The silver or prairie mole, American wild cat, gray wolf, prairie wolf or coyote, prairie fox, common skunk, American badger, raccoon, western fox, squirrel, striped gopher, prairie dog, American beaver, white-haired or Canada porcupine, prairie hare, gray rabbit, American elk, prong-horn antelope, and buffalo.

Birds.—Turkey buzzard, duck hawk, prairie falcon, sparrow hawk, blue-backed hawk, red-headed woodpecker, night hawk, belted kingfisher, cow bird, meadow lark, common crow, wild turkey, (probably two species,) pinnated grouse or prairie chicken, quail, sand-hill crane, killdeer, English or Wilson's snipe, brown-fronted goose, Canada, or wild goose, mallard duck, green-winged teal, and blue-winged teal.

Reptiles.—Snapping turtle, horned toad, black snake, prairie rattlesnake, harlequin snake, (rare,) salamander.

One or two species of the catfish are found in the river.

The mean temperature, as obtained from three years' observations is 51.36° F.; highest point reached by the thermometer during that time, 102° F., on the 6th of August, 1869; lowest 7° below zero, on the 22d of December, 1869. The greatest variation in twenty-four hours took place between the 15th and 16th of January, 1870, when the mercury fell from 35° to zero. These sudden changes in temperature are not very frequent.

Average annual rain-fall for three years, 14½ inches; average number of days' rain, 35; 66 per cent. of which fell in the early spring and summer months. Though the average fall is low and the majority of rains light, large quantities of water, at times, fall in short periods. In

June, 1869, three inches of rain fell in four hours. Snow-storms are of short duration and rare occurrence. Hail-storms are rare, but when they do happen the hail-stones are remarkable for size. In June, 1868, hail-stones fell $2\frac{1}{4}$ inches in diameter, and none of a less diameter than half an inch have ever been seen.

The prevailing winds are from the south and southwest, and north and northwest, and they generally give dry weather; the north and northeast winds at all seasons bring rain or snow.

The following shows the direction of the wind in one hundred and six rains:

N.	NE.	E.	SE.	S.	SW.	W.	NW.
16.	17.	12.	14.	14.	9.	6.	18.

No accurate observations have been made as to the force or velocity of the winds. A good anemometer would, it is believed, show a very high average. The atmosphere is remarkably dry and bracing. Meat cut in slices and hung in the wind can be cured at almost any season. Fogs are very rare, and occur only in autumn. The winters here, though occasionally severe, seldom last long, the cold weather rarely beginning until January, and often ending in six or eight weeks. The summer, which may be said to begin in April, continues until the middle or end of October. The heat is seldom oppressive, being rendered more endurable by the winds.

There are four sets of quarters or barracks at the post, two of balloon frame, boarded and battened, and the others of logs. Each set of quarters is intended to accommodate one company, and has its kitchen, mess-room, &c., in the rear. The frame barracks were built in the fall of 1868, are at the west end of the garrison, and are unlike in plan. The barrack building proper is 117 by $22\frac{3}{4}$ feet, $9\frac{1}{4}$ feet high to eaves, and $16\frac{1}{2}$ feet to ridge, and is divided through its middle by a first sergeant's room, 14 feet by 8 feet 10 inches, and an entry into two dormitories, each $54\frac{1}{2}$ by $20\frac{3}{4}$ feet. Each dormitory has six windows, (two on the sides opposite each other, and two at each of the ends,) 5 by 3 feet, and three doors, 6 by 3 feet. These dimensions are all from internal measurements. The dormitories, entry, and sergeants' room are lathed and plastered up to the eaves; above which they are open to the roof, which is well shingled. Through the peak of the roof an opening, 3 feet 9 inches square, has been made, on the "ridge plan," for ventilation. A brick chimney, with an internal diameter of 12 inches, also pierces the roof of each dormitory. A building in rear of the dormitory, and at right angles to it, 65 by $19\frac{1}{2}$ feet, is divided by a plank partition into a mess-room, 45 by $19\frac{1}{2}$ feet, and a kitchen, 20 by $19\frac{1}{2}$ feet, both having a height of $9\frac{1}{4}$ feet to eaves. The mess-room has six windows, 5 by 3 feet, three on a side and opposite. In the kitchen are two windows. The kitchen and mess-room communicate through a door, 6 by 3 feet. The mess-room walls are lathed and plastered. The lumber in these buildings is white pine. The sills rest on brick pillars $2\frac{1}{2}$ feet above ground, which gives a clear open space for the circulation of air beneath the floors. The walls are lime-washed, both internally and externally.

The two sets of log quarters were built in the spring of 1867, on the stockade plan, each set having its own mess-room and kitchen. The barrack-room proper of these quarters is $99\frac{1}{2}$ by $19\frac{3}{4}$ feet, and $9\frac{1}{4}$ feet high, (the roof is nearly flat,) giving a total air space of 17,488 cubic feet, and has five windows on each side and opposite, $4\frac{1}{2}$ feet by 2 feet 9 inches, and three doors, $6\frac{1}{2}$ by $2\frac{3}{4}$ feet. At the east end is an orderly sergeant's room, $12\frac{1}{2}$ by $19\frac{3}{4}$ feet. The spaces between the logs are filled with plaster on both sides, and lime-washed inside and out. The roof is of logs, the inner ends of them resting on a heavy ridge log, supported by stout posts; the outer on the wall, though carried four feet beyond it. Earth nearly a foot thick covers the logs, with a layer of hay intervening to prevent the finer particles of the earth from falling through. Four chimneys, with internal diameters of 12 inches, pierce the roof. A log building, constructed in the same way, in the rear, 60 by 19 feet, $9\frac{1}{4}$ feet high, is divided into mess-room and kitchen by plank partition. The floors of all the log buildings at the post are one inch plank, on 3 by 4 inch scantling, which rests upon the ground.

The warming of the barrack buildings is by stoves, burning wood, the pipes entering the chimneys $6\frac{1}{2}$ feet from the floor.

Artificial light is obtained from candles.

The ventilation of the barracks is natural and is believed to be sufficient, as the continuous high winds move with velocity great enough to remove and renew the air in an ordinary building here, with sufficient frequency for its complete purification. The barrack dormitories all face north

and south, the more general direction of prevailing winds, and, the windows being opposite, give good cross ventilation, as during three-fourths of the year these can be left open. Even in the cold weather, which would require a closing of the windows, the force of the wind is sufficient with openings in the roof and with the chimneys to secure a continuous and frequent change of the air. The accidental openings, such as spaces between window frames and walls, also give entrance and exit to the air.

The floor of the log barracks, resting as it does almost on the ground, is, of course, a very objectionable feature, and in a damp climate would produce marked results, but in this dry atmosphere its effects on the occupants have not apparently been hurtful.

Though the ventilation of the barracks is believed to be sufficient, the mode of effecting it is deemed objectionable; the whole subject seems to have had very little attention given it in the construction of the barracks at the post. The simpler and better plan of the ridge openings for summer, with shafts carrying the stove pipes for winter, might readily have been given to all of these buildings.

The average air space per man in the frame quarters is 400 cubic feet, and in the log barracks 350 cubic feet.

The bunks, which are similar in all the dormitories, are double and two-tiered. This, as is well known, (aside from any immoral tendency,) is a most objectionable form of bed. All barracks should be constructed so as to give a sufficient area of floor to allow a separate bed to each man placed on it.

The bunks are provided with bedsacks filled with hay, (often changed.) The blankets furnished the men are good and sufficient. All the bedding is frequently sunned and aired.

There are no separate wash or bath-rooms attached to the men's quarters. The means for bathing are limited. This must be the case at many posts at which, like this, water has to be transported in water-wagons from the source of supply to the various parts of the garrison. A recommendation has been made by the post surgeon that a bathing-house for the enlisted men be put up near the spring from which the post is supplied, where abundance of water can be let into tubs at all times, while the elevation of the suggested site is sufficiently great to furnish the best drainage for all refuse water into a small creek at the foot of the hill. The order for the erection of this building has been issued. In the warm weather the men bathe in the Smoky River.

All the company quarters have sinks 150 yards to the rear. These sinks are of frame over a pit ten feet deep into which a box is sunk; and their dimensions are 13 by 8 feet and 8 feet high. They are divided by a partition through the middle so as to give a double row of seats. The best police is maintained, and disinfectants are used daily during the warm season.

The company kitchens are moderately well adapted for the purpose. Those of the log buildings have too few windows to light and ventilate them well.

The mess-rooms of the frame barracks are very suitable; those of the log quarters have the same objections as the log kitchens.

There are eight buildings, all frame, occupied as quarters by married soldiers and laundresses. Several of these buildings were put up as work-shops and mess-houses for quartermaster's employés. None of them are well adapted for the purpose to which they are applied.

Nine buildings at the post are used as quarters for officers. Three of them (one story) are built of red sandstone. The largest of these stone buildings contains eight rooms and a kitchen, and is occupied by the commanding officer. Each of the other two stone houses contains four rooms and a kitchen. The remaining six sets of quarters are frame. Three of them are two-storied and have six rooms; the others contain each five rooms on one floor. All of these quarters are well plastered and painted, and are moderately comfortable dwellings. Each building is intended to accommodate one family, or one mess, there being but one kitchen to each; in consequence of the number of officers at the post, however, in several instances two families occupy one house and mess together. Water is supplied to these quarters from the spring, a short distance west of the post, by wagons. There are no bath-rooms proper in any of the houses. The officers' quarters are all heated by wood-burning stoves.

There are three large frame store-houses at the post, one each for quartermaster, commissary, and ordnance stores. The quartermaster's store-house is 200 by 50 feet, and 12 feet high to eaves. It is substantially constructed, dry, and well ventilated. The commissary warehouse is 150 by 50 feet. Both buildings are close to a side track of the railroad, so that cars can be unloaded into

them, and both are admirably adapted for the purpose of storing large amounts of supplies. The ordnance store-house, 45 by 19 feet, and 10 feet high, is 100 yards north of the parade ground.

A large well constructed ice-house, (frame,) with a capacity of 400 tons, was put up in the fall of 1867. Ice of fair quality is cut from Smoky Hill River, and the building is filled every winter. Liberal issues are made to the hospital, companies, and to officers, daily during warm weather, by the quartermaster under whose charge the ice-house is placed.

The guard house, a substantial two-story stone building, is at the west end of the parade ground. The upper floor is divided into two large rooms, one $17\frac{1}{2}$ by 12 feet, and $9\frac{1}{2}$ feet high, the other 13 by $17\frac{1}{2}$ feet, and $9\frac{1}{2}$ feet high, and six small cells, each 7 by 3 feet, and $9\frac{1}{2}$ feet high. This floor, which is reached by an outside staircase, has three windows. The lower story is divided into three rooms, a guard-room, 26 by 15 feet, and 9 feet high, a non-commissioned officers' room, 13 by $8\frac{1}{2}$ feet, and a small tool-room. The guard-room is provided with three windows. The ventilation of the cells is defective, and it is difficult to remedy this effectually in the present building without giving many of the more daring prisoners chances to escape. Hygiene is not incompatible with security in guard-house buildings, and it is thought more consideration of this important subject might be well had in planning them and in their construction.

The post hospital, a substantial building of dressed sandstone, 200 yards south of the garrison, fronting west, is, with a few unimportant exceptions, built after the plan prescribed by the Surgeon General in Circular No. 4, of 1867. The front part of the administration building is one story and a half (attic) high, and is $48\frac{1}{2}$ by 38 feet, with a height of 34 feet. The lower story, 14 feet high, is divided by a hall, 7 feet wide, running from front to back, and a cross entry connecting the wards, of the same width, into dispensary, 18 by 15 feet; steward's room, 15 by $14\frac{1}{2}$ feet; two offices, each 15 by 8 feet; and a store-room for medicines, &c., 18 by 15 feet. The attic, which is reached by a stairway, 3 feet wide, is 8 feet high to eaves, and open 12 feet to ridge. This floor is divided by a hall, 9 feet wide, into two rooms, one 20 by 20 feet, used as a dormitory for attendants, and the other, 15 by $14\frac{1}{2}$ feet, as a store-room for linen, bedding, clothing, &c. The rear portion of the central building is of one story, 40 by 18 feet, and 14 feet high to eaves. It is divided into a mess-room, 18 by 12 feet, kitchen, 18 by $15\frac{1}{2}$ feet, and commissary store-room, 18 by $11\frac{1}{2}$ feet. These rooms open into each other, and are reached through a door from the hall in the central building.

The two wings, in which are the wards, are each 51 by 24 feet, and 14 feet high to ceiling, and have an air space of 17,136 cubic feet. Each ward has ten windows, 7 by 3 feet. Through the ridge, which is 20 feet above the ward floor, is an opening, 10 by 3 feet, with an arrangement of slats, on the Venetian-blind plan, for closing in cold weather. The ward in the south wing has at its southern end a room partitioned off, 8 feet square. Each ward has two chimneys, with openings for stove-pipes. A good piazza, 9 feet wide, extends the whole front of the building. The roof of the hospital is well shingled.

The store-room for medicines and hospital stores, a light, dry room, is back of the office, separated by the cross entry. It is well provided with shelves neatly painted. The steward's room is in rear of the dispensary, is well lighted by two windows, and contains a good closet.

The mess-room is well furnished with tables and benches, neatly painted and varnished. The mess furniture, such as knives, forks, spoons, plates, bowls, &c., is of good quality, and sufficient.

The kitchen is thoroughly supplied with furniture and fixtures. The cooking is done by a large wood-burning stove.

The wards are each furnished with twenty beds, with an average air space per bed of nearly 900 cubic feet. Not more than a third of the number of beds are ever occupied, however. Bed ticket-frames are attached to all the beds, and in them are placed cards giving the occupant's name, rank, company, and regiment, name and address of the nearest relative, diagnosis, with treatment, result, and date; and these tickets are filed away at the patient's discharge from the hospital. At every bedside is a small table, and for every other bed a chair is provided. There are also three comfortable arm rocking-chairs in use. The bed linen, which is ample, is changed on all the beds at least once a week, and as much oftener as may be required. Most of the mattresses in use are hair. The windows of these wards, as well as every window in the hospital, are fitted with a good dark green rolling curtain, furnished by the Medical Department, and each ward is provided with a good clock. The ventilation of the hospital wards is effected by the windows and ridge; the former can be kept open during the greater part of the year, and the latter, from its height above the ward floor, the year round, without lowering the temperature too much for health and comfort.

The nursing of the sick is moderately well done by soldiers detailed in hospital from companies on duty at the post. A corps of nurses enlisted for the purpose, subject to no other duty, and assignable by the Surgeon General, would be of the utmost advantage. The walls and ceilings of the hospital are plastered, though the mess-room, kitchen, and commissary store-room only are completed, by having the hard-finish coat of smooth work. The wards, hall, &c., are, unfortunately, only rough-finished. The doors, door-frames, and window-frames, are handsomely grained and varnished. The doors are all lettered in black lettering, indicating the rooms within, viz., "Dispensary," "Post Surgeon's Office," "Store-room," "Ward," "Dining-hall," &c. The floors of the hospital, which are four feet above the ground, are painted a dark brown. The room partitioned off from the south ward is used for bathing and washing. It contains a good tin portable bath-tub, furnished by the Medical Department. Patients who are able to do so, and all the attendants, are directed to bathe at least twice a week. A second bath-tub is kept in the store-room, for use in giving to the sick, as may be required, a warm bath at the bedside. There are no water-closets in the hospital building; earth-closets have been sent to this post. The sink of the hospital is about 68 yards to the rear.

The dead-house is a frame building, 60 yards to the rear of the hospital. It is 34 by 12 feet, and 9 feet high, and is divided into two rooms of equal size, a dead-room and *post-mortem* room, the latter well lighted by two windows and a skylight. Both rooms are furnished with tables, &c.

There is no baggage-room at the hospital. The baggage brought by soldiers when about to be admitted into hospital is generally limited to a knapsack, and this, with such other articles as are occasionally offered for storage, is labeled with the owner's name, a list of the property entered in a book kept for the purpose, and everything belonging to the patient sent to an appropriate place in the store-room.

The hospital is warmed by wood burnt in box stoves. One large stove generally heats the ward sufficiently, though two can be used. Until the general order from the War Department prohibiting burning of volatile oils at posts, kerosene was in use. Now light is obtained from candles supplied by the commissary.

A post and rail fence in rear of the hospital incloses a space 169 by 150 feet, in which is a good well, forty feet deep, from which the water used in the hospital is obtained.

Medical stores are obtained from the purveyor in St. Louis, a year's supply at a time. The quality of the stores sent here is invariably good, and they are always well packed. The year's allowance is generally quite sufficient, and but occasionally special requisitions for a few articles have to be made. The amount of medicines, dressings, and hospital stores furnished is ample, and the articles of furniture, including that for wards, the mess-room, and kitchen, which are supplied, give everything possibly needed in the working of the hospital. The medical supplies (exclusive of bedding) are stored in the store-room, which is light, dry, and well ventilated. The bedding not in use is put away, carefully protected against moths, in the attic store-room, which is well fitted with good shelving.

The general plan of the hospital is excellent, and furnishes few grounds for criticism or suggestions for improvements. The building is believed to be one of the best of the kind on the plains. The ventilation of the wards, now moderately complete, would have been thoroughly accomplished by the ridge and shaft plan, as described and figured in Circular No. 4, of 1867, from the Surgeon General's Office. As it is, the number of beds in each ward might well be reduced a third. The plastering of the walls and ceiling of the wards should have been completed by the addition of a smooth, hard-finish, instead of being left at the rough coat, which is more permeable and harder to whitewash. The piazza in front of the hospital would have been of more benefit to the patients had a door been made to it from each ward. The addition of a small ward, which could be darkened when necessary for eye cases, is desirable. The attic, or half-story, in the administration building should be a full story, as in the Surgeon General's plan. A wind-power over the well in the hospital inclosure would, at a small expense, furnish abundant water, which could be carried through the hospital, and give a good supply for bath-rooms and water-closets.

The post bakery is a large, frame building, 36 by 14 feet, and 14½ feet high. Within a year a new and large oven has been built capable of preparing three hundred rations of bread at a baking. As a rule, the bread made is of good quality.

There is no general laundry at the post.

The building used for a chapel was formerly the office of the depot quartermaster. It is 37 by

24 feet and 19½ feet high. There are ten windows, 53 by 39 inches, which well light the room naturally. It is furnished with benches, chairs, and a reading table. Service is held twice each Sunday by the post chaplain, and the attendance of soldiers is fair. In the west end of the building is the post quartermaster's office, and in the east is the post library.

There is no school-house at the post.

Four frame buildings used as stables for the cavalry are at the west end of the parade ground. They are each 175 by 39 feet, and 20 feet high, and contain sixty stalls in two rows, each stall 9 feet long and 4 feet wide. At the west end of each stable two rooms are partitioned off, 9 feet square, for forage, &c. These buildings are well roofed with shingles, and are dry and well ventilated.

The post library is in a light and cheerful room, 10 feet square, adjoining the chapel. The books are well arranged upon shelves, and classified. There are now 170 volumes, of which 60 are historical; the remaining are novels by the best authors, with a few poetical works. The library is under the charge of the post treasurer, and is open daily from 9 o'clock a. m. till 4 o'clock p. m.

Water for the post is obtained almost exclusively from two springs, a hundred yards apart, three hundred yards west of the post. These springs open through fine gravel underlaid by clay midway up a bluff of sixty feet overhanging the small creek (Spring Creek) which empties into the Smoky River, a mile from the garrison. The water is carried from the spring in wooden pipes to water-tanks below, and from these tanks water-wagons convey it to barrels placed for use near the barracks and quarters. The wagons make two or three rounds a day as may be required. The tanks, pipes, water-wagons, and water-barrels, are frequently cleansed. The two springs will average a yield each of 4,500 gallons in the twenty-four hours, making a total of 9,000 gallons daily. In the hospital yard is a good well, and three sets of the officers' quarters also have wells. With these exceptions the garrison is supplied from the springs. The chemical examination has not been made complete, though enough so for all practical purposes, and the result shows the water in use here to be good; spring water neutral, slightly alkaline after boiling. A gallon of the water decomposed one-eighth of a grain of permanganate of potash. Carbonate of lime in minute quantity, with traces of chloride of sodium and lime, was discovered. The well water gave similar results, with the exception of the amount of contained organic matter being less, one-twelfth grain of permanganate of potash leaving a slight tinge after a twenty-four hours' mixture.

The drainage of the post is entirely surface, though from the elevation it is as complete as natural drainage can be. The slops, garbage, &c., are collected in barrels daily, under the direction of the police sergeant, (a permanent detail,) and hauled a mile from the post and buried. Manure from the stables is hauled the same distance and burned.

The cemetery is about one-fourth of a mile southeast of the post; it is 290 feet square, and contains 183 graves. With but few exceptions the graves are filled with the dead of cholera. The ground is prettily laid out, being divided by broad walks, and having also a walk on each of the four sides. Trees have been planted and are growing well. A good post-and-plank fence surrounds the cemetery.

The post garden is to the north of the garrison one-half a mile, and contains three and a half acres. It is under the charge of the post treasurer, and is well worked. Last year a large amount of vegetables was raised and distributed to the companies, band, and officers. Some seasons are too dry for growth, but generally all kinds of vegetables do well. Two enlisted men are detailed to work in the post garden.

The hospital garden is to the southwest of the post; about three and one-fourth acres were fenced in in the spring of 1868, at the request of the post surgeon. During the spring of 1869 but little was done, it being impossible to get men detailed to work, the term of enlistment of all but eight men in the companies here having expired. Some of the later vegetables planted in May did well. Radishes, corn, okra, lettuce, beans, &c., yielded abundantly. This spring (1870) a gardener has been detailed, and the garden is well under way, and it is hoped that a sufficient supply of vegetables for the year will be obtained from it.

There are eleven milch cows here, one of which belongs to the post hospital; the others are owned by officers. The cows cost little or nothing to feed, fine grass abounding nine months of the year. Hay can be had for about \$6 per ton. Cows can be purchased at from \$40 to \$70 each. Few, if any, horses or mules can be bought in the neighborhood.

The commissary department here is liberally supplied, and the quality of the stores is invariably good. The food of the men is both ample and sufficiently varied. Purchases of articles not in the ration are made in liberal quantity of the post commissary and of farmers near, and paid for from company funds. Extra issues of vegetables, pickles, &c., are made on the recommendation of the post surgeon. The messes of the men are well cooked and served, and are inspected regularly.

But very little cultivated fruit is produced near the post. Wild plums, wild grapes, and gooseberries grow in abundance, and can be purchased cheaply and furnish a fair substitute. The prices of vegetables, &c., will be reduced as the country becomes more thickly settled and more produce is brought in.

The furniture of the barrack-rooms, as is the case at most of the posts on the plains, is very limited, consisting of bunks, benches, and arm-racks.

Kitchen and mess-room furniture for the companies is very ample and good. The furniture in the married soldiers' quarters is very simple, and made at the post. That in the officers' quarters, with the exception of a few articles made by the quartermaster, is brought from the east. With the exception of mess furniture, none can be procured in the vicinity.

The inhabitants in the vicinity of the post are principally farmers, who are hard-working, industrious people; their number is estimated in the county at five hundred. Great difficulty is experienced by officers here in obtaining servants, and generally it is necessary to send to the East for them.

Notwithstanding that a number of cases of malarious fever are presented for treatment here, it is believed that there is no local malarial influence, in by far the larger number of cases the disease being one of recurrence in patients elsewhere primarily affected, and in the few cases (a very small proportion) which show a first attack, it is thought that the malarial poisoning can be traced to unhealthy regions through which the men had escorted trains, &c. Lung diseases are neither frequent nor severe. Pneumonia and pleurisy are rare. Mild bronchial inflammations in the winter furnish most of the pulmonary cases. The rarity of consumption is remarkable, and the first case has yet to be seen in which this disease began to be developed here. A majority of cases treated for it, in whom its commencement took place elsewhere, have been much improved. The cold of the winters is trying for cases very far advanced, though the summer and early fall have their advantages for even this stage of the disease, the one great remedy, exercise in the open air, being interfered with but very little by wet weather. Bowel affections are not now numerous, and a majority of those occurring among the men are caused by great indiscretion in eating or drinking, (crude food, and poisonous whisky after pay day are frequent causes,) or exposure after both. Typhoid fever is almost unknown, no case of it having appeared since July, 1867. Severe cases of acute rheumatism are very uncommon, and in the majority that have been observed the attack was not the first one.

Fort Harker is used as a base by troops not belonging to it for operations in the field, and many sick from commands in the vicinity have been sent in here at various times for treatment or discharge. The sick-list is often enlarged in this way. There are two out of five men in hospital at the present time (May, 1870) who belong to commands which have never been at the post nor attached to it.

Statement showing mean strength, number of sick, and principal diseases at Fort Harker, Kansas, white troops, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarhal affections.*	No. of deaths.
1868	215. 16	255	61	72	6	16	18	2	20	1
1869	184. 66	160	41	30	2	8	12	1	24	5

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT LARNED, KANSAS.

REPORTS OF ASSISTANT SURGEON W. H. FORWOOD, UNITED STATES ARMY, AND ASSISTANT SURGEON A. A. WOODHULL, UNITED STATES ARMY.

Fort Larned is situated on the right bank of Pawnee Fork, about eight miles from its confluence with the Arkansas River, latitude $38^{\circ} 10'$ north, longitude 99° west; altitude above the sea, 1,932 feet. The occupancy of the site dates from September, 1859, when it was known as Camp Alert. Buildings were erected in 1860, when the post received its present name as a compliment to Colonel B. F. Larned, then Paymaster General. The object of the post was the protection of the Santa Fé trail. The buildings were at first constructed of adobe. During several years the agency for the Cheyennes and Arapahoes was located at Fort Larned, but it was discontinued in 1868, and as all the Indians formerly roaming in this vicinity are now on reservations at Camp Supply and Fort Sill, and the travel by this post is now diverted by the railroad on the north, it is now of little importance. Should the Arkansas bottom become settled it will be of value as a nucleus, but at this date (March, 1870) there are no settlers, Indians, or lines of travel within its influence. Four miles square are held as reserved, but the extent of the reservation has not been officially declared. The post is bounded on the north and west by the creek; on the south a flat prairie extends six miles to the Arkansas River. The bottom land is covered with good grass, from which hay is obtained for the post. The post was rebuilt in 1867, the buildings being of sandstone and arranged around a square, the quarters for enlisted men being on the north. There are two buildings, each containing two sets of company quarters. Three of the four squad-rooms are 40 feet square by 10 feet high. Between the ceilings of these rooms and the roof, there is a free space containing (in each building) about 30,000 cubic feet, and communicating with the external air by a series of openings under the eaves on the south side, said openings having in each building the aggregate area of 30 square feet. Each squad-room communicates with this loft by three rectangular openings in the middle line of the ceiling, having an aggregate area of 2,652 square inches. In December, 1869, the air space per man in these dormitories was from 381 to 457 cubic feet. In October, 1869, the post surgeon (Assistant Surgeon Woodhull, United States Army) called the attention of the commanding officer to the fact that the ventilation of these barracks was imperfect, that at night the air was perceptibly vitiated, and recommended that ventilating shafts from the ceiling to the ridge of the roof be inserted, and that openings be made in the ceilings on the south side for inlet of fresh air, having a sloping shelf underneath to protect the men sleeping below from the descending current, and that the trap-doors covering the openings in the ceiling be removed from the control of the men. The commanding officer approved these recommendations, but as the post quartermaster did not concur nothing was done. Besides the dormitories the company quarters contain mess-rooms, kitchen, orderly-room, and store-room.

The buildings for officers' quarters are three in number, built of sandstone, one story high, shingled roof, with a broad portico in front. One of these buildings is for the commanding officer; it contains a hall, four rooms, each 14 by 16 feet, a kitchen, 19 by 16 feet, and a servants' room over the kitchen, which is the only up-stairs room at the post. Each of the other buildings is 84 by 33 feet, and contains four sets of quarters. They are traversed by two halls, 7 feet wide, each hall being common to two sets of quarters, so that each building is supposed to accommodate two captains and four lieutenants. The captains' quarters are in the ends, and consist of two rooms, each 16 feet wide by $14\frac{1}{2}$ feet deep, and 12 feet high, and a kitchen, 19 by 10 feet, from which opens a servants' room. The two rooms communicate by folding doors, and the kitchen opens into the back or bed-room. Under the kitchen is a cellar which, within the past year, has been deepened and floored, and been thus transformed into a kitchen, leaving the kitchen proper for use as a dining-room. On the opposite side of the hall two lieutenants are presumed to live in one room each, without kitchens. At this writing (February, 1870) frame additions are being erected to the subalterns' quarters, which will give to each two lieutenants three other rooms, although neither has the superficial allowance of a room proper; so that hereafter two lieutenants will have between them a kitchen, a dining-room, and a servants' room, instead of none as at present.

In the rear of each building just described is a well, not in use. Water is drawn in a wagon from the creek and poured into barrels standing in the yards. There are no water-closets or baths. Each hall opens into a yard common to all the occupants of that side of the building, and in each yard is one small privy.

The hospital is an old adobe building erected in 1860. It contains four rooms, each 16 feet square, by 8 feet high, two of which are used as wards, each containing four beds, giving a little over 500 cubic feet air space per bed. The building was improved in 1866 by a shingle roof, which leaks, and in 1867 by board floors in the wards and dispensary. One end fell in a storm in the spring of 1869, and was replaced by weather-boarding. The ceiling is of old canvas.

The following letter shows its condition in October, 1868:

SIR: I have the honor to request that I may be furnished with one hospital in good order, for the use of the sick at this post. The adobe building now used for this purpose is about worn out, and in a condition which renders it liable to fall down on the sick at every storm that comes. It has already given way in one wall, and has been propped up. The steward has spent most of the past summer in patching it up to keep out the dust and rain, and still more exertion will be required this winter to keep out the snow. It has been frequently inspected by the post commander, and by other officers, and pronounced unfit for the proper treatment of the sick, and this unfitness becomes still more apparent by comparison with the new and commodious stone buildings occupied as store-rooms and offices, and with the comfortable houses of the officers.

It was a custom in former times to look after the comfort of the sick as one of the first things in building a post, but here it seems to have been left to the last, and, finally, by some oversight, neglected altogether. It is hoped that these just grounds of complaint may be speedily removed, by giving the matter that prompt attention which its importance demands.

Very respectfully, your obedient servant,

W. H. FORWOOD,

Br't Maj. and Ass't Surg. U. S. A., in Charge.

Similar representations and requests were made during the year 1869, by Assistant Surgeon Woodhull, United States Army, but without result.

The quartermasters' and commissary store-houses are stone buildings in good condition.

The water supply of the post is mainly from the creek, being hauled in barrels. There are several wells, from 15 to 40 feet deep, but the water in most of them is sulphurous, and unfit for use. The drainage of the post is entirely superficial, and not good, but this is of less importance on account of the scanty rain-fall.

Owing to repeated failures in previous years, no garden was attempted during 1869. The causes of want of success are deficient rains, intense heat, poor soil, grasshoppers, and hail storms.

Limited quantities of fresh vegetables are brought to the post in summer, and sold at high rates, *e. g.*, potatoes, \$2 50 per bushel; tomatoes, \$1 per peck, &c.

The nearest railroad station is Fort Hays, 50 miles distant. A mail is received once a week. The general sanitary condition of the post is good.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Larned, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	165.5	259	25	71	11	.....	6	8	27	1
1869.....	112.33	89	6	13	2	4	.....	5	7	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Larned, Kansas, for the year 1868.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Catarhal affections.*	No. of deaths.
1868.....	83.33	88	8	32	4	4	2	9	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT DODGE, KANSAS.

INFORMATION FURNISHED BY ASSISTANT SURGEONS C. S. DE GRAW AND W. S. TREMAINE, UNITED STATES ARMY.

Fort Dodge is situated on the north bank of the Arkansas River, on the old Santa Fé trail, latitude $37^{\circ} 50'$ north, longitude 100° west. It is at the foot of a range of limestone bluffs, about 75 feet high, on a low piece of bottom land, consisting of blackish clay mixed with sand, and formed by washings from the bluffs. The width of this strip is about 800 feet.

The position is weak in a military point of view, being commanded by the bluffs, and liable to surprise on account of the numerous ravines in the rear. In a sanitary point of view the location is bad, the low land being difficult to drain and flanked by a creek and low marshy ground. Malarial diseases are frequent during the autumn months. A much better location, but a few hundred yards distant, would be on an elevated plateau, with good natural drainage and commanding an extensive view of the surrounding country. The meadow lands on the right and left of the post and on the opposite bank of the river, here about 500 yards wide, furnish excellent grazing. The upland in the vicinity is covered with buffalo grass. No timber is found within fifteen miles. Buffalo, antelope, deer, and rabbits abound, and wild ducks in large numbers frequent the river and adjacent ponds. The climate is dry, there having been 14 rainy days, with a total rain-fall of 8.2 inches during 1869. The average temperature is about 56° F.

The post was established in 1864 by General G. M. Dodge, United States volunteers, the site being an old camping ground for trains going to New Mexico—what is known as the "dry route" from Larned striking the Arkansas at this point. It is between the two principal points at which the Indians cross the Arkansas—one at Cimarron, twenty-five miles west; the other at Mulberry Creek, fifteen miles east.

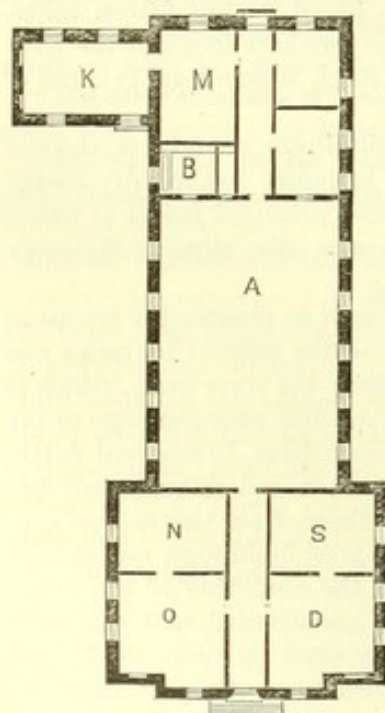
From the prevailing high winds in this vicinity it was very difficult to quarter the troops in tents, and from the occupancy of the post to October, 1867, when one of the present barracks was completed and occupied, the troops were quartered in "dug-outs" along the river bank, which is from eight to twelve feet above the water. A "dug-out" consisted of a cellar near the edge of the bank, 10 by 12 feet and 4 or 5 feet deep, roofed over with poles, gunny bags, brush, and earth, about two feet above the ground, with one door, a hole for a window, and a sod chimney and fire-place. Banks of earth were left for bunks. There were seventy of these, from two to four men being quartered in each. The officers' quarters and the hospital were good buildings, roofed with earth. During the summer of 1866 some lumber was obtained, and the condition of the "dug-outs" was materially improved, the roofs were raised, wooden bunks constructed, and the sides and roof lined with pieces of condemned tents. In 1867 the post was visited by epidemic cholera. During this year a stone quarry having been opened about five miles from the post, quarters, store-houses, &c., were erected.

During the prevalence of Indian hostilities, in the winter of 1868-'69, the post was an important base of operations. The barracks for enlisted men consist of three buildings—two of stone, one of adobe, each 130 by 30 feet, and 9 feet high in the clear, with an L, 50 by 30 feet, containing the

dining-room and kitchen. The dormitory, 118 feet long, contains 22 double two-tier bunks, allowing 362 cubic feet per man. Ventilation is effected by opposite windows and doors; heating by wood stoves. In the rear is a well, and attached to the kitchen is a wooden shed, with trough for washing. The latrines are about 30 yards distant. Laundresses and married soldiers live in dug-outs and sod buildings along the river bank. The commanding officer's quarters is a stone building, one and a half stories high, and arranged for a field officer; it consists of a central hall, with two rooms on each side, 18 by 18 by 10 feet, a kitchen in L, and four attic rooms. The lower rooms are heated by fireplaces, and lighted and ventilated by two windows each.

Quarters for the other officers of the command are insufficient in number, several being as yet in an unfinished state. An adobe cottage, one story high, is divided by a partition wall into two dwellings, each containing two rooms, 17 by 17 by 9 feet, a hall, a kitchen, and two attic rooms. One dwelling is occupied by two families, ten persons in all; the other dwelling accommodates one family, consisting of six persons. Each room is warmed by a fireplace, and lighted and ventilated by two windows. The material of which this house is constructed is poorly adapted for a building of a permanent character, exposed to the severe storms prevalent in this locality. The walls are much washed away, and to prevent the destruction of the building it will have to be weather-boarded at an early date. A one-story stone building, containing four rooms, 18 by 18 by 10 feet, one kitchen, and four attic rooms, is occupied by four officers. A small frame building, containing three rooms, 15 by 15 by 8 feet, affords quarters for three officers. Two small shanties of the negro cabin order are quarters for one captain and two lieutenants, one of the latter having a family of four persons. These comprise the quarters of the officers, ladies, children, and servants; thirty individuals to be sheltered from the weather in eight rooms, 18 by 18 feet each; by dint of crowding into attics, closets, and shanties, the difficult problem is solved; but, of course, health, comfort, and convenience are not taken into consideration.

The store-houses, two in number, located on the west side of the parade, are built of sand-stone, 130 by 30 feet each, and separated by a wooden shed, 110 by 27 feet, which is used as a forage house. At the north end of each building two rooms are partitioned off as offices, one for post headquarters. The nearest depots of supply are at Fort Leavenworth, Kansas, 367 miles distant; the route is by rail from Leavenworth City to Hays City, thence by wagons. Eight months' supply of subsistence is usually kept on hand.



On the same side of the parade, and placed between the store-houses and the hospital, is the guard-house, a temporary wooden shed, 18 by 24 feet, in very bad condition and poorly adapted to the purposes for which it is used. Its cubic capacity is 4,860 feet; stoves are used for warming; windows afford light and ventilation. Its average occupancy is 18.

The hospital, located at the northwest corner of the parade, is built of stone, one story high, and finished and occupied in February, 1868. The arrangement of the hospital is bad, as will be seen by reference to Figure 40.

A, ward, 26 by 43 feet; B, wash-room, $6\frac{3}{4}$ by 7 feet; D, dispensary, $15\frac{1}{2}$ by $16\frac{1}{2}$ feet; K, kitchen, 10 by 18 feet; M, dining-room, $10\frac{1}{2}$ by 17 feet; N, bed-room, 10 by $15\frac{1}{2}$ feet; O, office, $15\frac{1}{2}$ by $16\frac{1}{2}$ feet; S, store-room, 10 by $15\frac{1}{2}$ feet.

The ward is a passage-way between the dispensary and steward's room on the one hand, and the kitchen, dining, and attendants' rooms on the other, thus separating the administration. The building is heated by stoves, and lighted by candles and lard-oil lamps. The ward, containing 12 beds, is plastered and hard-finished, lighted and ventilated by nine windows on opposite sides; no other means of securing ventilation is provided, and the top sash of the windows is

Figure 40.—Scale, $31\frac{1}{2}$ feet to 1 inch. not made to lower; the air space per bed, however, is ample, being 1,040 cubic feet. The wash-room adjoining contains a bath-tub and basins. Situated about 75 feet to the west is a frame building, 40 by 24 by 9 feet, not plastered nor ceiled, and occupied as a ward for colored troops, with a portion partitioned off for a store-room. The ward contains five

beds, with 784 cubic feet of air space to each. The sinks are about 30 yards distant from the main building.

The post bakery, built of stone, contains two ovens, capable of baking 500 rations of bread per diem.

The quartermaster's corral has a sod wall, 8 feet high, on the north side, with a shed extending its entire length on the inner side; the other sides consist of a post-and-rail fence. At the northeast corner is a forage-room and harness room. The cavalry corral, 464 feet east of the cavalry quarters, is an inclosure composed of a sod wall, 200 feet long, by 150 feet wide, and 8 feet high, with a shed roof on three sides, and capacity for one troop of cavalry horses.

The post library is kept at the adjutant's office, and comprises 225 volumes, principally the works of celebrated novelists of the day.

The water supply is obtained for drinking purposes from wells, and for washing and extinguishing fires from the Arkansas River; for the latter purpose, buckets and axes are kept in the barracks and store-houses. The supply from the wells is plentiful, and of excellent quality.

The drainage of the post is effected by a drain from each of the company quarters, discharging into a larger drain which empties into the river. Slops and refuse are carted into the river below the post, and carried off by the current. During the summer months the men bathe in the river, but in winter there are no facilities.

An attempt has been made to cultivate a garden for the post hospital, which has proven a partial success. Radishes and string beans have been raised; the tomatoes, melons, and potatoes are looking well. It is believed that if a systematic and determined effort was made to cultivate a post garden it would be successful, as the soil is rich and fertile near the river. The difficulties to be overcome are the natural dryness of climate and the attacks of insects and grasshoppers. Watering the plants with a diluted solution of coal-oil has proved most successful in meeting the latter difficulty.

The furniture of officers' quarters consists principally of plain bedsteads, tables, and chairs, made at the post. The cost of transportation from St. Louis or Leavenworth makes it difficult to obtain other furniture except at a very great expense.

Mail communication is had once a week with Hays City, on the Kansas Pacific railroad, distant 90 miles, the mail taking three days to go and three days to return. A letter requires five days to go to St. Louis, Missouri. The mail is regular, except occasionally, during the winter months; temporary interruptions are liable to occur from snow-storms.

The nearest Indians are the Arapahoes and Cheyennes—now on the war path. There are no settlements of any importance nearer than Hays City.

An examination of the sick reports of the post for the years 1866-'67 shows but little difference in the proportion and variety of the diseases treated; and while this could hardly be said to be a malarious country, yet the greater number of cases is seen to be from diarrhœa, dysentery, or intermittents. In the winter months diseases of the respiratory organs abound. Cholera was brought to the post July 9th, 1867, by a detachment of colored troops, *en route* to New Mexico. The first case appeared among the troops July 21st, and the disease raged until the 31st day of that month, when it disappeared as suddenly as it commenced. This is the only epidemic that has been at the post. The prevailing diseases during the summer months are diarrhœa and dysentery, but the general health of the post has been good. Nearly every patient in the hospital has come from outside sources, being left by transient troops *en route* to and from Camp Supply, Indian Territory, and among them are several cases of scurvy. The sanitary condition of the post has been generally good. Earnest attention is paid in the way of disinfection, chloride of lime and carbolic acid being used, and every available means taken to insure the health of the garrison.

Statement showing mean strength, number of sick, and principal diseases at Fort Dodge, Kansas, for the years 1865, 1866, 1867.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1865, 1866, and 1867.....	201.43	759	1	125	259	2	1	7	27	57	17	74	20

Statement showing mean strength, number of sick, and principal diseases at Fort Dodge, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Diphtheria.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	232.83	350	1	25	166	9	.....	27	16	2	13	2
1869.....	129.41	164	.....	30	40	5	2	6	8	.....	16	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT HAYS, KANSAS.

REPORT OF SURGEON A. F. MECHEM, UNITED STATES ARMY.

Fort Hays, in the central part of the State of Kansas, latitude 38° 59' north, longitude 99° west from Greenwich, 2,107 feet above the level of the sea, is located on a slightly elevated piece of ground a quarter of a mile from Big Creek, a branch of the Smoky Hill Fork of the Kansas River; 10 miles north of the Smoky Hill Fork, and 15 miles south of the Saline River, another branch of the Kansas.

The nearest mountains are from 200 to 250 miles distant in a westerly direction. The nearest post, Fort Larned, is 41 miles southeast; Fort Dodge, about 80 miles south; Fort Harker, 69 miles east on the Kansas Pacific railroad, and Fort Wallace, near the same road, 127 miles west.

Hays City, about three-quarters of a mile from the post, is the nearest station of the Kansas Pacific railroad.

Old Fort Hays, on Big Creek, 15 miles east of this post, was established in the autumn of 1866 to protect the employes of the Kansas Pacific Railroad Company from the attacks of Indians, and at first was named Fort Fletcher, in honor of ex-Governor Fletcher, of Missouri; but afterward, in the winter of 1866-'67, the name was changed to Fort Hays, in honor of Major General Isaac G. Hays, who was killed at the battle of the Wilderness. During the summer of 1867, it became necessary to abandon the site first chosen on account of a destructive overflow of Big Creek at that point. The present site of Fort Hays was selected by Brevet Major General Gibbs, United States Army, major Seventh United States Cavalry, June 22, 1867, by authority of Major General Hancock, commanding the Department of the Missouri.

The reservation is irregularly triangular, extreme length 6 miles, extreme breadth $3\frac{1}{2}$ miles, and contains about 7,500 acres. This tract of land and country in the immediate vicinity are situated in a shallow basin surrounded by a low limestone ridge, the distance from the post to the ridge varying from 2 to 5 miles. The surface of the reservation is gently undulating, and is tra-

versed by numerous gullies running from the ridge to the creek, which convey the surface drainage of the reservation and the ground about the post.

The geological formation includes a series of groups constituting the secondary mountain formation of the cretaceous system. This formation occurs at greater or less depths on the reservation, but crops out throughout the whole extent of the ridge which surrounds the post. Bivalve fossil shells are very abundant in these rocks.

Overlying the cretaceous strata from above downward, we have dark, sandy loam, fine silicious loam of a buff color, yellow clay, and hard marly clay. Selenite, breccia, and conglomerates are found thinly scattered over the ground in the vicinity of the post. The soil is tolerably fertile in the bottoms, but unproductive, not so much for want of rain as on account of the dry scorching winds which sweep the plains during the summer season.

The trees grow almost exclusively along the banks of the streams, as there are but few other localities which are protected from the annual fires which sweep the plains. A few elms have been found in the ravines and cedars on the cliffs. The elm surpasses all other trees, both in beauty and number, on the bank of the creek near the post.

The wild animals found near the post are three varieties of the common bat, the American wild cat, gray wolf, coyote, long-tailed weasel, common mink, American badger, raccoons, skunk, American otter, American beaver, striped gopher, prairie dog, wood rats, yellow-haired porcupine, common American hare, prairie hare, jackass rabbit, American elk, antelope, two varieties of the genus cervus, and the American buffalo.

The birds are the turkey buzzard, duck-hawks, pigeon-hawk, sparrow-hawk, great horned owl, screech owl, burrowing owl, sapsucker, black woodcock, red-headed woodpecker, red-shafted flicker, whippoorwill, nighthawk, belted kingfisher, bee martin, robin, cliff swallow, mocking bird, red bird, cowbird, red-winged blackbird, western lark, crow blackbird, crow, blue jay, Carolina dove, wild turkey, dusky grouse, prairie chicken, sand-hill crane, killdeer, wild goose, long-billed curlew, blue-winged teal, mallard.

The fish found in Big Creek, near the post, belong principally to the *Cyprinidae* or carp family; the common shiner, (*Leuciscus americanus*;) brook minnow, (*Leuciscus atronacus*;) chub suckers, (*Catostomi*.) Besides these are the catfish or common horned pout. The crustaceans are represented by the craw-fish, and the mollusks by the *Unio* or fresh-water clam, both found in the creek. There are but few streams in this region. Big Creek, the only one within ten miles, is a clear running stream, from 10 to 20 feet wide, with gravelly bottom and good fall. Four wells, from 30 to 50 feet deep, were dug at different points about the post in July and August, 1867, and walled with limestone. No springs have been found in the vicinity, and the nearest ponds, about two miles distant, are near the creek, containing water only for a short time after heavy rains.

The climate is hot and dry in summer, and cold in winter; very changeable; strong winds prevail the greater part of the year; mean temperature for 1869, 52.89°; hygrometrical, 48.92°; extreme heat, 108°, 2 p. m. July 12th, 1869; extreme heat (hygrometrical) 99°, same date; extreme cold 5° below zero, 9 p. m., December 23d. Rain-fall for 1869, 18 $\frac{7}{10}$ inches; greatest amount in any one month during the year 4 $\frac{8}{10}$ inches in June. The rain-fall was heavier in 1869 than had ever been remarked before in this section of country. Six days of snow during the same year; greatest fall in the months of February and December. The prevailing winds for the greater part of the year are from the south; in the fall and winter northerly winds prevail. The winds are dry and scorching in the summer and early fall, cold and piercing in the winter and early spring. The barracks, for four companies, consist of four frame buildings erected in the winter of 1867-'68, by citizen carpenters in the employ of the quartermaster. These buildings are temporarily constructed of pine lumber, with single-cased wooden walls, boards nailed on vertically, and the joints battened. They are not ceiled or plastered. Each barrack is 118 feet long by 24 feet wide, 10 feet high from floor to eaves, and 6 feet from eaves to ridge; divided into two dormitories, 55 by 24 feet and 42 by 24 feet, respectively. First sergeant's room, 13 by 13 feet; store-room, 11 by 13 feet; hall between the dormitories, 6 by 24 feet; capacity of the dormitories, 22,152 cubic feet. The dormitories and first sergeant's room are warmed by wood-burning stoves, and ventilated by means of opposite windows and louvres in summer. The strong winds prevailing in the fall, winter, and spring thoroughly ventilate the buildings at those seasons by passing through the walls and roof. The average occupancy of the barracks

allows from 500 to 600 cubic feet of air space per man. The beds are double-tier wooden bunks, two men sleeping together in each tier, four men in each bunk. There is a drawer for each occupant under the lower berth, and an arm-rack and shelf at the foot of the bunk, the whole arrangement being very objectionable. The bedding consists of bedsacks, washed and filled with fresh straw monthly, and two blankets to each man. At present there are no wash or bath-rooms, but it is proposed to build additions to the mess-rooms for that purpose. The sinks are in rear of and lower than the barracks, about 50 yards distant, and consist of pits covered with small frame buildings. These sinks are moved occasionally, and the excreta in the pits thickly covered with dry earth. In rear of each barrack is a frame building, 66 by 20 feet, containing the mess-room, 46 by 20 feet, and kitchen, 20 by 20 feet; height from floor to eaves 10 feet, from eaves to ridge of roof 6 feet.

The married soldiers' quarters consist of four frame buildings of the same character as the barracks, each building containing four sets of quarters of two rooms each, the rooms being 12 feet square. Some of the quarters have temporary sheds in the rear which are used as kitchens. There are nine buildings at this post used as officers' quarters. They are tolerably well constructed of unseasoned pine lumber, which having shrunk since the erection of the buildings, allows the rain and snow to drive in, particularly when accompanied by high winds. All the officers' quarters are plainly finished, weather-boarded frame buildings, painted on the outside. The interior walls and ceilings were at first hard-finished, but have since been lime-washed. Seven of the buildings are one story and a half high, with porches in front, the remaining two being one story high without porches.

In the commanding officer's quarters there are four rooms on the first floor, each 15 by 13 feet, and a kitchen 17 by 13 feet, with a hall, 31 feet by 8 feet 4 inches, running from front to rear. The four attic rooms are used for servants, dormitories, &c.

The other one-story and a half buildings have two rooms in front, each 15 feet square, with a hall between running from the front door to the dining-room, which is 13 by 15 feet. In rear of the dining-room is the kitchen, 15 by 16 feet—height to ceiling in all the rooms 10 feet. There are two attic rooms over the front rooms.

The one-story buildings have each four rooms on the first floor; in one, two rooms are 14 by 9 feet; the dining-room, 16 by 14 feet; kitchen, 14 by 14 feet—height to ceiling 10 feet. In the other two rooms, one 15 feet square, and one 8 by 11 feet—height to ceiling 8 feet; two other rooms, 13 by 11 feet—height to ceiling $7\frac{1}{2}$ feet; kitchen, 15 by 10 feet.

The quarters are conveniently arranged for one family, or two or more officers without families; but when it becomes necessary for more than one family to live in a single set of quarters, it has been found exceedingly inconvenient. To obviate this in some measure temporary shed-rooms have been erected in the rear of front rooms of some of the quarters.

In the story and a half buildings, and chaplain's quarters, the front rooms are heated by means of wood fires in fireplaces, the other rooms by means of wood-burning stoves. They are ventilated by means of the fireplaces, and the wind passing through openings about the windows and doors.

The water for officers' use is brought from the creek in a water-wagon and emptied into barrels placed near the quarters. There are no bath-rooms.

The quartermaster's store-houses consist of three, one-story, frame buildings, each 96 by 24 feet, built parallel to each other, at an interval of 10 feet, all joined the whole length by narrow roofs, with less pitch than the main roofs. The quartermaster's offices, &c., are in a one-story frame building, 96 by 24 feet.

The commissary office and store-house are in a one-story frame building, 150 by 34 feet. These buildings are in rear of the company barracks, outside of the parade ground and diagonally in front of the officers' quarters, on sloping ground, lower than the officers' quarters or soldiers' barracks. The guard-house is a stockade building with shingle roof, located about seventy-five yards in rear of the officers' quarters. It is 50 by 20 feet, and contains two cells, one 7 by 21 feet, height 10 feet; the other 11 feet 6 inches by 21 feet, height 8 feet; the guard-room, 27 by 20 feet, height to ridge of the roof 13 feet; cubic capacity of the cells 3,402 cubic feet—warmed in winter by a wood-burning stove in the guard-room; imperfectly ventilated by windows. It is not well fitted for the purpose intended. The hospital is from 50 to 75 yards from the nearest barrack and quarters. It is a one-story

frame building, built of pine lumber, with jointed weather-boarding, constructed in St. Louis, Missouri, shipped to this post, and erected in November, 1867.

There are two main buildings, 40 by 24 feet, with porches in front and at one end. The plan of the hospital is shown by Figure 41. A, wards; D, dispensary; H, passage-way; K M, kitchen and dining-room; O, office; P, porch; S, store-rooms.

One building is occupied entirely by a ward, 40 by 24 feet; in the other is a ward, 28 by 24 feet. Surgeon's office, 12 by 9 feet; dispensary, 12 by 7 feet, with a hall between the office and dispensary, 12 by 8 feet. In the rear of the large ward is a wing of the building, 24 by 12 feet, used as a kitchen

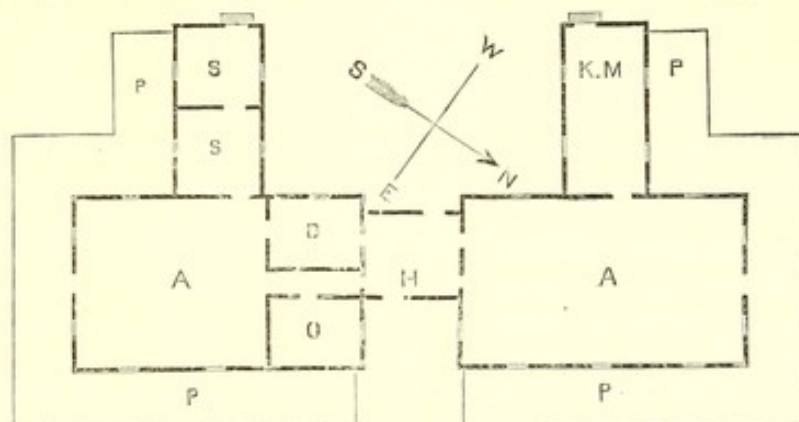


Figure 41.—Scale, 28 feet to 1 inch.

and dining-room. In rear of the other ward are two store-rooms, each 12 by 12 feet. The two main buildings are joined by a passage-way, 14 by 12 feet.

The plan of the building is deficient in many respects. There are no wash-rooms, bath-rooms, nor mess-rooms, and the storage-room is insufficient. The wards, office, and kitchen, which serves the double purpose of kitchen and mess-room, are heated by wood-burning stoves, lighted and ventilated by means of windows, louvres, and a modification of McKinnell's circular tube.

The cubic capacity of the wards, including the louvres and the passage between the office and dispensary, is 18,072 cubic feet. This, with eighteen beds, will give as the air space per man 1,004 cubic feet; the occupancy has, however, never exceeded fifteen. The average occupancy has been seven. The bath-room is in the end of the laundry building, and there is no lavatory connected with it. The sink is 50 yards in rear of the hospital, consisting of a pit covered with a frame shed. The dead-house is a frame building, about 30 yards in rear of the main building, 15 by 11 feet 6 inches. The baggage of the patients is stored in the bath-room.

The post bakery is a stockade building, plastered with mud, roofed with shingles, and contains a well-constructed brick oven.

There is no post laundry, chapel, nor school-house. The quartermaster's stables are located lower than the quarters and barracks, about 75 yards northeast of the nearest barracks. There are four frame buildings, each 175 by 28 feet, roughly weather-boarded, shingle-roofed, with ridge ventilation; or it may be considered as one frame building, 175 by 112 feet, with a double "M" shingle roof, partitioned so as to form four parallel stables, the aisles between the stables having a gradual slope the whole length of the building, so that the stables are dry and well drained under all circumstances. This building is inclosed by a stockade corral, 250 by 225 feet and 10 feet high.

The quartermaster's workshops and the quarters of quartermaster's employés are adjacent to and just outside the corral.

The cavalry stables are about 100 yards west of the nearest barrack, on a gentle slope, lower than the post dwellings, and consist of a main building, 110 by 24 feet, with wings at the ends, each 86 by 24 feet. This building has stockade walls, plastered outside and inside, shingle-roofed, with louver ventilation. The post library is kept in the adjutant's office, the post chaplain acting as librarian. Books are given out every Saturday. Number of volumes about 200, principally history and novels.

The most of the water used at the post is brought from the creek in a water-wagon. Besides this source of supply there are four wells, one near the quartermaster's corral, one near the barracks, one in the hospital yard, and another in rear of the officers' quarters. The supply of water is practically unlimited, as there is water in all the wells, and there is brought from the creek to the post between 1,500 and 2,000 gallons daily. The water from the creek ordinarily deposits very little organic sediment. After heavy rains the oxidizable organic matter is much increased, but not

to such a degree as to produce any injurious effects. The water is impregnated to a limited extent with lime and magnesia, in combination with carbonic and sulphuric acids.

The natural drainage is excellent, the post being so located on a slight elevation that the drainage in every direction is from the site of the post.

There are no artificial drains or sewers. The slops and offal of the post are transported every morning to a point about two miles down the creek. The excreta is disinfected as often as necessary, and covered thickly with earth whenever the sinks are moved. The post is very deficient in bathing arrangements, there being at present no bath-rooms in any building at the post, except the one mentioned at the hospital. Men bathe in the creek in the summer season.

The cemetery is badly located between two ravines, which carry the drainage into the creek above the place where the water is procured for the post. This fact has been brought to the notice of the commanding officer, and it has been recommended to change the site to some point below the post, where all burials in future shall be made. Area of cemetery, 133,464 square feet, or a little more than three acres. Number of graves, 86.

A hospital garden was cultivated last season, but the plants were destroyed by insects. Another attempt to cultivate a small garden is being made this season. There are no post or officers' gardens.

Of the component parts of the soldier's ration, the flour, made of a mixture of spring and winter wheat, is of average quality. The fresh beef, for some time during the winter, was very inferior; at present good fresh beef of merchantable standard is furnished. Hard bread, very old and musty; salt pork, average; occasionally rusty pieces are found. Much of the bacon is inferior; other articles of the ration from good to middling.

The articles in the list of subsistence stores are inferior with very few exceptions, so inferior that they would not be considered merchantable by experienced purchasers. Similar stores kept for sale at the trader's and in the vicinity of the post at Hays City are very much superior in quality. Whether this inferiority depends upon defective storage, long keeping in store, or the inexperience and carelessness of the purchaser, the fault can certainly be remedied. At this post all are comparatively independent of the commissary department, being able to purchase from the stores in the vicinity.

Besides the articles on the list, there can be procured from the post-trader and the stores in Hays City fresh vegetables, such as cabbage, onions, asparagus, lettuce, and such fruit as apples, pears, peaches, oranges, and grapes. Vegetables and fruits are comparatively dear on account of transportation from a distance.

The furniture of the barracks is sufficient in quantity, but of very poor quality, the bunks, for instance, being of the meanest possible description.

The medical supplies for the post are obtained from the assistant medical purveyor of the United States Army at St. Louis, Missouri, every six months.

There is an uninterrupted communication with Hays City, the nearest station on the Kansas Pacific railroad. The railroad communication between this place and Leavenworth and other cities of Eastern Kansas is at times interrupted by snow during the winter season, (last winter the interruption, however, lasting but one day.) The mail communication is daily from the East, and from the West as far as Denver, Colorado. The mail is daily to and from Fort Wallace, weekly to and from Camp Supply, Fort Dodge, and Fort Larned. Length of time for a letter to go to department headquarters, 36 hours.

The only settlement in the vicinity of the post is Hays City; population about 150, consisting principally of whites and a few negroes. The inhabitants of this town are mostly store-keepers, saloon and restaurant-keepers, and a few employes of the Kansas Pacific railroad. There are some loafers and desperadoes, but the majority of the inhabitants are peaceable, good citizens. The nearest Indians are the Sioux, Cheyennes, Arapahoes, and Kiowas. These tribes have frequently waged war with the whites, but are not now openly hostile.

The prevalent diseases at the post for the year ending December 31, 1869, were acute diarrhœa, attributable to improprieties of eating and drinking, and pulmonary complaints, caused by frequent and sudden changes of weather. Many cases of intermittent fever have been treated, but no case originated at the post. Changeable weather is the only observed local cause of disease.

The population of the vicinity of the post is 200, many of the inhabitants of Hays City having left during the latter part of 1869. The soldiers have been drilled very little during the past year. Soldiers not on duty as post guards, guarding line of the Kansas Pacific railroad, or escort duty, are generally on fatigue duty, such as policing the grounds in and around the garrison, loading and unloading quartermaster and commissary stores destined for Fort Dodge, Camp Supply, and troops serving in the field, and cutting and packing ice in winter, &c.

Amusements of soldiers consist of gymnasium, ten-pin alley at the post-trader's, and sometimes ball-playing.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Hays, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	120.08	114	1	6	40	15	1	16	15	2
1869.....	199.16	106	1	35	9	3	.....	6	27	1

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Hays, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	184.16	213	1	12	103	2	18	1	46	5
1869, (four months).....	89	14	.....	1	9	.....	1	1	2	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WALLACE, KANSAS.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEON M. M. SHEARER, UNITED STATES ARMY.

Fort Wallace is situated on the south fork of Smoky Hill River, three miles from Pond City, the nearest settlement; latitude $38^{\circ} 55'$ north, longitude from Greenwich $100^{\circ} 50'$ west. Fourteen square miles are held reserved. At this point the Smoky Hill is a comparatively beautiful stream of running water, due to one of its tributaries, which joins it about three miles west of the fort; beyond that point the river consists of occasional ponds with intervening sand beds, through which the water takes a subterranean course. To the north the plateau ascends gradually for several hundred yards, terminating in ravines which run to the river, east of the post. On the east, south, and west it descends more rapidly to the stream, which is about 300 yards from the bluff on which the fort is placed.

The soil is good, but unproductive, for want of water. There is no timber within sixty miles. The surrounding country is rolling prairie, covered with buffalo grass.

Average temperature for 1868 and 1869, 50.69° F.; extremes, 111° F. and 14° F. Rain-fall for 1869, 15.65 inches; snow-fall, .55 inch.

The wild animals in the vicinity are prong-horned antelope, black-tailed deer, elk, buffalo, wild horse, jumping hare, muskrat, rabbit and jack rabbit, beaver, otter, wolves, and weasel.

The reptiles are rattlesnakes, (very numerous,) copperhead, (not common,) black snake, milk snake, garter snake, ring snake, horned and common toads.

Birds—Wild goose, canvas-back duck, mallard, teal, widgeon, spoonbill, pintail, black diver, black chin, (*Podiceps minor*), crane, bittern, coot, plover, three varieties, great, little yellow-legged, and golden plover, (all quite numerous,) curlew, kingfisher, avocette, robin, finch, sparrow, wren, meadow lark, crow, blackbird, red-winged blackbird, golden-winged blackbird, cow bunting, woodcock, brown thrush, bee martin, or king bird, bobolink, woodpecker, yellow hammer, wild turkey, quail, grouse.

Two of the barracks are constructed of adobe, or rather of a marl, which can be easily worked with carpenters' tools, and in a recent state is of a light pink color. It grows harder and darker on exposure, owing to the presence of magnesium and iron. These buildings measure 118 by 25 feet, with a height of 11 feet 3 inches to the eaves, 3 inches to the ridge, inside measurement. The walls are two feet in thickness. The buildings are divided into soldiers' quarters, 100 feet in length, and two small rooms, used for first sergeants' and store-rooms, giving a space of 490 cubic feet to each man of a company of infantry of minimum strength.

The buildings are placed so low as to prevent the possibility of any ventilation beneath, though they are ventilated at the ridge.

The company quarters are lighted by three windows upon the west and two upon the east side, each window being arched, 7 feet 3 inches in height, and 3 feet in width. Additional light is obtained by means of a glass in the upper part of each door in the building.

The barracks are warmed with stoves provided with drums, the pipe extending the length of the room.

Each dormitory contains forty double bunks in two tiers, intended for eighty men.

The remaining barracks (of wood) are a little wider than those just described, and are similarly arranged. These quarters are unprovided with bath-rooms. The temporary structures used for kitchen and mess-room purposes are of rough boards, battened, roofed with tenting, and only in part floored. Similar material is used in most of the temporary structures at this post. The cheerlessness of these accommodations is mitigated by a rigid system of cleanliness and white-washing.

There are at this post three temporary structures occupied by the families of non-commissioned officers. Four married soldiers occupy hospital tents, framed and lined inside, all contributing forcibly to the unfinished and temporary aspect presented by this post.

A row of officers' quarters forms the limit of the parade to the north, while to the south the guard-house and magazine are all that interfere with the view south of the river. The officers' quarters are each 40 feet in length by 20 feet in depth, and are one story high. They are constructed of rough boards, battened, roofed with shingles, and provided with verandas in front. A board partition divides each building into two sets of quarters, which are subdivided into three small rooms and a similar-sized hall. For the accommodation of married officers, similarly-constructed kitchens have been added to a part of the buildings, and lath and plaster replace the ordinary lumber ceiling and partitions. These quarters have been greatly improved in appearance by the construction of a high light fence of boards in rear and pickets in front of each building. New large and permanent outhouses have also been erected for the use of the occupants of these quarters.

The store-houses, occupying the southwestern portion of the camp, are durable buildings of stone, 128 feet in length, 24 feet in width, and 10 feet to the eaves. Both are provided with ventilated cellars, and are lighted by sky-lights. The grain-house is constructed of wood, and has a capacity of 15,000 bushels. The store-rooms are all in good condition.

The post guard-house is a durable structure of stone, 34 feet front by 31 feet in depth, with a veranda in front, 8 feet in width. A hall passes through the center of the building, and is lighted by a window in the rear. To the left of this hall is a sergeant's room, 15 by 8½ feet, and five cells, each 5 by 8½ feet. To the right of the hall is the guard-room, 20 by 14 feet, and a prisoners' room, 29 by 13 feet. The height of this building to the eaves is about 9 feet. There is no ventilation

underneath, though it is ventilated at the ridge. For the original garrison at this post, two companies, this guard-house was considered, for an ordinarily disciplined command, sufficient, but with the increase of the troops it has been almost constantly crowded.

There is at the post, perhaps, no structure except the guard-house, for the proper construction of which so much contention is necessary as a hospital. This building has received the denunciation of officers from the present and previous post commanders to the Lieutenant General, and has reached its present unfinished condition at a slow rate of progress. The necessities of the service requiring the economy, so rigidly enforced during the latter part of 1867, resulted in the roofing of the building before the wards had reached to within three feet of the height contemplated in the original design, and the central administrative building was curtailed in its proportions even more than that, altering it essentially in its internal arrangements. The building, however, is well built of the stone referred to, and is well adapted for its uses. It consists of a central building and two wings as wards, with a back building to the central part, 40 by 20 feet; the wings are 48 feet in length by 24 in width, 12 feet to the eaves, and 17 feet to the ridge. The wards extend in a north and south direction, and are lighted by four windows on each side, and one window, same size, on the end of the passage; a door communicates on either side with the verandas. These wards are well ventilated underneath and throughout their length by the ordinary ridge ventilation. They are warmed by two stoves of Minnesota pattern, large size, with drums, the pipe gaining exit through the usual shaft ventilator. The windows are so arranged as to secure ventilation at the top.

In the absence of any means of securing a flow of water, no closets exist in connection with the wards, though the bath-room is well fitted up. The wards have each a capacity of 12 beds, with an air space of 1,116 cubic feet per bed. The central building is 34 feet front by 44 feet deep, and is divided below into four rooms, used respectively as surgery, office, steward's room, and store-room. A hall, 8 feet wide, with staircase leading to the floor above, also communicates with the rear building; another hall, 5 feet wide, communicates with the wards. The second floor is divided and occupied by stores and attendants; a dead-house is also obtained in this part of the building; the utility of this portion of the hospital is compromised by the low ceilings. The back building is provided with a cellar, and furnishes the dining-room, kitchen, and laundry; this portion is plastered, as is the central building, and the whole whitewashed throughout. The bakery is a new and excellent structure, well furnished with appliances and facilities for the proper care of flour, and has a capacity for the baking of 400 rations. A single story frame building standing in the center of the eastern side of the parade ground is occupied as chapel and adjutant's office. The stables are conveniently located, fitted with new stalls, gravelly floor, raised walk through the center, and dormitory windows on each side. The library, kept in the adjutant's office, contains 118 volumes, consisting of works on history and standard light literature.

The configuration of the stream at this point has been somewhat altered by the construction of a dam some six or eight feet in height and the formation of a pond, from which is obtained during most of the year the water used by the garrison as well as the ice laid up during the winter. The post, however, is supplied with a well, located near the foot of the bluff, which does not extend below the bed of the stream, and furnishes only the surface drainage. The water is highly impregnated with minerals, and is further deteriorated by a wooden curb, rendered necessary by the variety of the soil, to prevent the refilling of the well. An attempt has been made to secure water for the garrison by means of a well, located within the limits of the post proper. After penetrating the alluvium and drifts of the cretaceous in this region, at a depth of 36 feet, the underlying shale was reached, through which, at the cost of great labor, the excavation proceeded for fifty additional feet, when, by the advice of an experienced geologist, the effort was abandoned. The appearance of petroleum in the underlying stratum was an interesting feature observed.

The fort being constructed on a gradual slope inclining to the river, no artificial drainage is considered necessary. All refuse matter from kitchens and stables, or about the garrison, is conveyed away daily in wagons kept exclusively for that purpose.

The Smoky River flows within a few hundred yards of the garrison. In the summer time the enlisted men are compelled to bathe at least once a week. In winter season tubs situated in small

rooms at the extremity of each dormitory are used for the cleansing of the persons of enlisted men. The frequency of the baths is likewise in this case compulsory.

The failure of the post garden located here for three successive summers would seem to demonstrate the incapacity of the soil and climate or the want of practical agricultural knowledge on the part of the garrison. Not the least discouraging event in connection with the garden has been the yearly destruction by insects of what little nature had allowed to grow. The tributaries, either to the east or west, offer little better inducements to the agriculturist.

The character of rations obtained from the post commissary is unexceptionable, with an abundant and excellent variety. By reason of exorbitant prices charged for extra articles of food by private parties shipping them from Eastern States, extra vegetables are purchased from the commissary of subsistence, for the use of the men, with the company fund.

The nearest quartermasters' and subsistence depots are at Fort Leavenworth, Kansas, 402 miles distant. The route of supply is by the Kansas Pacific railroad, and is open at all seasons. Twelve months' supply is usually kept on hand. Medical supplies are obtained from St. Louis, Missouri, upon requisition, and are received and kept in good condition. The means of communication between the post and the nearest town or settlement is by stage. A mail arrives at the post daily each way, east and west, with the exception of one day in the week for each direction. The length of time required for a letter to reach department headquarters at St. Louis is thirty hours.

Five ambulances—two only in running order—are the means at the post for the transportation of sick. Scouting parties or detachments sent from the post are never supplied, and it is believed lives are lost in consequence. In the hospital are ten stretchers and one Tompkins wheeled litter.

The inhabitants of the surrounding country consist of roving bands of hostile Indians, as the Arapahoes, Cheyennes, Sioux, and Kiowas. Their physical condition is excellent.

The prevailing disease at the post and vicinity is rheumatism in all its varied phases. Pneumonia has prevailed to an alarming extent among the citizens working on the railroad, due probably to exposure and poor diet. Colds, inflammation of lungs, and pleural, hepatic, and intestinal derangements are diseases of local origin, though the prevailing diseases in garrison are generally such as would arise from error in diet, cold, and sudden changes.

During the winter and spring of 1869 a large proportion of the sick of colored troops at this post were cases of scurvy, which developed itself with terrible malignancy. For the month of April, 1869, eighteen cases of this disease appear upon the hospital register, which only in a great minority exhibits the number affected with the malady, which manifested itself in many to a degree not requiring their being relieved from duty, though the modification was apparent in its rendering the patient more susceptible to diseases arising from ordinary causes and more difficult to cure. The manifest cause of this wide-spread scorbutic taint is to be found in the hardships and privations of arduous winter scouts, which were frequent, with often little time intervening for purposes of recuperation, and a constant pork diet.

The most prolific source of disease among white troops has been cold, manifesting itself in bronchial affections, pulmonary diseases, and inflammatory diarrhœa. Among the colored troops who have yielded to disease most readily have been those from the South, while those recruited in the North have withstood the effects of climate and exposure equal to any troops in the garrison.

Statement showing mean strength, number of sick, and principal diseases of white troops at Fort Wallace, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	216	258	17	90	17	.....	10	2	17	1	42	1
1869	187	327	47	75	12	1	14	1	20	2	66	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

Statement showing mean strength, number of sick, and principal diseases of colored troops at Fort Wallace, Kansas, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (five months)...	268.4	83	13	17	5	4	.....	4	.....	20	1
1869, (five months)...	194.2	134	11	20	9	5	21	8	1	28	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT LYON, COLORADO TERRITORY.

REPORT OF ASSISTANT SURGEON H. R. TILTON, UNITED STATES ARMY.

Fort Lyon is situated on the north bank of the Arkansas River, in latitude $38^{\circ} 5' 36''$ north, longitude west from Greenwich $103^{\circ} 3' 30''$, and is about 4,000 feet above the sea-level. The reservation on which the post is situated has not been declared. A little over nine square miles is held reserved.

The nearest spurs of the Rocky Mountains are 115 miles west. Fort Wallace is 115 miles to the northeast. The town of Kit Carson, on the Kansas Pacific railroad, is 55 miles to the northeast. Los Animas, a small town on the opposite bank of the river, lies one mile to the west.

The geological formation is sandstone of the lower cretaceous period. Eight miles distant, limestones of a later period, very rich in fossils, are found. Coal, of poor quality, has been discovered on Rule Creek, ten miles from the post.

Over 1,000 acres are under cultivation within ten miles of the post. The land is irrigated by a small canal leading from Purgatory River, a small stream emptying into the Arkansas, two and a half miles west of the fort. Large crops of cereals, vegetables, and melons are raised. Wild plums, currants, and gooseberries grow on the Purgatory River bottoms, and wild grapes are found in great abundance on both streams.

The following animals have been killed or seen within 40 miles of the post, viz: Buffalo, prong-horned antelope, elk, black-tailed deer, white-tailed deer, American panther, wild cat, white, gray and dusky wolves, coyote, cinnamon bear, fox, weasel, mink, otter, skunk, badger, raccoon, gopher, prairie dog, beaver, kangaroo rat, Norway rat, porcupine, muskrat, mule-rabbit, sage hare, and wild horse.

Birds seen are the golden eagle, bald eagle, pigeon, sparrow and fish hawks, prairie falcon, great horned owl, burrowing owl, woodpecker, kingfisher, robin, bluebird, mocking bird, sky-lark, sparrow, red-winged blackbird, meadow-lark, raven, magpie, turtle-dove, wild turkey, prairie chicken, (rare but increasing,) sand-hill crane, white heron, blue heron, killdeer, plover, wild goose, and ducks of several kinds.

The climate is mild; the nights are always pleasant. Average temperature 49° F.; extremes 108° F., and 22° F., a difference of 50° F. between the morning and 2 p. m., has been observed, though very seldom. The average humidity is 56.25. Annual rain-fall 11 inches. Snows are seldom more than three inches in depth, and rapidly disappear.

The fort is located on a sandstone bluff, the highest point of which is 36 feet above the river. There is a stratum of sand and gravel, more or less impregnated with alkali, overlying the sandstone. A low bottom, from 100 to 200 yards wide, separates the bluff from the river. This is overflowed when the river is unusually high, and is very objectionable, but no place within the limits designated for the post could be found so free from disadvantages as this site. The bluff is 2,000 feet wide, and 1,500 feet long, with a face of sandstone 10 feet high. There is a gradual slope from the center to the edge of the bluff, in all directions, making the surface drainage excellent.

The site was first occupied on the 9th day of June, 1867, the old site, 20 miles distant, being abandoned because of its unhealthy location and the increasing scarcity of wood. Temporary store-houses were first erected for the commissary and quartermaster. The officers and men occupied tents, while the hospital consisted of one old hospital tent for a dispensary, a canvas ward, 15 by 25 feet, and a canvas kitchen. The warehouses were completed and occupied in December, 1867.

The arrangement of the post is shown in Plate No. 7.

Three sets of barracks are built of sandstone; the fourth is of adobe. They are covered with good shingle roofs, and plastered inside with hard-finished walls. The outside dimensions are 100 by 34 feet; each building is partitioned into a squad-room, mess-room, office, and store-room. The squad-rooms measure (inside) 66 by 31 feet, and are 12 feet high. They have two ventilators, 18 inches square, eight windows, and two outside doors. The air space per man, allowing 50 men to a company, is 492 cubic feet. The bunks, in two tiers and double, accommodate four men each. The rooms are heated by wood-stoves, and the chimneys, being at the ends, necessitate a large amount of stove-pipe. The floors, which are not tight, are two feet above the ground, and there are numerous openings in the outside walls, giving free circulation of air, under and through the buildings. The sinks are located over the edge of the bluff, and are rebuilt as required, from time to time.

There are six laundresses' quarters, wooden buildings, 12 by 24 by 8 feet, and one forage-master's house of the same dimensions.

The commanding officer's quarters are $46\frac{1}{2}$ by $39\frac{1}{2}$ feet, outside measurement, one and a half stories high, with a kitchen back, 16 by 17 feet, one story high. There are four rooms on the first floor, 18 feet square and 10 feet high, and a hall, 7 feet wide; on the second floor are four rooms, each 14 by 18 feet.

There are in course of erection six buildings, each containing two sets of captains' quarters, which will be $54\frac{3}{4}$ by $39\frac{1}{2}$ feet, one story and a half high, with a kitchen, 21 by 32 feet, one story high. The rooms will be of the same size as in the commanding officer's quarters. Temporary quarters for officers are built of limestone and mud, with board roofs; seven of them measure 22 by 54 by 9 feet, and the eighth 22 by 38 by 9 feet. The commissary's and quartermaster's store-houses are 320 feet apart, built of sandstone, and are each 42 by 100 feet, outside measurement with basements 9 feet deep, and an upper story, 12 feet high. The forage-house is built of wood, 40 by 140 by 12 feet, and well ventilated. Located at a distance from the garrison, and near the edge of the bluff, is the magazine, constructed of sandstone. The ice house is made of logs and poles, in the side of the bluff, (under ground,) with a dirt roof, and a shingle roof above that. It is 45 by 46 by 10 feet, outside measurement, and has a capacity of about 389 tons of ice. The blacksmiths, wheelwrights, and saddlers are occupying temporary frame buildings. The guard-house is a temporary frame building, 12 by 36 feet, and 8 feet high. It is ventilated by latticed windows and warmed by a stove. The building contains one common prison, 12 by 20 by 12 feet; there are, besides, two underground cells 6 by $7\frac{1}{2}$ by $6\frac{3}{4}$ feet, ventilator 9 inches square, for those undergoing solitary confinement.

The building now occupied as hospital, and situated in the center of the post, is built of gray sandstone, and consists of a main building 45 feet square, and one and a half stories high, with a ward and wing attached; the other ward has only the foundation laid. The main portion consists of 4 rooms, each 16 feet 8 inches square, and 11 feet 11 inches high, with two halls. The ward, 25 by 34 by 11 feet 10 inches, accommodates 12 patients, giving 856 cubic feet of air space to each. The building has large windows in opposite sides, two outside doors, half sash, with transom windows over them, and nine ventilators, 20 inches in diameter, arranged four on each side and one in the center of the ward, through which the stove-pipe is carried. A shaft extends from each side of the ward below the floor, and opens beneath the stove. The bath-room adjoins the ward at one end; the back building is divided into a dining-room, kitchen, and laundry; a cellar extends beneath the kitchen. A porch, 8 feet wide, extends from the front of the main building around the ward to the dining-room. All the doors in the hospital have transom windows, and the walls are plastered and hard-finished. This building will shortly be occupied for post headquarters, as a new hospital building is now in process of erection, and will be completed before the coming winter. Its location is far more

FORT LYON, COLORADO TERRITORY.

Scale: 400 ft. to lin.

0 100 200 300 400 500 600 700 800



French, Langran & Ogilvie, Lith Wash^g



desirable, being placed on the northeast side of the post. The material used is green sandstone. The plan is similar to that suggested by Circular No. 4, Surgeon General's Office, 1867, with the following exceptions: The administration building is only one story high with attic; the front wall of the main building and wards is on the same line, and the back wing is on the line of one wall of the main building. The roof of the main building is pitched at right angles to that of the wards, adding much to the appearance of the whole. A covered porch extends around the entire building, except the wing in the rear, and two doors, half sash, with transom windows over them, open from the ward upon the porch. The interior of the building is 12 feet high throughout. The arrangement and dimension of rooms, capacity, &c., are very similar to those proposed in Circular No. 4, Surgeon General's Office, 1867. The wards, of which only one is being built for the present, have four small rooms, two at each end, for water-closet, bath room, wardmaster-room, and linen-room, one of them to be used as a dead-room when needed. The ward will contain 12 beds, giving 808 cubic feet to each. The outside doors are 3 by 7 feet, and the windows are 2 feet 10 inches by 6 feet; all the doors have transom windows, 15 inches by 3 feet. The ventilation is secured by eight inlet shafts under the wards opening by one large hole under the stove, and nine outlet shafts, 20 inches in diameter, four on each side of the ward, and one in the center over the stove. It is to be regretted that the walls of the building could not have been carried up to the height of 14 feet, but the funds are limited. A large amount of the work is being done by enlisted men.

The post bakery is built of sandstone, 24 by 46 by 10 feet, and divided by a stone partition which separates the ovens from the mixing and bread rooms. The room containing the two ovens is 14 feet 5 inches by 20 feet 3 inches. When the bakery was built, sandstone was used for the floors of the ovens, and adobes for the arches. The floors soon gave out and the arches lost several adobes, rendering the ovens unfit for use. They have since been entirely rebuilt of burned brick, and are in fine condition.

The cavalry stables are constructed of wood and designed for three troops of horses. They are 189 by 177 by 11 feet, with a space between the rows of stalls, 27 feet wide. The quartermaster's stable is of wood, 60 by 286 by 10 feet. It is only a temporary building, and will eventually be removed to a site corresponding to the cavalry stables.

There is no post library.

Water is obtained from the Arkansas River, and is carried in water-tanks on wagons, and daily distributed. The tanks are filled by a stationary pump. The Arkansas water is very palatable at all times of the year. From the month of April to the month of August it has a great deal of mineral and organic matter, in consequence of the rise in the river, and affects some persons, causing diarrhœa; but during the remainder of the year the river is quite clear, and its water is at all times highly appreciated by those who have been obliged to drink from streams and ponds on the prairies. In the summer of 1857 there was a very clear and cold spring of water between the bluff and river, in the bottom, and in the absence of ice it was very grateful, but as the river went down in the fall, the spring gradually failed, showing that it was the river water, filtered through a great bed of sand. In the summer of 1858 the spring entirely failed. A canal could be led from the Arkansas River, and water be introduced into the post to supply it for many objects. By going five or six miles above the post, there would be sufficient fall to carry the water upon the bluff where the post is built. Post gardens could be cultivated by this means. The sinks could be built over a branch canal, and trees made to grow wherever desired. In order to dig the ditch a full garrison would be required, and the men detailed on the ditch-digging would, in all probability, fail to see the future benefits to be enjoyed by their successors.

There are no sewers in the post. The surface drainage, as before mentioned, is excellent.

This section of the country was formerly occupied by the Cheyennes and Arapahoes, but since the Sand Creek fight, in 1864, their visits are rare. The country is being settled by Americans, and the number of acres of cultivated land is rapidly increasing.

Mail communication is by the stage, which runs from Kit Carson to Santa Fé, six times a week; time to department headquarters from six to seven days.

The prevailing diseases at the post are mild malarial fevers and rheumatism. Bowel affections are somewhat prevalent in the summer months, the drinking water at that time containing considerable organic matter.

Statement showing mean strength, number of sick, and principal diseases at Fort Lyon, Colorado Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fevers.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	212	321	1	23	136	6	12	.....	22	2	20	2
1869	150.66	236	14	18	91	23	2	1	13	4	20	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT REYNOLDS, COLORADO TERRITORY.

REPORT OF ASSISTANT SURGEON GEORGE McC. MILLER, UNITED STATES ARMY.

Fort Reynolds is situated in the southern part of Colorado Territory, in Pueblo County, on the south bank of the Arkansas River, latitude $38^{\circ} 15'$ north, longitude $104^{\circ} 12'$ west from Greenwich; elevation above the level of the sea, about 4,800 feet. The reservation on which the post is situated has not been declared by the President, but has been announced in General Orders No. 19, Headquarters Department of the Missouri, dated June 3, 1868, as including a little over 22 square miles. The fort is nearly east of the town of Pueblo, and distant 18 miles from it. It is distant about 80 miles from New Fort Lyon, 60 miles from Bent's Old Fort, and 4 miles from the mouth of the Huerfano River, a tributary of the Arkansas. Its distance from the nearest point of the Rocky Mountains is said to be 40 miles, and from Pike's Peak, 65 miles. The fort commands a fine view of the mountains. Pike's Peak is visible in the northwest; the Snowy range, Greenhorn Mountain, and Spanish Peaks in the southwest, and the main range in the west.

The post of Fort Reynolds originated in a transfer of the garrison of the previously existing post of Pueblo, Colorado Territory, which was evacuated July 2, 1867. The site of Fort Reynolds, previously selected by Brevet Major General R. B. Marcy, Inspector General United States Army, was occupied by the garrison July 3, 1867. No movements of any consequence having taken place from the post, its military history is unimportant.

The fort is built on the upland, or prairie, about 60 feet above the level of the Arkansas River. For some distance the prairie slopes abruptly to the very margin of the river, while east and west of this point it is separated from the river by the intervening bottom, sometimes to nearly the extent of a mile, although usually the breadth of this portion of the valley is considerably less. Toward the southwest the prairie extends about a mile, and then descends abruptly to the lowland bordering the Huerfano River. In a westerly and northwesterly direction the extent of the prairie is indefinite, but it is intersected by occasional ravines which terminate in the valley of the river. The general direction of the Arkansas River, in the vicinity of the post, is usually considered to be from west to east. The river is very tortuous in its course, making many very sudden turns, and following any given direction for but a short distance. By this means the valley is more thoroughly watered than it would be otherwise. The river has evidently changed its course very frequently, many of its old beds being visible.

The soil, both of the prairie and bottom land, is argillaceous. The clay is dark and tenacious, and is of the kind known as adobe clay. The clayey stratum is of moderate thickness. At a distance of a few feet from the surface of the ground sand begins to preponderate, and at depths of 18 or 20 feet the subsoil is almost exclusively arenaceous. The principal geological formation in and near the post is limestone. A kind of stone frequently met with consists of a vast number of minute flinty pebbles, held together by a sort of calcareous cement. Magnesian limestone is found in great abundance at a distance of eighteen miles from the fort, and in and near the fort, on the slopes which descend from the upland to the bottom land, quartz and feldspar are very abundant.

Almost all the land in the vicinity of the post is under cultivation, and is well watered and timbered; the principal crops are wheat, corn, and oats. The cottonwood grows rather abundantly in the river valley, and is the only tree of any size. Stunted willows are occasionally met with along the river bank and near the forsaken channels of dried up streams. The sunflower (*Helianthus annuus*) is exceedingly abundant in the bottom-lands. The great abundance of this plant, taken in connection with the remarkable freedom of the valley from miasmatic diseases, might seem to lend some countenance to the idea which has been entertained, that the plant is capable in some way of neutralizing the miasmatic poison. A species of wild hop flourishes on the prairie slopes leading downward to the river. On the margin of the river and its tributaries a species of toxicodendron grows quite abundantly. It attains a height of less than a foot; its leaves are of a deep green in the summer, and of a rich and beautiful crimson in the fall. In its appearance it closely resembles the common poison ivy of the eastern portions of the country. The emanations of this vegetable have produced a few cases of cutaneous disease among the soldiers, particularly erythema and a pustular affection, having the characters of ecthyma. The grease-weed, as it is called, grows abundantly in the bottom-land. A conspicuous feature of the upland is the soap-weed or Spanish bayonet. During the summer the valley is filled with a luxurious growth of rich green grass, but the upland, being clothed only with a sparse and stunted verdure, presents a bare and sterile aspect, very different from that which meets the eye on the prairies of Northern Kansas.

The prairie or barking wolf is occasionally met with in the vicinity of the post. Other animals are the common skunk, otter, beaver, and the prong-horned antelope.

The climate of this region is highly salubrious, and, leaving out of view the disagreeably violent winds which occasionally occur, may be even pronounced delightful. Owing to its considerable elevation above the sea-level, and its proximity to the mountains, the district enjoys a coolness of temperature much greater than its latitude would at first lead one to anticipate. The mean temperature for the summer months is 75.97° ; for the autumnal months 50.60° . The vicissitudes of temperature are considerable here, the thermometer not unfrequently having a range of 50° between the hours of 7 a. m. and 2 p. m.

The atmosphere of the post is dry. Fogs seldom prevail. The amount of rain-fall is slight; snow seldom falls during the winter months, and only in small quantities. The amount of snow, however, seems to be relatively greater than that of rain. The prevailing winds are from the west, east, and southeast. The morning winds are usually western; the afternoon winds eastern or southeastern, and the night winds western again. During the warm afternoons of summer north winds sometimes suddenly spring up and blow for several hours, cooling the atmosphere greatly and rapidly. A remarkable effect of a south wind was noticed here in January, 1868. On a certain night the snow covered the ground to the depth of two inches. In the morning following not a particle of snow was to be seen upon the ground, and the latter was quite dry. A south wind had been blowing steadily during the night, and had caused the rapid evaporation of the snow.

The prairie is a rectangle 455 by 400 feet, the long diameter being north and south. Its northern and eastern sides, as well as a part of the southern side, are planted with young cottonwood trees.

The barrack, on the eastern side of the parade, is an adobe structure, with shingle roof, 143 feet long, 28 feet 4 inches wide, 9 feet 8 inches high to the eaves, and 18 feet high to the ridge, with a frame veranda in front running its whole length. This building was originally designed for one company, though sometimes occupied by two. It is divided into four rooms; the orderly sergeant's room, 15 feet 6 inches by 25 feet 9 inches, the dormitories, two in number, dimensions each 50 feet 6 inches by 25 feet 9 inches, and a kitchen, 24 feet by 25 feet 9 inches. The building is plastered externally and internally with clay having mixed with it a small proportion of lime. It is warmed by large stoves, and the ventilation appears to be sufficient. The natural illumination of the building is bad. In the dormitories the air space per man is about 500 cubic feet, with the present command of one company. Wooden double bunks arranged in tiers are used.

A frame building, situated 62 feet southeast of the barrack, is used as a combined mess-room and kitchen by the company. Small frame and adobe buildings, situated in the northern part of the post, are used as quarters for married soldiers and quartermasters' employés. They are not sufficiently well lighted and ventilated.

The officers' quarters are ranged along the southern side of the parade, and consist of three separate buildings. The principal and only permanent one is an adobe structure, 55 by 33 feet, 12 feet to the eaves and 22 feet to the gable, being one story and a half high. The roof is shingled. Dormer windows are in the upper story. The house is not plastered externally, though it is plastered, whitewashed, and generally well finished within. The building contains two sets of quarters, each comprising a hall and three rooms on the first floor, and one room on the second. A frame building also used as quarters, measures 17 feet front, 23 feet deep, 8½ feet high to the eaves, and 13½ feet to the ridge, and is divided into two rooms. It is shingled, well lighted and ventilated, and not plastered within.

A second frame building, used as officers' quarters, measures 24 by 12 feet, 14 feet high to the ridge, and 8 feet to the eaves, and contains two rooms. The walls of these frame quarters and of the wooden buildings of the post generally are constructed of upright boards, battened.

The quartermaster's store-house is 80 feet 8 inches long by 28 feet wide, with a height to the eaves of 9½ feet, and to the gable 18 feet. The commissary store-house is of the same dimensions. These buildings are built of adobes, plastered with clay outside, and have shingled roofs. A large ice-house is conveniently located near the bank of the river.

The guard-house is 32 by 24 feet, 9 feet to the eaves, and 18 feet high. A small building attached to the northern side of the main building is 13½ feet long and 9 feet 10 inches wide. The guard-room or front room of the building is, by inside measurement, 21 feet 10 inches by 12 feet 10 inches. Cell No. 1 is 21 feet 10 inches by 15 feet 10 inches. The height of these rooms agrees very nearly with that of the exterior of the building. Cell No. 2, which is contained in the small appended building, is 9 feet 10 inches by 7 feet 10 inches by 7 feet 2 inches. The guard-house, including the appended portion, is an adobe building with shingled roof, and well floored. Its ventilation and natural illumination are imperfect. It is warmed by stoves.

The main building of the hospital, a wooden structure of the shape usually characterized by the epithet "salt-box," is 41 by 14 feet. Having the form just indicated, its roof has but one slope, which is backwards. Its height in front is 11 feet 9 inches; the height behind is 8 feet 6 inches. Its roof is of boards covered with paulins. Its walls are of upright boards, battened, and are marked by numerous crevices and knot-holes, which, however, may be regarded as not particularly objectionable in a sanitary point of view.

The building is divided into three rooms, which are used respectively as ward, store-room, and dispensary. It is warmed by stoves. The ventilation is fair. The mean height of the ward is 8½ feet. The floor, which is of common boards, is elevated somewhat above the ground. The air-space of the ward measures 1,768 cubic feet, which would allow nearly 600 cubic feet to each of the three beds which it contains. Each bed has also a superficial area of nearly 70 square feet. Thus, if there should be but one patient in the ward, which is about the average occupancy, he and the nurse would have an allowance of nearly 900 cubic feet of air space, and a little over 100 feet of superficial area. The ward has a window in front and one behind. There is no room which is specially used as a lavatory and bath-room. In the rear of the main building is a hospital tent, framed and floored, which is used as quarters for the hospital steward and his family. Near it is a framed and floored wall tent used as laundry.

The bakery is a frame building, with adobe ovens, adequate to furnish an amount of bread sufficient for a two-company post.

The horse corral is north of the hospital, and distant from it 100 feet. It is 226 feet long and 70 feet wide. Along the northern and southern sides is an adobe wall, 8 feet high. Its eastern and western sides are closed in by a wooden fence of the same height. At the eastern end is the grain-house, a frame building. The corral is furnished with covered stalls adequate to accommodate 80 horses. The mule corral is 127 feet long and 95 feet wide, and surrounded by a wooden fence.

The water-supply to Fort Reynolds is obtained from the Arkansas River, and has always seemed to be sufficiently good and wholesome for all practical purposes. Scarcely any springs are to be found in the valley or in the vicinity of the post. The very few that are found are situated near the river, and are derived from it, by percolation through the earth, and their water differs in no essential respect from that of the river, and has no advantages over it, except that of a somewhat greater clearness. They are also small and inconveniently situated. The experiment of

digging wells has not been tried on the southern side of the river, at least within a distance of several miles from the post; but in one instance it has been tried, with satisfactory results, in the portion of the valley on the northern side of the river.

The water of the river is formed chiefly by the melting of the snow and ice on the mountains, and during the latter part of summer and early part of autumn is more apt to be loaded with earthy matters than at other times. It is usually clear, has no perceptible odor even after standing a long time in a receptacle of any kind, and is free from any well-defined taste, is always cool, makes an excellent lather with soap, and is, therefore, soft and adapted to washing purposes. Even when turbid, if allowed to stand quietly for a few hours, its earthy ingredients, held in suspension only and not dissolved, subside to the bottom of the vessel. The permanganate of potash test shows this water to contain an exceedingly small proportion of organic impurities. Nitrate of silver does not throw down a precipitate. Alum, however, throws down a precipitate of alumina, and this is the chief impurity of the water. The fort is supplied by means of water wagons. In the summer season ice is furnished to the garrison, and the hospital receives a liberal supply.

No system of drainage has been inaugurated at the post, the fort being situated in a region of country where rain and snow seldom fall, and only in small quantities. The clayey soil absorbs and holds the small amount of water precipitated from the atmosphere, and the heat of the sun readily dissipates it by evaporation. The ground upon which the fort is built, being very level, would be poorly adapted for natural drainage if the amount of rain-fall was considerable and the removal of surface water necessary.

The post garden, containing somewhat over an acre of ground, is cultivated by soldiers and watered from a neighboring acequia. A great variety of vegetables is raised, and under favorable circumstances the yield is very considerable.

Until recently ten cows were kept at the post; at present there are but two, which are personal property. All domestic animals can be easily kept by officers.

The nearest quartermaster and subsistence depots to the post are at Fort Harker, Kansas, 429 miles distant. The route of supply is by way of Fort Lyon, Colorado Territory, open at all seasons. Transportation is generally by train. Three mails from the States are received at the fort every week, via Denver, Pueblo, and Booneville. Three other mails are also received weekly from New Mexico, and from the military post as far east as Fort Riley. These mails are liable, in winter, to frequent interruption by heavy snows occurring between Denver and Pueblo, and also between Denver and Cheyenne. When there is no unusual delay, it takes a letter six or seven days to go to department headquarters.

The valleys of the Arkansas and Huérfano rivers, the only portions of the country in the vicinity of the post which are inhabited, are populated by white settlers from the eastern parts of the United States, by emigrants from Europe, and by Mexicans. The settlers are an industrious, thrifty, intelligent, and generally moral class of people. Their time and exertions are devoted to the raising of stock and the culture of the soil. They water their lands by means of irrigation, use scarcely any fertilizers, and raise good crops of grains and vegetables. The Mexicans, as a class, are filthy and indolent, ignorant and immoral. Very few of them can read and write, and their minds appear to be in the most torpid condition imaginable. Physically the Mexicans are quite well developed, and the females are not deficient in comeliness. Sickness does not seem to prevail much among them, and, so far as can be ascertained, venereal diseases do not appear to exist largely. Such complaints of various kinds as arise are usually treated by the old women, who use vegetable remedies almost exclusively. They make much account of a species of flag which grows on the bank of the Huérfano River, and from which they prepare decoctions, using them as a panacea. Parturient women receive an excessive amount of attention from these female practitioners. During the week following delivery such patients are fed with rich food and are made to drink large quantities of hot herb teas. Debility seems to be much apprehended in such cases.

There are no Indians inhabiting the neighborhood. The Utes, a large and warlike but friendly tribe, live in the mountains and occasionally visit the post in parties of eight or ten.

There has been a remarkably small number of cases of diarrhœa, dysentery, colic, or other intestinal affections to treat at the post, and, when occurring, they have been traceable in most cases

to errors in diet, either as regards its quality or quantity, and generally the latter. In no case can it be perceived that the water used at the post was in fault.

Constitutional syphilis is the only disease meriting the designation of "prevalent." Diseases of a local origin are cutaneous affections, sometimes in the form of eczema and sometimes of ecthyma, caused by a poison-ivy growing in the valley. Malarial diseases are unknown, and pulmonary and rheumatic affections are of infrequent occurrence.

Statement showing mean strength, number of sick, and principal diseases at Fort Reynolds, Colorado Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	110.33	154	1	2	16	11	28	1	12	18	.....
1869.....	58.83	91	.....	3	12	4	5	.....	7	18	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT GARLAND, COLORADO TERRITORY.

REPORT OF ASSISTANT SURGEON E. McCLELLAN, UNITED STATES ARMY.

Fort Garland is located in Southern Colorado, on the lowest bench of the Sierra Blanca Mountains, distant twenty miles east from the Rio Grande, and some six miles below the site of old Fort Massachusetts, latitude $37^{\circ} 22'$ north, longitude $105^{\circ} 23'$ west, and stands at an elevation 8,365 feet above the sea. It occupies the northeastern portion of the San Luis Park, and what is known as the Beaubien or Gilpin grant. This park, which has been described as the "bowl of a drained primeval sea," extends from the Sierra Madre Mountains in the east to the San Juan or Miembres Mountains in the west, from the Sierra Blanca in the north to the chain of mountain spurs which forms the northern boundary of the Great Taos Valley of New Mexico, and contains an area of 9,400 square miles.

The San Luis is the southern of the Colorado parks; through it, entering at the northwest and flowing south, runs the Rio Grande del Norte, while from its mountain boundaries numerous streams either empty their waters into the great river or sink and become lost upon its plains. Throughout the park isolated volcanic buttes are found, resembling islands upon the surface of the sea.

The location of the fort commands the mouth of the cañons of the Rio de los Yutos and the Rio del Sangre de Christo. The roads of travel are through these, joining, some eight miles distant, to cross the mountains at the Sangre de Christo Pass, twenty-three miles northeast of the post.

No record can be found at this post which throws any light upon the early history of Fort Garland; but from a ranchero living in the vicinity, who was at one time a soldier in the regiment of mountain rifles, I learn that "Fort Massachusetts, which had been built in 1850, in the cañon of the Rio de los Yutos, was abandoned on account of its unfavorable position, and Fort Garland was established in 1857."

Fort Garland was built by the enlisted men of Company E, Regiment of Mounted Rifles, commanded by Captain (now Lieutenant Colonel) Thomas Duncan, United States Army, and Company A, Third United States Infantry, commanded by Captain (the late Lieutenant Colonel) A. W. Bowman, United States Army. The post was established to afford protection to settlers in the San Luis Park from the Apache and Ute Indians, and to command the Sangre de Christo Pass, at that time the only practicable pass to the Arkansas Valley.

In the mountain boundaries of this park precious metals have been found, and future "prospecting" will undoubtedly develop them in abundance. The agricultural interests of the park are not great, the severity of the winter and the early frosts of summer preventing large crops. Some corn, wheat, and rye are raised, but full crops are never anticipated with certainty. The principal crops are oats, potatoes, and some of the hardier vegetables. The majority of the inhabitants are engaged in pastoral pursuits. Horses, horned cattle, and sheep are raised in great numbers.

The indigenous trees of this locality are the yellow pine, the piñon, aspen, cedar, spruce, and shrub oak, upon the mountains and foot-hills; the cottonwood upon the streams. With the exception of the pine, none of these woods are of any value for mechanical purposes, but furnish an abundance of valuable fuel. The indigenous plants are sage, Spanish bayonet or soap plant, hops, flax, wild onions, wild parsnips, lambs' quarters, strawberry, raspberry, currant, and wild cherry.

The wild animals of this vicinity are—the black, cinnamon, and grizzly bears; elk, deer, antelope, panther, wild cat, gray wolf and coyote, and mountain sheep.

In the fall and early spring all varieties of wild ducks, geese, swan, and crane are to be found upon the meadows of the Rio Grande, with an occasional snipe and Virginia rail.

The bald eagle, with varieties of the vulture, hawk, and owl families; and the raven and magpie, are found throughout the year; robins, doves, blackbirds, woodpeckers, and the killdeer through the summer. The red-backed and the broad-tailed humming bird are also found in the month of July.

The streams abound in trout, beaver, otter, and mink, with a few muskrats.

The climate is dry, and most favorable to all diseases of the respiratory and digestive organs. Average mean temperature is 45.50°. The extremes of temperature are 90° and 20°; humidity, 82° and 5°. The prevailing winds are the northeast and southwest. The spring seasons are very short, and hard frosts occur early in the summer; in one year as early as the month of July. Spring cannot be said to occur until after the early days of the month of May; it is, therefore, the shortest of the four seasons in this climate. There is early frost before the 1st of September, and winter is not fully established until after the month of December.

The post consists of a parallelogram, inclosing a parade ground, with buildings containing quarters for officers and men, arranged on its several sides. The barracks are two buildings, one story high, built of adobe, with mud roofs; each is 119 feet 6 inches by 33 feet 3 inches and 15 feet 4 inches to the center of the roof, which slopes toward the parade. The interior, plastered with mud and whitewashed with lime, contains the company office and store-room, 20 feet 8 inches by 33 feet 3 inches; three squad-rooms, 25 feet by 33 feet 3 inches, and the kitchen, 24 feet 6 inches by 33 feet 3 inches. The latter is also used as a mess-room. Each barrack is intended to accommodate one company. The squad-rooms are warmed by stoves and by open fireplaces; lighted by four large windows, two at either end of the room, by which ventilation is also secured. The air space per man, at the present rate of occupancy, is 1,277 cubic feet. Double wooden bunks are furnished with the usual bedding. As there are no wash or bath-rooms—ablutions are made in the squad-room or in the open air.

The sinks are wooden buildings placed over an acequia, through which a large volume of water constantly flows, carrying débris into the Rio del los Yutos. A capacious kitchen and mess-room for each barrack is furnished with a large cooking-stove and open fireplace, and fully meet all demands.

Quarters for married soldiers are in a small building north of the post, containing small rooms, which are badly ventilated and ill lighted.

The officers' quarters extend along the north side of the parade, are seven in number, and built of adobe. The rooms are ceiled with pine boards, covered with earth after the old Mexican custom; they are well lighted and ventilated; have large open fireplaces and board flooring. On the south side of the parade are two long buildings used as offices and store-rooms. In one of these is the guard-house, which is badly arranged, being cramped as to space, and ill ventilated. The cells in its rear are ventilated only by a small opening in the roof, no arrangements for floor ventilation existing. The guard-room is warmed by means of a large stove, and the prison-room by an open fireplace; there are no means provided for heating the cells, and in winter the occupants suffer from extreme cold.

The hospital building is situated at a distance north of the post and to the left and rear of the officers' quarters. This building was put up in 1866, and I am informed by individuals who were at this post at the time, that the adobes used were not properly dried before the walls were built. The meteorological register shows the season in which the work was performed to have been unusually wet and stormy. The beams used were too small and set too far apart to bear properly the weight of the roof. When the walls commenced to settle, which was soon after the completion of the building, and when the post was garrisoned by New Mexican volunteers, no care seems to have been taken properly to repair the damage. In the wards, kitchen, and dining-room the majority of the beams are broken, requiring supports to be placed under them, and in the largest ward no less than five of these supports are required. The rear wall of the plazita, which is 20 feet in height and 2 feet in thickness, requires support to be placed against it from the outside. In the past year such repairs to the building as were absolutely necessary have been made. On the mountains in the vicinity of the post pine wood can be obtained in abundance, from which shingle coverings for all the buildings could be obtained at a small expense. Of the two wards, each containing six beds, the larger has a superficial area of 97.22 feet to each bed and an air space of 1,069.44 feet to each bed; the smaller has an area of 84.22 feet, and an air space of 926.85 feet. The dispensary is well arranged and adapted to the purpose. There are no bath-rooms or tubs in the hospital; a small room is used as lavatory, and here all ablutions are performed. A small wooden building standing over a deep pit is the hospital water-closet; its drainage is good, and it is constantly disinfected by lime.

The post bakery is a room, 21 feet 8 inches by 29 feet 5 inches, containing two ovens built of adobe, having a capacity of 100 rations at a baking.

On the west side of the post and directly in the rear of the barracks is a long building, divided into ten apartments, used respectively as carpenter's shop, blacksmith's shop, store-room, laundry, coal-rooms, barber's shop, and mess-room for non-commissioned officers. The chapel is an apartment in the building on the south side of the post, in a line with the guard-house. The adjutant's office, magazine, billiard-room, and the opera house are also in this building.

The stables are situated 126 feet due east from the post, and consist of three long corrals, built of adobe, each 229½ by 44½ feet. These corrals contain long sheds, which are used as stables for public animals, and inclosed stables for the officers' horses. The space between the sheds is raised; the floors of the sheds slope from within; out in rear of each shed is a wooden drain sunk to the level of the ground, and empties upon a gravel bank east of the corral.

The post library consists of 62 volumes, of not much value. A number of new and valuable books are expected from the East.

The water supply is most excellent in quality, being obtained from the Ute Creek by an acequia; it flows around the parade, at each corner of which is a well. The water is pure and cold, flowing from the rocky sides of the Sierra Blanca, over a rocky, sandy bed directly into the post. There are no means of extinguishing a fire at the post beyond that of buckets and ladders. The drainage of the post is naturally perfect, being built upon a large gravel bed, which has little or no covering, and through which water is reached only at a great depth. There is no artificial sewerage at the post.

On the Sangre de Christo Creek very fine bathing and swimming arrangements have been established. For winter bathing no arrangements have been made.

The post garden consists of about 6 acres of ground, one half of which is devoted to enlisted men; the balance to officers and the hospital. They are cultivated by a detail from the garrison, and all garden produce that requires but a short season can be raised here. The crop of last season was totally destroyed by grasshoppers.

As no furniture can be obtained for the barracks and quarters, only such is used as can be made at the post.

Government wagons or private conveyance are the only means of communication with the Kansas Pacific railroad, the terminus of which is now distant from the post some 210 miles. For the past year the communications have been constant; in winter and spring it is liable to interruptions from snow on the Sangre de Christo Pass, and in summer by Indians between the Arkansas River and the railroad. The Arkansas River having been bridged at several points, floods do not now obstruct transportation. The receipt of official mail matter at the post has been much delayed;

in some instances communications from department headquarters, although mailed direct, are a month or six weeks in reaching this place; the same frequently occurs with communications from Washington.

The inhabitants of the surrounding country are Americans—strong and hardy frontiersmen—and Mexicans. The population of this park is estimated at about 5,853 souls.

The sanitary condition of the post for the past year has been satisfactory. The prevailing diseases have been syphilis, gonorrhœa, rheumatism, dyspepsia, intermittent fever, catarrhs, diarrhœa, and alcoholism. The causes of intermittent fever originated in Texas, where the regiment (Fifteenth Infantry) to which the troops of this garrison belong had been stationed for four years. Dyspepsia and diarrhœa were caused by the use of improper articles of diet. No severe pulmonary diseases occurred, as there was reason to apprehend from the great change of climate to which the troops had been subjected. Rheumatism alone can be attributed to climatic influence; as yet no malarial diseases have been known to originate in this country. In my experience the female is more affected by the climate influences than the male resident of this country; and I am of the opinion that the great altitude above the level of the sea has a most decided influence upon the uterine system. I find that female residents of the San Luis Park, of Colorado, and of the territory in its immediate vicinity, menstruate from two to three years later than those of the same races living upon the lower ranges. It is by no means uncommon among the Mexican and Indian girls to be married before they have menstruated; and one instance has come under my notice in which a female was married and never menstruated until after the birth of her fourth child.

Hemorrhagic labors are common. Out of 19 cases delivered under my care since August, 1868, 14 were complicated by post-partem hemorrhage. In these cases, with one exception, the hemorrhage occurred on delivery of the placenta, which was entire; in none was there any uterine injury. The exception was a case of retained placenta, to which I was not called until some hours had elapsed from the birth of the child. Of the remaining cases, one was a partial placental presentation. The others were natural and uncomplicated. Life was lost in none. In 10 of the cases noted, the females were of American, the remaining 9 of Mexican birth. Abortions, miscarriages, and menorrhagic disorders are frequent.

Statement showing mean strength, number of sick, and principal diseases at Fort Garland, Colorado Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	160.66	253	37	56	10	7	3	41	.....
1869.....	59.33	101	3	18	14	4	.....	28	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF THE PLATTE.

POSTS DESCRIBED.

Omaha Barracks, Omaha, Nebraska.
 Fort Kearney, Nebraska.
 Fort McPherson, Nebraska.
 North Platte Station, Nebraska.
 Fort Sedgwick, Colorado Territory.
 Fort D. A. Russell, Wyoming Territory.

Fort Laramie, Wyoming Territory.
 Fort Fetterman, Wyoming Territory.
 Fort Sanders, Wyoming Territory.
 Fort Fred Steele, Wyoming Territory.
 Fort Bridger, Wyoming Territory.
 Camp Douglas, Utah Territory.

SPECIAL REPORT OF SURGEON J. B. BROWN, UNITED STATES ARMY, MEDICAL DIRECTOR DEPARTMENT OF THE PLATTE, DATED JULY 15, 1870.

Permanent posts in the Department of the Platte.

1. Omaha Barracks.
 2. Fort Kearney.
 3. Fort McPherson.
 4. Fort Sedgwick.
 5. Sidney Barracks.
 6. North Platte.
 7. Fort D. A. Russell.

8. Fort Fred Steele.
 9. Fort Sanders.
 10. Fort Bridger.
 11. Camp Douglas.
 12. Fort Laramie.
 13. Fort Fetterman.

The above are all the posts in this department which have buildings specially erected for, or occupied as, post hospitals. During the summer, from May to November inclusive, the following points are occupied as temporary stations for troops:

Station.	Garrison.	Medical attendant.
Rawling's Springs, Wyoming.....	One company cavalry.....	Post surgeon at Fort Steele.
Camp on Little Blue, Nebraska.....	One company cavalry.....	Acting Assistant Surgeon Tower.
Ogallalla, Nebraska.....	One company cavalry.....	Post Surgeon at North Platte.
Medicine Bow, Wyoming.....	One company cavalry.....	Acting Assistant Surgeon La Barée.
Looking Glass Creek, Nebraska.....	One company cavalry.....	Acting Assistant Surgeon Hogg.
Potter Station, Nebraska.....	One company cavalry, det. of infantry...	Post surgeon at Sidney Barracks.
Plum Creek, Nebraska.....	One company cavalry, det. of infantry...	Post surgeon at North Platte.
Lodge Pole, Nebraska.....	One company cavalry, det. of infantry...	Post surgeon at Sidney Barracks.
Chug Water, Wyoming.....	One company cavalry.....	Post surgeon at Fort Russell.
Hillsdale, Wyoming.....	One company cavalry.....	Post surgeon at Fort Russell.
Pine Bluff, Wyoming.....	One company cavalry, det. of infantry...	Post surgeon at Fort Russell.
Sherman, Wyoming.....	One company cavalry.....	Post surgeon at Fort Russell.

These detached stations being for the most part on the railroad, their sick are sent by rail to the nearest post hospital, if there are any cases requiring protracted treatment, temporary accommodations with hospital tents being provided for those least accessible. Resident medical attendants are stationed at three of the above temporary posts.

Description of permanent post hospitals.—Good descriptions of these hospitals have been given in the sanitary reports of December 31, 1868 and 1869, but as I have visited and personally inspected each hospital in this department, I can give perhaps impressions derived from a different point

of view, and also the advantage of conclusions drawn from comparison with each other, or with the authorized post hospital plan of Circular No. 4, of 1867. I will therefore give a brief description of each of the post hospitals, mentioning particularly such points as seem to me to have been omitted in the special reports, and such modifications and alterations as have been made by way of improvement since the latest reports.

No. 1. *Post hospital, Omaha Barracks.*—The contract for the building of this post was made by the chief quartermaster of this department, and called for the completion of the buildings by November 20, 1868. On the 31st December, 1868, the post surgeon reports, "the hospital is unfinished, and will not be ready for occupancy for one and a half months." On the 27th January, 1869, the medical director, Lieutenant Colonel R. H. Alexander, United States Army, advised the Surgeon General that the hospital would be "ready in a few weeks." The post surgeon, in the sanitary report of July 31, 1869, makes the statement that the hospital was not sufficiently finished to be occupied until the 1st of March, 1869. It is not finished even up to the present date. I have before me a large file of copies of letters from the post surgeon to the commanding officer of the post, to the assistant adjutant general of the department, and to the medical director, applying for work to be done upon the hospital, which he represents to be essential to the care of the sick, and necessary to complete the hospital according to the plan. Some of this work has been done, and some still remains unattended to. The hospital at Omaha Barracks is built after the plan prescribed by Circular No. 4, of 1867. The ground floor, however, by some neglect, was not "elevated 18 inches above the ground, with free ventilation beneath it in summer-time."

The experience of one winter proved that the wards could not be properly warmed by the stove. Several expedients, and different arrangements of stoves, were tried by the post surgeon without success. A ceiling of lath and plaster for the wards, with openings for communication with the ridge, was recommended by me last fall, and the recommendation having been promptly carried out, no difficulty was found in warming the ward last winter. The present post surgeon and commanding officer of the post have recommended that the wards be furnished with shutters to exclude the sun and dust. I have not approved this recommendation for the reason that sun and dust cannot be entirely excluded without excluding air, and have advised, in addition to the curtains now in use, outside Venetian awnings, and appropriate measures to diminish the amount of dust near the hospital. The veranda, which is not allowed in this latitude, would obviate all inconvenience.

No. 2. *Fort Kearney, Nebraska.*—The post hospital is a one-story frame building, originally built and used for company quarters, the regular post hospital having been destroyed by fire. It has three small wards, poorly ventilated, and is altogether badly suited for hospital use. All attempts to improve the condition of this hospital have been answered by the statement that the post would soon be abandoned. Since July, 1869, some repairs have been made by the post commander which were evidently necessary for the preservation of the supplies and the shelter of the sick.

At this post I found in use, and still perfect, notwithstanding extraordinarily hard usage, the old-style iron bedstead. They are in complete repair, and having been newly repainted, are in every respect as good as when issued fifteen years ago.

No. 3. *Fort McPherson, Nebraska.*—The post hospital is a log building, chinked and plastered, with shingle roof; has two wards with capacity for twenty-four beds; air space, 518½ cubic feet per bed. The average occupation of beds is 12. This building is comparatively convenient and comfortable, and is kept in good repair.

No. 4. *Fort Sedgwick.*—The post hospital is an adobe building. Its size is ample. I found, however, very little room available for the use of the sick, but one ward, having a capacity for ten beds, being in use; the other was occupied by the post surgeon as quarters. Improvements have been made within the past year by which the ward-room has been doubled, and most of the other inconveniences removed.

No. 5. *Sidney Barracks*—No. 6. *North Platte*—Are posts in embryo. They have temporary accommodations for sick, which answer for present purposes. No permanent buildings of any kind have been erected at either station. Sidney has a frame building in use as hospital, with accom-

modation for 12 patients. It is thought that in time the post of Fort Sedgwick may be removed to Sidney.

No. 7. *Fort D. A. Russell, Wyoming Territory.*—This hospital is built after the plan prescribed by Circular No. 4, 1867, with the following variations: The hall of main building is 6½ feet instead of 5 feet in width, for the shelter of men attending sick-call—no veranda being authorized. A skylight was added to light the stairs and upper hall; the space above the front hall was therefore available to be inclosed and used as a closet for linen. The next variation from the plan was made by the quartermaster, and was productive of much discomfort, and perhaps suffering, to the inmates of the wards, which, instead of being plastered, were sheathed with flooring matched, but the imperfectly seasoned lumber soon opened at the joints, and admitted cold air, snow, and rain to such an extent that the post surgeon, Lieutenant Colonel Alden, United States Army, made an official report, and asked for repairs. After long delay, tarred-paper lining and ceiling to one ward was finally provided, but it required the official statement of the post surgeon that for two winters the ward had been insufficiently warmed, with cases of pneumonia and acute rheumatism under treatment.

No. 8. *Fort Sanders, Wyoming Territory.*—The frame-work of a two-story log building, 35 by 36 feet, each story 10 feet in height, with a one-story attachment, 13 by 23 feet, intended for offices, store-rooms, sleeping-rooms for attendants, and kitchen, was commenced and more than half finished in the latter part of 1868. It remains still half finished at the present date, want of lumber and of mechanics having prevented any attempt at completion. The long log structure now used as ward, dispensary, store-rooms, &c., is badly contrived for the purpose, and would be inadequate for a larger command. The post surgeon, by persistent applications, has brought it through the following progressive stages: Rechinking the cracks, patching with old canvas, and finally, by lath and plastering, it has been made comfortable for the sick, and will answer a temporary purpose till the command is increased, when the chronic correspondence will have to be reopened relative to the completion of the two years' half-finished administration building, which has become a conspicuous landmark on the Laramie Plains.

The officers' quarters at this post have had verandas added, and have been put into most comfortable condition. General J. H. Potter, in command of the post last year, assured me that he would have work immediately recommenced upon the hospital, but he was soon afterward assigned to special duty out of this department, and the work remains untouched.

No. 9. *Fort Fred Steele, Wyoming Territory.*—When this post was ordered built, the medical director of this department, Lieutenant Colonel R. H. Alexander, United States Army, submitted the plan of hospital required by Circular No. 4 to the Quartermaster's Department, recommending that it be built accordingly, but, for some reason not known to me, the recommendation was not carried out, and the post was completed without any provision for a hospital building. The post surgeon, Assistant Surgeon J. K. Corson, United States Army, in his sanitary report of December 31, 1868, states that the sick were treated in hospital tents on frames; these at a post when the thermometer shows a range from 90° to —21°, could scarcely be considered comfortable. A set of unoccupied company quarters was therefore fitted up as a temporary hospital, and it is still occupied as such. I found on a recent inspection of this post hospital, that while every other building at the post had been completed, the "temporary hospital" had not even been repaired, but remains in the precise condition in which it was taken for the emergency. The mud-chinking has fallen out from between the logs, and the shingles were warped so that daylight could be seen in any direction through the crevices in the walls and roof of the ward. I have approved and urgently recommended the proposal of the post surgeon, to have the temporary hospital transferred to another set of unoccupied company quarters, more eligibly situated, and that these be altered to a plan which will provide a comfortable and convenient post hospital with kitchen and mess-room attached for present use. As Fort Steele, however, is to be a permanent post in this department, it would be proper to have a hospital built in accordance with plan of Circular No. 4 without delay.

No. 10. *Fort Bridger, Wyoming Territory.*—The special report of the post surgeon, Assistant Surgeon W. E. Waters, United States Army, dated December 31, 1868, sets forth fairly the condition of this hospital at that time. His repeated recommendations for increased accommodation for

the sick, and his reports of the shameful character of the buildings occupied by them, were disregarded. The ward was 35 by 18 feet, with a height of ceiling of only 7 feet, and with no means of ventilation, when the doors and windows were shut, but the fireplaces, which fortunately being old style, and capacious, answered to prevent suffocation in the winter, and yet one can scarcely see how. The company quarters being built after the same plan, it is not surprising that ophthalmia should have been frequent at this post.

Assistant Surgeon Waters submitted a plan for the remodeling of this hospital on the 20th of August, 1868. The work was not commenced till August of the following year.

No. 11. *Camp Douglas, Utah Territory.*—The hospital at this post is very well described in the special report.

I consider the construction of this hospital eminently faulty. The wards have windows only on one side, the building being divided by a longitudinal partition into two wards. The ventilation is very imperfect, and, without an entire rearrangement of the whole inside structure of the building, cannot be improved. The weather is intensely hot in the long summer at this post, and I know that the inmates of the wards could be made much more comfortable. There is a front veranda before the dispensary and steward's room, but none for the wards. The whole building is old and infested with vermin, and should be rebuilt if the post is to be occupied.

No. 12. *Fort Laramie, Wyoming Territory.*—The post hospital of Fort Laramie is now quite capacious and very well appointed, and comfortable for patients. It is also in very good repair. Attention is called to the following extract from the sanitary report of Assistant Surgeon Schell, United States Army, dated December 31, 1868: "During the winter of 1866 and 1867 the hospital had been so full that I was obliged to have three hospital tents pitched all winter, where ward No. 1 now stands. A number of soldiers were afflicted with scurvy, as were also many of the employés of the quartermaster. The winter was unusually severe and stormy, and the tents, though pitched on frames in the most secure manner, were repeatedly blown down, and by the time spring came were torn into ribbons."

The winter, cold at this post, is usually intense, the mercury often falling to -20° F., and the wind storms are always violent; yet in spite of these known circumstances, and the repeated remonstrances of one of our most energetic and influential medical officers, then post surgeon, sick men were permitted to be treated in hospital tents during the entire winter.

No. 13. *Fort Fetterman, Wyoming Territory.*—The building of this post was commenced in July, 1867. The sick were treated in tents until late in December, when adobe store-houses for the quartermaster and commissary stores, officers' quarters, laundresses' quarters, and company quarters having been completed, a hospital was hastily thrown together from the logs remaining from the old hospital of an abandoned post in the vicinity.

During the previous month, November, there had occurred 101 cases of disease and wounds, and 2 deaths, out of a command of 374, mean aggregate strength of officers and men. This fact is mentioned to offset the general reply to applications for hospital buildings, that the command is so healthy that no emergency exists.

The hospital remained in the condition described by Assistant Surgeon Charles Mackin, United States Army, then post surgeon, in special report and sanitary report of December 31, 1868. The ward was lighted by three windows of one sash each, the daylight visible through every crevice between the logs and shingles, and the inmates suffering from cold in the winter. Part of the building had no floor but the hard soil, and thus the building remained until June of the present year, when I have succeeded in getting work commenced in a reconstruction of the old log frame, which is to be redivided according to a plan furnished by Assistant Surgeon Monroe, United States Army, post surgeon. The whole is to be lathed and plastered, and the work, which at last advices was being rapidly pushed forward, will, when completed, afford for the first time since the establishment of the post a comfortable shelter for the sick.

It will be seen by the above that in the construction of a new post the hospital is generally the last building commenced, and always the last one made habitable. In the absence of any positive and definite general regulations on the subject, the post commandant or assistant quartermaster, intrusted with the building of the new post, is permitted to be the sole authority as to the sequence

of commencing the structures. Under this state of affairs, there is room at least for the operation of individual personal preferences, which I need not enlarge upon, in the matter. After a careful examination of all the correspondence available to me in connection with the building of the posts in this department, I am forced to the conclusion that the personal popularity or influence of the post surgeon, with one or both of the above-named officers, has, in most instances, determined the promptness with which the post hospital has been commenced and finished. In other cases the most urgent representations of the [post surgeon have been apparently disregarded, or action upon them delayed, until a time arrived when, in their opinion, a beginning could be made. At this juncture perhaps the lumber is not available, or it may be the chief quartermaster, strongly impressed with the fact that the actual cost of building the post will far exceed the original estimates, just now orders the discharge of all mechanics except enlisted men, and further delay to the unfortunate hospital arises. Then commences the correspondence, indefinite in duration, requiring reference to the headquarters of the department, in which the assistant adjutant general, the chief quartermaster, and the medical director participate, and sometimes a personal inspection and special report are required from the assistant inspector general. In this manner is time consumed in setting right what could easily have been avoided by the operation of positive and definite regulations, which should prescribe the order in which the buildings of a new post should be commenced and completed.

After shelter has been provided for the subsistence of the men, and for such stores as are necessary for their use as soldiers, the hospital should be made habitable, if not simultaneously with the men's quarters, at least immediately afterward, and preceding the erection of quarters for officers and their families, and for camp followers. It is no doubt true that in summer, and under favorable circumstances of unusual health of command, this order might be disregarded, but I know of no other way of preventing the abuses which so often occur than to make the regulation imperative, and not admitting of exception. Circular No. 4, of 1867, though a great step out of previous chaos, is not definite in this respect; it does not prescribe any order of construction, or even require positively that all post hospitals shall be built in accordance with its plan. In this department there are but two, of the many which have been built since it was promulgated, at all in conformity with the circular, and in both of those unwarrantable alterations were made in the mode of construction therein directed, resulting, in the case of the post hospital at Fort D. A. Russell, in actual discomfort, if not suffering, to the sick for two severe winters before the eccentricity was corrected. The general features of the plan therein given are excellent. The use of tarred paper over sheathing, to be covered by weather-boarding on the outside, would, in my opinion, be an improvement over upright sheathing with battens, which, according to my experience, invariably leaves open joints. The same tarred paper over sheathing, to be covered with lath and plaster, for the inside, thus inclosing an air chamber, would make the wards warmer in winter and cooler in summer, and certainly prevent that prevailing style of crevices which may in some instances assist ventilation, but which, in many memorable cases, have admitted cold rain and snow upon those suffering with acute rheumatism and pneumonia. The alterations made by Lieutenant Colonel Alden, United States Army, post surgeon at Fort Russell, seem to be judicious and worthy of imitation. The veranda, which is only authorized in the circular at posts south of latitude 38° north, should, in my opinion, be provided for all post hospitals. At present all in this department are excluded from the great comfort afforded by the veranda. The summer heat here and throughout the whole length of the valley of the Platte is excessive, and at Camp Douglas the high temperature prevails for months.

Attention is also called to the fact that when extreme cold prevails in winter it is impossible to warm the wards with the roof open to the ridge. It is difficult to define this region between parallels of latitude, because a ward so constructed could more easily be warmed on Puget Sound than in New York Harbor, but I would respectfully recommend that some provision be made for these cases. At posts where the mercury habitually falls to zero of Fahrenheit, authority might be given to close the ward above by a lath and plaster ceiling, leaving capacious openings communicating with the ridge, which might, if necessary, be closed with traps.

OMAHA BARRACKS, NEBRASKA.

REPORT OF ASSISTANT SURGEON FRANK MEACHAM, UNITED STATES ARMY.

The post of Omaha Barracks is located on the Missouri River, three and one-half miles west of Omaha City, Nebraska, and one and one-half miles south of the town of Florence, in latitude $41^{\circ} 20'$ north, and longitude 96° west; altitude, 960 feet. The post was established November 20, 1868. The reservation comprises 80 acres of land, 40 of which were contributed by the city of Omaha; the remainder was purchased by the United States Government. It is nearly a perfect rectangle in shape; the long axis running north and south. The western side is elevated and overlooks the reservation and the city of Omaha. The country west and south is rolling, while east, toward the city, it is nearly level. The soil consists of a rich black vegetable mold from two to five feet in thickness, containing some sand, but entirely free from stones and gravel; it is easily plowed and very fertile. The subsoil is a yellowish clay, not impervious to water.

There are no trees on the reservation or vicinity. The shrubs are common elder, dwarf sumach, American hazel, common blackberry, dewberry, summer grape, wild gooseberry, dwarf raspberry, dwarf huckleberry.

The mean temperature for the year ending March 31, 1870, was 47.83° F., the extremes being 95° F. and -10° F. The total rain-fall for the same period was 65.36 inches. During the warm months the prevailing winds are from the south; in winter from the north. They frequently blow with great violence.

Ten buildings are used for company barracks, five on the north, and five on the south sides of the parade. They are wooden structures, lined with brick, each 30 by 80 feet, 12 feet high to the eaves, and 24 feet to the ridge, giving a capacity of 43,200 cubic feet. Each barrack has a porch in front, 10 feet wide, from each end of which a room, 10 by 10 feet, is cut off for store-room and first sergeant's room. The buildings are warmed by stoves; there are no special means of ventilation, though the rooms seem to be sufficiently open to supply all the fresh air that is necessary. Each barrack is capable of accommodating 75 men, giving to each 544 cubic feet air space. Two tiers of double wooden bunks are used. There are no wash or bath-rooms. There are two sinks at the rear of the middle barracks; they are frame houses, 16 by 50 feet, placed over pits, 11 feet deep. A kitchen and a mess-room for each company are contained in a building placed in rear of each barrack, and communicating with the latter by a covered passage way, 10 by 16 feet. The capacity is ample.

The quarters for laundresses and married soldiers are two frame buildings, each 150 by 30 feet, and divided into nine sets of quarters, each containing two rooms, 15 feet square. Two other buildings, each 30 by 80 feet, and divided into five sets of quarters of two rooms, are occupied by married soldiers.

The officers' quarters are fourteen frame buildings, lined with brick, plain batten finish, and painted a dull yellow color. They are one story high, with attic rooms. There are ten double sets of quarters for line officers, each accommodating a captain and two lieutenants. They are divided into two symmetrical parts, each containing a front room, 15 by 15 feet, two back rooms, each 15 by $10\frac{1}{2}$ feet, and a hall, 15 by $8\frac{1}{2}$ feet, on the first floor. The attics contain two rooms, each 15 by 15 feet, with a large closet. There are three sets of quarters for the field officers and the medical officer. These quarters contain a front room, 20 by 15 feet, two back rooms, 15 by 15 feet, and a hall, 15 by 10 feet, on the lower floor. In the attics are two rooms, 20 by 15 feet, with a closet, 10 by 10 feet, connected with each room. The commanding officer's quarters is a two-story house, 40 by 50 feet, with a porch, 8 feet wide, in front, and part of each side. There is a hall on the first floor, 40 by 7 feet; on the left is a room, 15 by 36 feet, with a bay-window; on the right are two rooms connected by folding doors; the front room is 15 by $15\frac{1}{2}$ feet, the back room, 15 by 20 feet; to the rear of these rooms are two smaller rooms, two narrow halls, a cellar-way, and a water-closet; still further back is the kitchen and laundry. On the upper floor are four rooms, 15 by $15\frac{1}{2}$ feet, with three smaller rooms, a bath-room, and a water-closet. This set of quarters has the only

cistern at the post. It is occupied by the general commanding the Department of the Platte. At the rear of each set of quarters there is a kitchen and small store-room contained in a detached building, 18 by 13 feet. This building is connected with the main building by a covered passageway, 15 by 6 feet, with latticed sides.

The commanding officer's quarters are heated by coal fires, for which grates are provided. All the rest are heated by wood-stoves. They are lighted by coal-oil lamps, and are ventilated by means of the windows, which open from the top as well as the bottom. Wells were dug between each two sets of quarters, but owing to the impurity of the water, none of them can be used. The quarters are now supplied by water taken from a well at the rear of the barracks, by a wagon which leaves at each kitchen daily the amount required. There is a privy 50 feet to the rear of each kitchen; they consist of small buildings placed over pits. There are no bath-rooms in any of the quarters except the commanding officer's.

There are two buildings for store-houses, each 80 by 30 feet; one used for quartermaster, the other for commissary stores.

The guard-house is $43\frac{1}{2}$ by $48\frac{1}{2}$ feet, with a porch in front, 12 feet wide. The entrance is in front near the center, and leads into a hall, 16 by 4 feet; on the left is a room, 16 by 16 feet, for the officer of the guard; on the right, a room, $22\frac{1}{2}$ by 21 feet, for the guard. The front hall leads into a second, 32 by 4 feet, which is a continuation of the first, separated from it by a strong door; on the left of this passageway is a room, 18 by 15 feet, in which are confined prisoners of the worst class. At the rear of this room are 3 cells, $7\frac{1}{2}$ by $4\frac{1}{2}$ by 12 feet high. At the rear of the guard-room is a room, 24 by 21 feet, in which are confined the lighter cases. All the above rooms are 12 feet high. The guard-house is warmed by stoves burning wood. The prison-rooms are ventilated by three grated windows, 2 feet square, placed 8 feet from the floor. These windows are kept constantly open. There is no ventilation in the cells. The rooms occupied by the prisoners contain 9,088 cubic feet of air space, and are usually occupied by 30 men, giving each man 303 cubic feet of air. The cells contain each 390 cubic feet of air. They are seldom used, and only for solitary confinement. With the exception of the want of proper ventilation in these cells, the guard-house is well adapted to its purpose.

The hospital is located at the south end of the garrison. It is a frame building, lined with brick, batten finish, painted dull yellow. Its general arrangement is the same as given in Circular No. 4, from the Surgeon General's Office, 1867, for 48 beds. It is warmed by wood-stoves, and has ridge ventilators. There are 24 beds in each ward, with 990 cubic feet air space per man. The bath and wash-rooms are well arranged. There are no water-closets in the building. The hospital sink is 80 feet distant. There is no dead-house. The baggage of the patients is stored in one of the small rooms at the end of the wards.

The post bakery is 40 by $20\frac{1}{2}$ feet, and contains one room in front, with an oven, 15 by 12 feet by 6 feet high, in rear.

There are six stables, each 221 by $30\frac{1}{2}$ feet, and containing 46 double stalls. There is a well with pump in each. They are ventilated by the ridge. There are two other stables, one 190 by $30\frac{1}{2}$ feet, the other 120 by 26 feet. The smaller one is used at present for a store-house. The six largest are not in use during the summer, but are occupied by the cavalry companies during the winter months.

The library contains 420 volumes of a miscellaneous character.

The water used at the post is taken from a well north of the north row of barracks, and left at the kitchens each day by the water-wagon.

No analysis of the water of this well has yet been made. The following is a qualitative analysis of the water from a well on the line of officers' quarters, made by Assistant Surgeon S. M. Horton, United States Army, April 27, 1869:

"The quantity of organic matter is very large, consisting chiefly of vegetable material suspended and in solution. It is this large quantity of organic matter that gives the water its nauseous odor. A large amount of almost black powder was deposited upon adding solution of yellow chloride of gold to the water while boiling. A large proportion of solution of permanganate of potash was added to a definite quantity before the pink color would remain. A large quantity of carbonate of lime was deposited upon the sides of the vessels when the water was boiling. Some

salts of lime other than the carbonate, as the sulphate and nitrate of lime, were found upon further examination. Also a small proportion of magnesia and ammonia was discovered. No free sulphuric, nitric, or nitrous acid was found. No chlorides nor sulphureted hydrogen were found, although they were looked for. The great objection to this water is its nauseous odor, and to many its disagreeable taste, both from the organic matter it contains and its hardness. It is almost impossible to form a lather with soap when cold and before boiling the water. The organic matter found in it originates evidently from the water filtering through a peat bed most probably of great age, and from four to seven or more feet thick. The sinks in rear of the officers' quarters must ere long prove a further source of contamination to the water on that line, as they are not many yards distant from the wells, and are above them on the hill-side. It is recommended, in consideration of the above facts, that large cisterns be constructed, with charcoal filters, so as to purify this water before using it for drinking or culinary purposes."

The water now used at the post has very little of the disagreeable smell and taste referred to by Dr. Horton.

There are no springs on the reservation nor in its immediate vicinity, but there is a mineral spring $1\frac{1}{2}$ miles southeast, of which the following is an analysis:

	Grains per gallon.
Carbonate of lime.....	5.86
Carbonate of magnesia.....	4.91
Carbonate of soda.....	2.42
Sulphate of lime.....	4.10
Sulphate of magnesia.....	4.31
Sulphate of soda.....	6.00
Chloride of sodium.....	2.63
Chloride of calcium }	
Chloride of magnesia }	.33
Oxide of iron.....	.44
Organic matter.....	.29
Total.....	31.29

Carbonate of lime, magnesia, and oxide of iron held in solution by carbonic acid. Carbonic acid not ascertained.

As a precaution against fires there are barrels and buckets constantly filled with water in each of the barracks, store-houses, and stables; also at the hospital. In addition there are one or more patent fire-extinguishers in each of the above-named buildings.

The natural drainage, except at the south end of the grounds, is ample. The artificial drains are simple open ditches, and are used exclusively about the south row of barracks and laundresses' quarters. The drains discharge into a small stream that flows in front of the post and empties into the Missouri River. Slops and excreta of the post are hauled away and deposited on the commons northeast of the post.

During the summer the men bathe in the Missouri River, $1\frac{1}{2}$ miles distant. There are no arrangements at the post for bathing in summer or winter.

About $3\frac{1}{2}$ acres are cultivated as gardens, half an acre being under the direction of the post surgeon, the remainder under the supervision of the post treasurer. Each company has a garden of 3 acres area outside the post, cultivated by details. The company gardens supply the companies with vegetables during the year, except potatoes; these can be purchased in the vicinity so cheap that it is not thought necessary to raise them in large quantities.

The prevailing diseases during the past year have been intermittent fever, acute diarrhœa, catarrh, tonsillitis, and acute rheumatism.

The intermittent fever and diarrhœa prevailed principally during the summer months, and were undoubtedly influenced largely by the impurity of the water. The other diseases, catarrh, tonsillitis, and acute rheumatism occurred principally during the colder months, and were probably caused almost entirely by the variable climate and damp atmosphere.

Statement showing mean strength, number of sick, and principal diseases at Omaha Barracks, Nebraska, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarhal affections.*	No. of deaths.
1869.....	416	1,061	224	93	53	57	2	77	2	285	4

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT KEARNEY, NEBRASKA.

REPORT OF ACTING ASSISTANT SURGEON W. H. BRADLEY, UNITED STATES ARMY.

Fort Kearney was established as Fort Childs, Indian Territory, in 1848. It is situated in latitude 40° 33' north, longitude from Greenwich 99° 6' west, and about 2,360 feet above the level of the sea, on the south bank of the Platte River, in the State of Nebraska. The reservation, ten miles square, was declared by the President under date of January 18, 1849. The Union Pacific railroad crosses the northern portion of the reservation on the north bank of the river, a distance of six miles from the fort. The Platte River at this point is about nine miles wide, and filled with islands. A range of hills, of sandy formation, skirt the valley on the south side; the range is from one to two miles wide. South of these hills, to the Republican River, is about forty miles of table-land, slightly undulating. The whole country is prairie, and is supposed to be, with little exception, arable, capable of yielding good crops of wheat, corn, oats, potatoes, fruit, and all kinds of vegetables that grow in the same latitude in the Eastern States. The soil of the Platte Valley is principally clay, mixed with a little lime and sand and vegetable humus, washed down from the adjoining bluffs. No stone or rocks are found in the vicinity of the post. A few feet beneath the surface of the ground is found the quicksand, originally washed there by the Platte River. Cottonwood, elm, ash, cedar, and wild plum trees are found on the islands. The wild animals are the buffalo, antelope, deer, gray wolf, coyote, swift rabbit, ground squirrel, badger, skunk, prairie cat, and field mouse. Birds are represented by the eagle, turkey buzzard, several species of hawks and owls, the blackbird, snowbird, wild goose, duck of all varieties, prairie chicken, plover, and small species of snipes. Catfish of all sizes are caught in the Platte River. The reptiles are represented by the frog, toad, rattlesnake, and several species of small grass snakes.

The average temperature from July 1 to December 31, 1868, was 52°; hygrometer, 51°. High winds, storms, heavy rain-showers, and hurricanes are frequent during the summer and fall. Snow does not remain any length of time.

Fort Kearney was, at the time of its establishment, the only intermediate station between Fort Leavenworth, Kansas, a distance of 350 miles east, and Fort Laramie, 420 miles west, on the California overland route, and is about midway between the Mississippi River and the Rocky Mountains. It was established for the protection of the west-bound emigrants and peaceable Indians from hostile Indian tribes and outlaws infesting the country. The post is built on a level plain, one and a half mile from the bank of the river. Eight miles east, beyond the limits of the reservation, and two miles west, were situated, about two years ago, two flourishing towns—the former, Valley City; the latter, Kearney City—both now in ruins, and nearly deserted on account of the Union Pacific railroad taking the place of the old overland route.

The post is laid out in a regular square, with the store-houses on the north; the officers' quarters and one barrack, now unoccupied and used for theatrical performances, on the south; the company quarters and guard-house on the east, and the commanding officer's quarters and office buildings on the west. These buildings surround a parade ground of four acres in extent, in the center of which is erected the flagstaff. A few cottonwood trees line the sidewalks of the parade,

but afford shade only to the deserted officers' quarters. These trees have been planted inside of the garrison, but have been neglected.

About 200 yards in rear of the store-houses belonging to the regular square of the post are the stables and a quartermaster's store-house, on a line front, facing the parade. About 200 yards in rear of the commanding officer's quarters and office buildings are the married soldiers' quarters, post office, bake-house, and sutler's shop. Southwest and about 200 yards from the main square is the hospital building; northeast, the magazine; and about 150 yards in rear of the company quarters is the blacksmiths' shop.

The company quarters, three in number, are one-story frame buildings, divided into rooms, two of which are 25 by 40 feet, for the company; two, 10 by 12 feet, one of which is used as a company store-room, the other for the orderly sergeant and as office; one mess-room, 16 by 50 feet, and a company kitchen. These buildings are very well lighted, which is the case with all the buildings in the post, but no regard to ventilation has been had in their construction, though all the buildings are spacious. The dormitories have an air space of 250 cubic feet per man, and are furnished with double bunks, with bedsacks filled with hay. Quarters for married soldiers are in log and adobe buildings, and in a very dilapidated condition. These buildings are divided into rooms, 16 by 16 feet, well lighted, though badly ventilated.

The commanding officer's quarters consist of a story-and-a-half frame building, containing six rooms, each 20 feet square, a hall, kitchen, and a large porch in front and rear, with several out-buildings. This building is built in an old-fashioned style, and is surrounded, with the exception of the front, which faces the parade ground, by the remains of a garden. The buildings are comfortable and in good repair.

The officers' quarters is a two-story-and-a-half frame building of old style, containing twelve rooms, with halls and kitchens. This building is spacious and in good condition. A small one-story frame building, cottage style, with three rooms, 15 by 15 feet, is situated in the line on the left of the officers' quarters, and was originally designed for the use of the chaplain of the post.

The office buildings, four in number, are much of the character of the company buildings, and of sizes suitable for offices. The store-houses are frame and weather-boarded, spacious, and in good condition.

The guard-house is a one-story frame building, with two rooms, 20 by 20 feet, one for the guard, the other for prisoners. The building is provided with a front porch, is well lighted, and built on the plan of the company quarters, and is well adapted to its purpose.

The hospital building, a one-story frame structure, formerly used for company quarters, has three ward-rooms, each 25 by 30 feet, one store-room, 10 by 12 feet, a dispensary, 10 by 12 feet, which is used also for an office, a kitchen, 20 by 20 feet, and a laundry, 10 by 10 feet. This building is well lighted, warmed by stoves, and ill ventilated, and it being old and dilapidated, is entirely unadapted for the uses for which it was built. A new hospital is much needed at this post. The dispensary is very much out of repair. The wards have a capacity of twenty beds, with an air space of 600 cubic feet per bed. No bath-rooms are connected with the hospital.

The post bakery is an adobe building, with dirt roof, very large, with an oven constructed of brick, in which sufficient bread is baked for the use of the command.

The magazine is a heavy frame, conoidal in form, covered with several feet of earth, and in good condition.

About 300 yards southwest of the fort is an ice-house entirely over ground, as the nature of this place does not permit it otherwise on account of the water which is found only a few feet beneath the surface. It is a frame building, 20 by 40 feet, old and dilapidated. Several other small buildings are scattered between those already mentioned, one used as a billiard-room, another as a school-room.

The stables are of the same construction as the store-houses, but very dilapidated and in need of repair.

Water for the use of the garrison is obtained from wells, 12 to 20 feet deep. The water rises and falls according to the rise and fall of the Platte River. It is of a good, soft quality, with a slight magnesia taste. The animals are watered in the Platte River.

There are no sewers at the post. Drainage is effected by evaporation and absorption, as the soil is composed of dry alluvial deposits and sand. The offal of the post is collected by police parties

and carried in wagons some distance out on the prairies. The sinks are ordinary dirt latrines, filled, and new ones dug as occasion requires. One room, fitted up with tubs made from barrels, is used as a bath-room by the men.

There are no gardens connected with the post. All vegetables, as potatoes, onions, &c., are furnished at a plentiful rate from the assistant commissary of subsistence at Omaha, Nebraska. There is a daily mail from Kearney's Station, on the Union Pacific railroad. Time to department headquarters, twenty-four hours.

South of the Platte River, in all the scattered settlements, there are about 1,500 inhabitants. Agriculture is the general occupation of the settlers, and there is considerable trading done at the towns of Kearney, Wood River, and Grand Island; the last mentioned is west of Fort Kearney, on the Union Pacific railroad, about 40 miles distant.

Statement showing mean strength, number of sick, and principal diseases at Fort Kearney, Nebraska, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	92.83	198	61	28	9	.....	12	3	23	.....
1869	40.58	31	4	2	5	2	2	1	8	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT McPHERSON, NEBRASKA.

INFORMATION FURNISHED BY SURGEON P. C. DAVIS, UNITED STATES ARMY, AND ASSISTANT SURGEON A. D. WILSON, UNITED STATES ARMY.

Fort McPherson, Nebraska, is situated in latitude $41^{\circ} 3'$ north, longitude $100^{\circ} 38'$ west, at an elevation above the sea of 2,770 feet, on the south bank of the South Platte River, eight miles above its confluence with North Platte River, and lies directly east from North Platte City eighteen miles, and five miles in a southeasterly direction from McPherson Station, Union Pacific railroad. The post, including a line in rear of stables and rear of post hospital, covers an area of 38 acres. There are two corrals, and both are included in the land estimate. This locality, known as Cottonwood Springs, was used by the Overland Stage Company for a number of years, and in consequence became the residence of from 75 to 100 citizens. Indian depredations having been committed near this point, troops were sent to this place September 27, 1863, and named it Cantonment McKean. On the 18th of May, 1864, the name was changed to Fort Cottonwood, and on or about March 11, 1866, the name was again changed to Fort McPherson. The reservation has not been declared, except by a post order, dated June 24, 1866, which includes four miles square, the north-west point being so located as to insure control of the bridges over the river, and also to include a portion of an island of considerable size, which is used for the purpose of procuring hay. The area of the reservation consists almost entirely of the bottom land along the river, but includes a portion of the bluffs south of the post. The immediate location of the post is upon a plateau or tableland, containing about 38 acres, situated about one-half mile south from the river, and about 30 feet above its level. The geological formation of this region belongs to the tertiary period.

The surrounding country is not arable; there are no trees or gardens; the soil is sandy; good grass is found about three miles from the post. The animals of this region are those common to the whole extent of the plains. The Platte River rises in April and falls in July; is fordable about seven months of the year. The climate is very dry. The estimated average monthly temperature

for the twelve months ending June 3, 1869, is 51° F.; the extremes were 104° F., on the 9th of July, and -3° F. on December 21, 1869. The prevailing winds are northwest.

Fort McPherson is a five-company post, built of lumber. There are five barracks, three log and two frame buildings, well plastered and ventilated. Each building contains eighteen large windows; one building, 150 by 27 feet, with wing 87 by 25 feet; two buildings, 108 by 25 feet, with wings 71 by 20 feet; one, 96 by 25 feet, with wing 71 by 20 feet; one, 132 by 30 feet, with wing 60 by 24 feet. The main buildings are used as orderly-rooms and sleeping-rooms, the wings as bath, dining, and cooking-rooms. The average air space per man in the dormitories is $328\frac{1}{2}$ cubic feet.

The laundresses' quarters are five log and one frame buildings capable of accommodating fourteen families; they have shingle roofs, and are in good repair. Two of the buildings are 40 by 24 feet; one 30 by 15 feet; one 40 by 18 feet, with wing 24 by 15 feet; one 60 by 18 feet; one 30 by 15 feet, with wing 12 by 15 feet; they face the rear of the company quarters.

The officers' quarters are frame buildings, lathed and plastered, with shingle roofs; there are ten in all, which face directly south to the parade ground and company quarters; they are comfortable, well built, and spacious. Six are single buildings, 42 by 20 feet; three double, 54 by 20 feet; one building for the commanding officer, 65 by 24 feet. All have kitchens attached, 24 by 15 feet.

The commissary store-house is a portable frame building, 100 by 24 feet; the quartermaster's warehouse, a log building, well built, 132 by 30 feet; the forage-house, a log building, well built, shingle roof, 130 by 27 feet; the adjutant and quartermaster's office, a log building, in good condition, 42 by 20 feet; and the magazine is a circular frame building, about 20 feet in diameter.

The guard-house is a log structure, with shingle roof, built in shape of the letter T; the main building is 30 by 20 feet, and has two apartments, one for the officer of the guard, and one for the guard; the wing, 15 by 24 feet, is for the confinement of prisoners, and has one large grated window.

The hospital is a log building, well chinked and plastered, with lathed and plastered ceilings and shingle roof. It consists of a main building, 69 by 20 feet, and a wing, 64 by 20 feet; for the general arrangement of which see Figure 42.

A, ward No. 1, 20 by 42 feet; A, ward No. 2, 20 by 24 feet; D, dispensary; E, steward's room, 10 by 20 feet; K, kitchen, 20 by 20 feet; M, dining-room, 20 by 24 feet; O, office; S, store-room, 20 by 20 feet.

The hospital is capable of accommodating 24 patients; air space per bed $518\frac{1}{2}$ cubic feet.

The post bakery is a log building, 45 by 30 feet, well built, shingle roof, and has a fine, large oven.

There are five cavalry stables, built of logs, with shingle roofs. Three are 200 by 30 feet; one 280 by 30 feet; and one 24 by 30 feet.

There is no post library. The regimental library of the Fifth United States Cavalry is kept in the adjutant's office, and numbers but 30 volumes, mostly works of fiction.

The water is principally obtained from the Platte River. There are three wells at the post; two of them contain but a

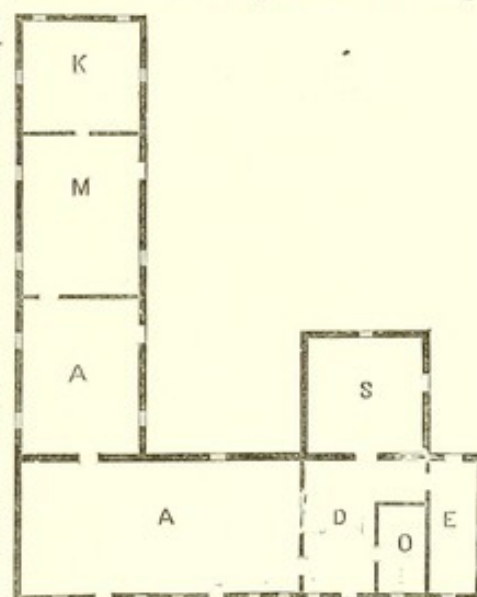


Figure 42.—Scale, 30 feet to 1 inch.

small quantity of water, and are not used; the third is located in the post corral, and furnishes a good supply of wholesome water for the stock. There are three wells in the vicinity of the post owned by citizens, all of which are in good order and furnish excellent water. The average depth of all the wells is 35 feet. There are no cisterns or reservoirs. The water is hauled from the river in a water-wagon, and is distributed in barrels kept for the purpose around the post. The quantity supplied by the water-wagon averages 3,246 gallons per diem. From the 1st of May until the 1st of August the river is very full, and at such times is loaded with earthy, and also contains about 6 parts in 1,000 of organic matter.

The immediate location of the post is a perfect flat or level, and, in consequence, there is no natural drainage. The fall of rain and snow remains upon the surface until evaporation occurs, which is rapid in this region. Very little moisture is absorbed by the soil. There is one artificial sewer at the post, and that, being connected with a set of officers' quarters, is but little used. There is one open ditch or drain about the commanding officer's quarters. The building being in a low place, the ditch drains the ground in the vicinity of the post very perfectly.

Each of the company quarters is provided with a small room in which the soldiers are enabled to perform their daily ablutions. If any of them desire to bathe they must use an ordinary tub. One of these rooms in one of the quarters is provided with two bath-tubs of wood for bathing purposes. The rest of the companies are destitute of these necessary articles. During the summer months the men are accustomed to bathe in the Platte River. There never has been an order issued at this post designating a time for the men to bathe in the river. The prisoners during the summer months are the only persons required to do so, and they generally by order of the officer of the day. The men have no facilities whatever for bathing in the winter.

During the month of March, 1870, one sergeant and six men were detailed to inclose a piece of land for a post garden, in a northeasterly direction from the post and adjacent to the Platte River, with a trench four feet deep, three feet wide at the bottom, and four feet wide at the top. The earth thus excavated was thrown upon the inner side of the trench, and the external surface of the mound thus formed is covered with a layer of sodding. Three gates are placed at intervals on a line with the mound. The middle one is small, and the outer ones so constructed as to admit teams. A rude house was constructed of logs inside the garden as a shelter for the gardeners. The inclosure thus formed embraces an area of $11\frac{1}{2}$ acres of land. There are no hospital or officers' gardens. The post garden is cultivated by six soldiers detailed for that purpose. It is watered by means of pumps stationed at intervals along the edge of the Platte River, which are worked by horse-power. A water-wheel and pump combined has been constructed and placed in the river. It performed its duty exceedingly well for a while, but the ever-changing quicksands of the Platte has rendered it useless, for the present at least. The water is conveyed over the garden by means of wooden troughs and ditches placed at appropriate intervals. The garden has yielded lettuce, onions, radishes, cucumbers, beets, &c., in profusion. Many of the vegetables planted are not yet matured, but are in a thriving, healthy condition. There seems to be no obstacle whatever to the cultivation of fine vegetables in the bottom lands of this region.

There is at the post commissary an ample supply of pickles, sour-kraut, &c., together with an estimated supply of canned fruits and preserves.

The nearest quartermaster and subsistence depots are at Omaha, Nebraska, 286 miles distant. The route of supply is from Omaha to McPherson Station by the Union Pacific railroad, seven miles distant; thence across one branch of the Platte River by a temporary bridge, and over the other branches by fords. In the spring the river rises, washing away the temporary bridge and making communication with the railroad station very uncertain and hazardous. The best season for transportation is from July 1 to March 31. McPherson Station is distant from Fort McPherson about four miles. The eastern and western mails are delivered regularly every day. Letters mailed here in the evening for department headquarters, Omaha, Nebraska, reach their destination about two o'clock p. m. the next day.

There are no Indians in the vicinity of the post, and but few white settlers. There are in all about 25 or 30 citizens living on the reservation, and they are mostly employed by contractors for the quartermaster's department.

There seems to be no disease that can be considered peculiar to this climate. The most of the cases occur among recruits, and can probably be attributed to the change of climate and water, and to excesses of diet, &c., during transportation.

Statement showing mean strength, number of sick, and principal diseases at Fort McPherson, Nebraska, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	331.83	690	2	124	103	40	9	3	30	2	111	2
1869.....	284.33	425	1	75	78	16	20	1	27	4	50	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

NORTH PLATTE STATION, NEBRASKA.

REPORT OF ASSISTANT SURGEON F. W. ELBREY, UNITED STATES ARMY.

North Platte Station is situated on the line of the Union Pacific railroad, 7 miles from the confluence of the North and South Platte Rivers, and 21 miles west from Omaha, Nebraska. Latitude $41^{\circ} 6' 55''$ north, longitude $101^{\circ} 25' 44''$ west from Greenwich; altitude 2,789 feet above the level of the sea.

The post was established in August, 1867, for the protection of the railroad, and to serve as a basis of supply for detachments of troops stationed in the vicinity. The ground occupied comprises a little over 8 acres adjoining the railroad, and is a portion of an alternate section granted by the General Government to the Union Pacific railroad. The surface topography of the vicinity is an unbroken prairie, extending 7 miles to the east and 16 miles west, with an average width of 6 miles, limited by the North and South Platte Rivers. The underlying stratum is of tertiary formation. The soil, being of a rich, alluvial character, is fertile if properly irrigated, irrigation being necessary by reason of the insufficiency of rain-fall and the oft long-continued droughts. The prairie from the South Platte River, being from 40 to 50 feet higher than the North Platte, has an even descent of about 7 feet to the mile toward the latter river, rendering irrigation convenient.

The climate is healthful, and the extremes of temperature, on account of the dry and rarefied atmosphere, are well borne. The rain and snow-fall are small. The prevailing winds during the summer are from the southeast and in winter from the northwest. The winds are frequent, of long continuance, and blow very violently.

The post grounds, inclosed by a fence, are nearly in the form of a square. The parade occupies a space near the center. All the buildings are constructed of pine wood, the roofs of some being the so-called "composition roof," consisting of boards covered with tarred paper secured by means of batting, and of the others common shingles. The barrack building, accommodating one company, is 96 by 30 feet, and one story high. It is warmed in winter by three wood-stoves, lighted and ventilated by four lateral and two end windows placed in opposite sides. If the company at present occupying the building had its full complement of 100 men the dormitory would give only 192 cubic feet of air space per man, but the company has not averaged more than 65 men for the past year, one-third of whom are now on detached service. Wooden bunks are used. The wash-room, 12 by 12 feet, is partitioned off from the quarters. The men's sinks are located south of the stable, and are unexceptionable as to depth, cleanliness, and position. The kitchen and mess-room both adjoin the barracks. Quarters of laundresses and married soldiers are contained in a building with two rooms, each 10 by 12 feet. Two one-story buildings are used for officers' quarters, constructed of wood, plastered, covered with shingles, and finished in the plainest style possible. One is divided into two sets of quarters of three rooms each, having attic chambers; the other, with no attic, contains only two rooms. The first has a kitchen attached; neither have bath-rooms.

Water is supplied from a well located to the rear. The store-house, placed near the officers' quarters on the west side of the parade, is 37 by 20 feet, one story high, and covered by a composition-roof. The building is ample in size, and well adapted for its purpose. The guard-house, located adjoining the store-house, being 20 by 13 feet in size, adequately warmed, but very imperfectly ventilated, has a capacity for 6 prisoners. There is no hospital. The post bakery is 24 by 15 feet, built of wood, and adjoins the rear of the company kitchen.

The stable is located to the south of the parade ground, built of wood, covered with boards; dimensions 52 by 22 feet, accommodating 8 horses. A portion of this building is used for storing certain quartermaster's stores, having been partitioned off for that purpose.

The North Platte River being distant from the post only 1,741 yards, and the South Platte 2,300 yards, and the soil being very porous, everywhere inexhaustible wells can be dug a depth not exceeding 10 feet from the surface. The supply for the post is therefore abundant; but the quality of the water is not all that could be desired on account of its organic impurities, the permanganate of potassa test showing a residuum of 19 grains to the gallon.

The natural drainage is all-sufficient, the porosity of the soil preventing the collection of stagnant water.

There are no bathing facilities at the post, excepting during the summer months, when the North Platte affords excellent advantages.

The post garden covers an area of three-fourths of an acre, and is well cultivated, being made productive by irrigation. Cabbage, lettuce, radishes, beets, &c., are raised.

The post being located on the line of the Union Pacific railroad, communication with Omaha, Nebraska, is easy and regular. The mails are daily.

The inhabitants of North Platte town are 500 in number, composed of railroad employés, artisans, and small traders. There have been no prevailing diseases during the past year, there being an especial absence of malarial, pulmonary, and bowel diseases, and of rheumatism.

FORT SEDGWICK, COLORADO TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEONS F. LE BARON MONROE AND J. M. DICKSON,
UNITED STATES ARMY.

Fort Sedgwick is situated upon the right or south bank of the South Platte, which flows past the post in an easterly direction; latitude 41° north, longitude $102^{\circ} 30'$ west from Greenwich; height above the sea, 3,660 feet. The town of Sidney, on the Union Pacific railroad, is 39 miles west from the post, and Fort McPherson 86 miles east, on the south bank of the Platte River. The nearest town is Julesburg, Nebraska, a railroad station on the Union Pacific railroad, three miles due north of the post.

Fort Sedgwick was established in the month of May, 1865, by Colonel McNally, Third United States veteran volunteers, for the protection of the overland route to California, against the Indians, who were troublesome at that time.

The valley of the Platte is here about three miles in width, and the fort is built about one-quarter of a mile from the river. The river is fordable nearly all the year; but from about the first of June until the middle of August, it is quite high, the rise varying with different seasons. In 1868, wagons crossed every day but one, though the water came above the bottom of the wagons for two months; the river being half a mile in width, with a channel shifting, and at times abounding in quicksands, is the greatest obstacle to communication with the railroad. The ford is about 500 yards below the post, and still further below are the ruins of old Julesburg, which was destroyed by Indians in 1865. The reservation contains 64 square miles. The ground rises gradually from the river to the bluffs—a mile distant; then comes a series of hills for about ten miles, beyond which stretches the flat table-land as far as the eye can reach. The immediate vicinity of the post is nearly level, having just slope enough to insure good drainage. The soil is not fertile, sand and gravel predominating, and is slightly impregnated with alkali. Gardens do not succeed without irrigation and great labor; and what insects do not destroy, is liable to ruin from violent hail-storms.

The mean temperature for the year 1869 was 50° F.; extremes, 99° F. and 16° F. Rain-fall during the year, 3.9 inches; snow-fall, 10.82 inches. The atmosphere is usually dry. The prevailing winds are from the westward.

Two adobe buildings are used as barracks, each 100 by 25 feet, and 10 feet high, and intended for one company, giving from 225 to 300 cubic feet of air space per man; the walls are two feet thick, and a room, 14 by 21 feet, is partitioned off at the end for the orderly sergeant. They are warmed by stoves; have no special means of ventilation, and no wash-rooms. An adobe building, built in the rear of each barrack, contains a commodious kitchen and mess-room, with fixtures and furniture complete. Married soldiers' quarters are constructed of boards and canvas, and are hardly suitable for occupancy.

Four small houses constitute quarters for the officers of the command; they are one story and a half high; two are built of adobe and plastered; the others are of portable frame, battened exteriorly. The adobe buildings contain, each, three rooms on the lower floor and two on the upper; the lower rooms measuring, respectively, 15 by 16, 11 by 16, and 11 by 14 feet; are 8 feet high, and used as parlor, dining-room, and kitchen. The upper floor has two rooms, each 7 feet high; the one 22 by 15 feet, the other 11 by 15 feet. The frame buildings have each three rooms on the lower floor, two 10 by 11 feet, and one 14 by 15 feet; these rooms are 8 feet high. The upper story consists of one room, 22 by 28 feet by 7 feet high. Temporary sheds are attached to the frame quarters for kitchens. Each of the four buildings is intended to accommodate one set of company officers. They are heated by stoves, and artificially lighted by lamps. No means for ventilation are provided. There are no water-closets or bath-rooms. Water is supplied from the South Platte River, and from the well in the rear of the quarters.

The guard-house is situated on the north side of the parade. It is a frame building, 48 feet front, by 24 feet deep, and 10 feet high. It is warmed and lighted as are the other buildings, and contains no cells, being divided into two rooms; one, 20 by 24 feet, occupied as a guard-room, the other, 28 by 48 feet, by the prisoners in common. One chimney serves for both rooms. The prison-room has a roof ventilator. The building is in very bad repair; the roof leaky and the walls full of holes. During three months, 82 prisoners have been confined in it; the maximum number being 16, and the average 7.

The hospital is of adobe, and stands in a good location 200 yards to the rear of the parade ground, toward the bluffs. It is an L-shaped structure, consisting of one building, 28 feet front by 100 feet deep, with a wing, 28 feet front by 32 feet deep. For the general arrangement of the hospital, see Figure 43.

A, ward, 25 by 25 feet; D, dispensary, 10 by 13 feet; E, steward's room, 13 by 15 feet; K, kitchen, 25 by 20 feet; M, dining-room, 25 by 16 feet; S, store-room, 14 by 25 feet; Y, surgeons' quarters, 24 by 25 feet.

The height of all the rooms is 10 feet 6 inches. The hospital, in size, is sufficient for a four-company post, but its construction is faulty; improvement in this particular has been sought, but not yet accomplished. It is warmed by stoves, and ventilated by doors and windows, and by roof ventilators. The dispensary is convenient and well arranged. The ward contains ten beds, giving 656 cubic feet of air space per man, if all were occupied. There is no bath or wash-room and no water-closet connected with the hospital. The wing portion of the building was erected as a ward, but at present is occupied as surgeon's quarters. The hospital is occupied chiefly by patients from the sub-posts, or citizens from the Union Pacific railroad.

The post bakery, 18 by 23 feet by 12 feet high, is built of adobe, the walls being 3 feet thick. The oven is 10 by 12 feet, and the supply of bread to the garrison is constant and sufficient.

The stables are two in number: one, located 300 yards east of the post, is a wooden building, 25 by 240 feet, 11 feet high to the ridge, and rectangular in shape; the other, located between the

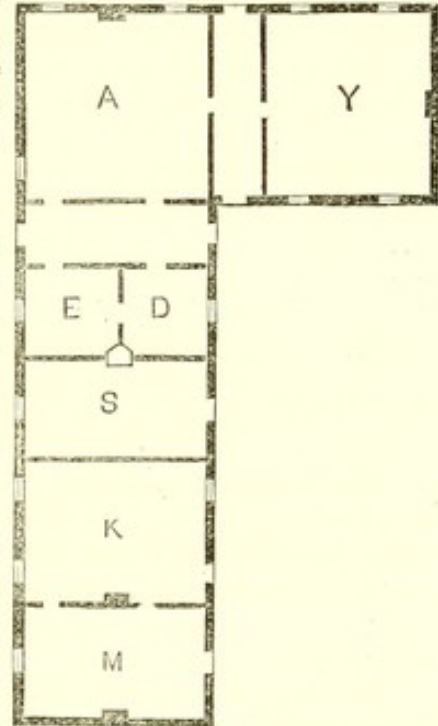


Figure 43.—Scale, 20 feet to 1 inch.

post and the river, is about 200 yards distant from the company quarters. This is built of logs, with a dirt roof, and is in a very dilapidated condition.

A library, consisting of 286 volumes of biographies, novels, and miscellaneous works, is kept in the adjutant's office under the supervision of a detailed librarian.

The post is supplied with good water from the wells, sunk to an average depth of 20 feet, and from the river. The wells are doubtless supplied by percolation from the river; the quality and quantity of water thus obtained are entirely satisfactory. The soil being very porous, good surface drainage is insured. Offal and refuse material are conveyed some distance from the post, and thrown on the prairie.

The mails are received daily and regularly. Two days are required in transmitting a letter to department headquarters, and six days to Washington. There are no inhabitants in the surrounding country, except a few families at the railroad station, Julesburg.

There are no prevailing diseases at the post, though there is undoubtedly a small amount of malaria present, but not enough to produce intermittent or other fevers. Most of the cases in the hospital are surgical. Rheumatism is obstinate and long continued, though nearly all cases of that disease have been sent here from the sub-post of Sidney, which is situated in the valley of Lodge Pole Creek. Diseases of the lungs are almost unknown.

Statement showing mean strength, number of sick, and principal diseases at Fort Sedgwick, Colorado Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	391. 16	296	1	36	49	5	1	8	21	1	63	2
1869.....	235. 41	44	.....	5	4	1	.....	3	3	.....	6	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT D. A. RUSSELL, WYOMING TERRITORY.

REPORT OF SURGEON C. H. ALDEN, UNITED STATES ARMY.

Fort David A. Russell is situated in the southeastern part of the Territory of Wyoming, in latitude $41^{\circ} 8'$ north, and longitude $104^{\circ} 45'$ west of Greenwich, at an elevation of 6,062 feet above the level of the sea. It lies on the north bank of Crow Creek, a branch of the South Platte, and three miles west of the town of Cheyenne, a station on the Union Pacific railroad. The base of the Black Hills is about 15 miles distant; Omaha is 517 miles east; Fort Sedgwick, 146 miles east; Fort Sanders, 57 miles west; all on the Union Pacific railroad. Fort Laramie is 90 miles north, by wagon road, and Denver City 107 miles south, reached by the Denver Pacific railroad.

The post is named in honor of Major David A. Russell, Eighth United States Infantry, brigadier general United States volunteers, and brevet major general United States Army, who was killed at the battle of Opequan, Virginia, September 19, 1864. The ground was selected and first occupied by troops in July, 1867. The object in establishing this post seems to have been to protect the railroad in this vicinity, and the lines of travel south to Denver, and northward to Fort Laramie and the posts beyond. A large quartermaster and commissary depot was established in August 1867, $1\frac{1}{2}$ mile east of the post, which is an important base of supplies for the military stations to the northward, the old road from Fort Sedgwick to Fort Laramie being now abandoned for the new and shorter one from Fort Russell.

The reservation was originally a parallelogram, extending 2 miles east and west, by 3 miles north and south, and containing 3,840 acres. Additions somewhat irregular have been made, partly

to give increased space for the quartermaster's depot, situated in the southeastern angle. The reservation is about equally divided by Crow Creek, which crosses it from northwest to southeast. This is a small and tortuous but never failing stream. On either side of the creek are bluffs from 30 to 50 feet high, there being many small bottoms between them. Along the stream the terrace formation can be traced in some places, particularly in the part occupied by the quartermaster's depot, where there are four successive benches rising from the water to the plain. To the north of the creek there is a large level plateau, about a mile wide, beyond which the country is broken. To the south of the stream the country is much broken into low hills for some distance. This region lies near the southern extremity of what is called by Professor Hayden "the White River tertiary beds," which extend from the Upper Missouri southward along the eastern slope of the Rocky Mountains for several hundred miles. The stratification is easily seen for some depth on the faces of the bluffs along the creek. There is first a layer of alluvium, from one to two feet thick; next below a layer of coarse gravel, several feet thick, sometimes cropping out to the surface; and below this a stratum of stiff sand, becoming harder in descending, until an irregular layer of sandstone is reached. This sandstone is coarsely conglomerate in places, the boulders imbedded in it being occasionally of considerable size. Fragments of tertiary mammalian fossils have been found some 25 miles north of Cheyenne, of which specimens have been sent to the Surgeon General's Office.

The soil on the prairies is barren, nor can the bottom lands be cultivated except by the aid of irrigation. The plains and hills are covered with a low, stunted, scanty grass. Along the creek a few low willows and wild currant bushes grow. In summer the desolate prairies and bottoms are made brilliant for a short time by a profusion of wild flowers, rich, however, rather in number than variety. The cruciferae, leguminosae, rosaceae, onagraceae, compositae, scrophulariaceae, and the boraginaceae, are the families most numerous represented. The only edible wild plants known are the wild onion, (*Allium stellatum*;) lambs' quarters, (*Chenopodium album*;) and wild currants, (*Ribes aureum*.) The most common wild animals are the coyote, prairie dog, and striped gopher. Rattlesnakes are occasionally seen. The numerous crania of buffalo testify to their presence in this country at no very distant period, but not probably within eight or ten years. Antelope, and occasionally common deer, can be found at some distance from the post. Among the animals sometimes seen, but not common, may be mentioned the gray wolf, the swift fox, the white-backed skunk, badger, beaver, jack rabbit, and cotton-tail rabbit. Of birds the species are numerous. Among game birds are the prairie chicken, sage cock, mallard duck, green-winged teal, killdeer, yellow-legged snipe, and Wilson's phalarope.

The weather is at all times subject to sudden and great changes, and the wind blows often with much violence, particularly during the spring and fall. The mean temperature for the past two years (1868 and 1869) has been 46.53°. The highest temperature has been 100°, August 5, 1869, and the lowest 16°, December 20, 1869. The average relative humidity has been 61.7°. Average annual rain-fall for the past two years, 6.25 inches; snow, 9.45 inches. The prevailing wind is northwest, blowing with most severity in February, March, April, September, October, November, and December. Spring opens about May 1, and the first frost comes in September. March is the most inclement month. During all the warm months the temperature is very much lower at night than by day.

The post is located a little to the left of the center of the reservation, its southernmost angle reaching to the edge of the bluff, there about 50 feet above the water which flows directly beneath. The buildings are entirely of wood; they are arranged around a parade of the diamond form, which is 1,040 in its long, by 800 in its short axis. The long axis is on the magnetic meridian, the variation being 50° 30' east. The officer's quarters, fourteen in number, seven on each side, are arranged like the two legs of an inverted Δ , with the commanding officer's quarters at the angle between them. They form the upper or northern sides of the diamond. The men's barracks, twelve in number, six on each side, form the other two limbs of the figure, the guard-house being at the point of junction. In front of the guard-house is a hexagonal tower-like building, having a room for the officer of the guard below, and a lookout for a sentinel above. In front of this tower is the flagstaff, 100 feet high. In the spring of 1870, cottonwood and pine trees were planted around the parade and in other parts of the post. The barracks do not directly face the parade, but are arranged "en echelon," by which means light and air have free access to all sides of the buildings. Behind the western row of officers' quarters is a "grout" or concrete building, intended for an

officers' mess-house, but now used for courts-martial and school. The post is designed to accommodate twelve companies, six each of cavalry and infantry.

The arrangement of the post is shown in Plate No. 8.

The general plan of the post was made by Brevet Brigadier General J. D. Stevenson, colonel Thirtieth Infantry, some suggestions being made by the writer, Surgeon C. H. Alden, United States Army. The diamond form of the parade was adopted not only for the sake of appearance, but to avoid the inconvenience of the very large inclosed space, which would have resulted from the ordinary rectangular or square space, owing to the great number of buildings required. There are twelve company barracks; they are built of rough boards placed upright, with the cracks battened; each is 80 feet long by 30 feet wide, with 11 feet walls, and shingled roof of one-third pitch, and has a porch, 7 feet wide, along the front. Inside there is a lining of adobes, placed on edge, filled in between the timbers to the level of the eaves all around. Each barrack is designed to accommodate 80 men, and allows 480 cubic feet of air space per man. There is a brick chimney in the center of each barrack, which is warmed by three stoves. Light has access by three windows in front, two at each end, and six in rear. There are but two doors, both in front. The roof and ends above the adobe lining are so open from the shrinking of the lumber that ventilation is amply sufficient. Some of the barracks have, however, special ventilation shafts. The beds, of bedsacks filled with hay, are arranged in two-story wooden bunks, each story holding two men. The water-closet, a small frame building placed over an ordinary sink, is situated about 75 feet in rear of each barrack. At the south end of, and on a line with, the porch of each building is a rough structure of logs placed upright in the earth, about 20 by 50 feet, and shingled. At the south end of this is the company kitchen, about 15 by 20 feet, the remainder of the interior being the mess-hall. Cooking is done by large stoves and caldrons. Each company has delf mess furniture. A wash-room is in some cases attached to the south end of the kitchen.

The quarters for the married soldiers and laundresses, some 18 in number, though somewhat scattered, are mostly situated west of the post, along the creek. The buildings are not only too few, but are very badly constructed. They are log huts, about 10 by 18 feet, and very roughly built. Better quarters would, no doubt, have been erected long since, could the lumber be obtained.

The officers' quarters are chiefly double houses, designed to accommodate the captain of a company on one side and his two lieutenants on the other. There are fourteen of these double houses on the parade, and the commanding officer's quarters, a large two-story building, with four large rooms on each floor, and a hall in the center. The quarters for the medical officers is a double house near the hospital. The quartermaster occupies a single set, placed near his warehouse. The officers' quarters, except the commander's, are one-story-and-a-half houses, and are all built of the same materials and in the same style externally as the men's barracks. Inside, the officers' quarters are lined with boards, which are covered with tarred sheathing-paper, and papered. The kitchen and servants' room are in a detached low building in rear of each house. The quarters have no special arrangements for heating, lighting, ventilation, nor supplying water. There are no bath-rooms and no water-closet, except a common sink in the rear.

The adjutant's office is in the set of officers' quarters to the right of the commander's. The commissary and quartermaster's offices are in their store-houses. These latter are two long wooden buildings, about 25 by 100 feet. The style is known as sectional, they having been brought up from Omaha in parts, and put together here.

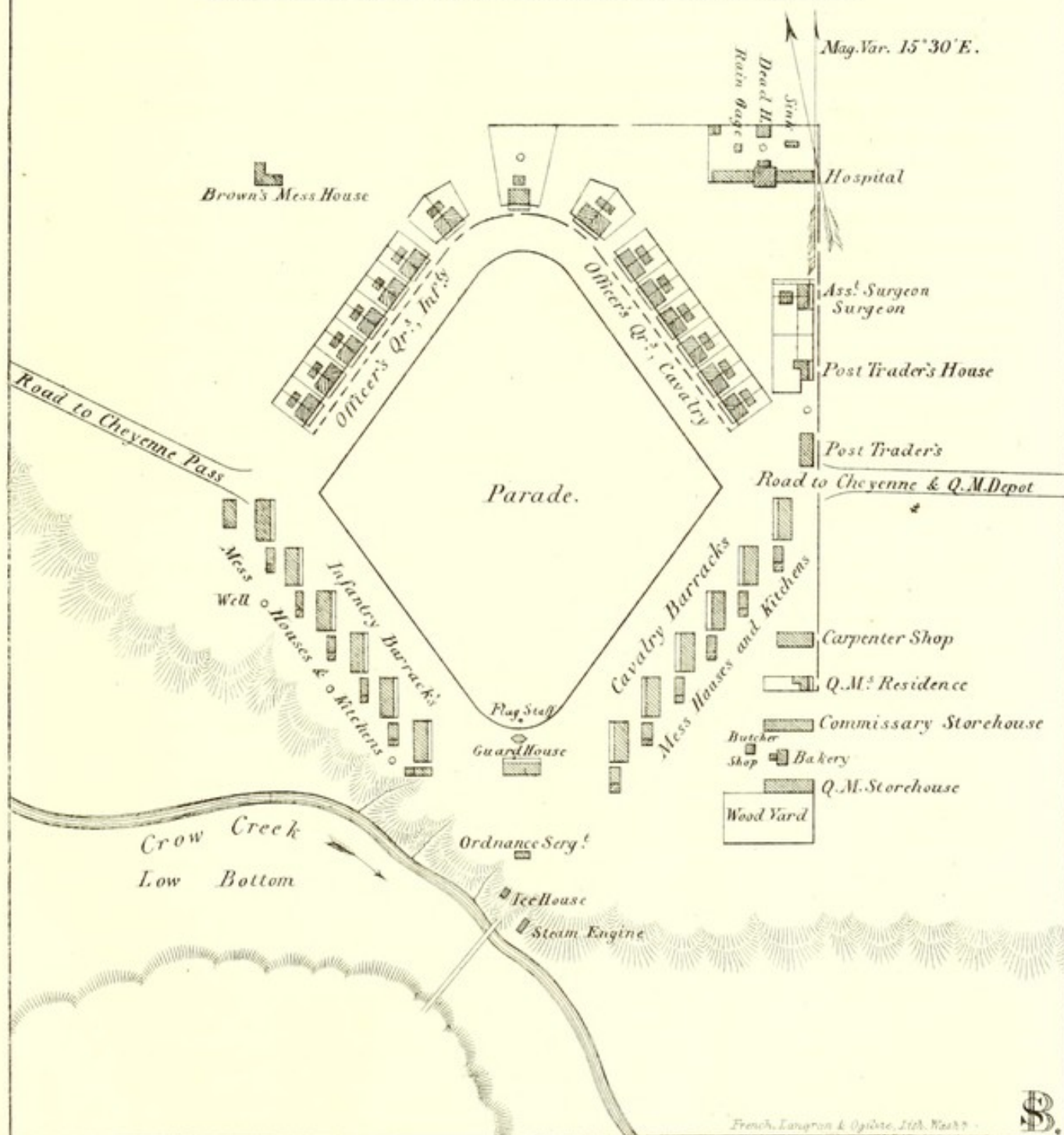
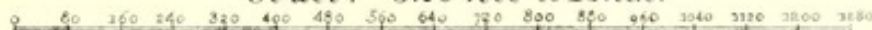
The guard-house is located at the southern angle of the parade. It is 40 by 40 feet, and constructed in the same manner as the other buildings. It is warmed by two stoves, and ventilated and lighted by windows, of which there are two in rear, two in each end, and one in front. Two doors in front give access to the interior. The building is well adapted for its purpose.

The hospital is located outside and to the northeast of the parade, and is constructed of the same materials and in the same style externally as the barracks. The plan is essentially that laid down in Circular No. 4, 1867, Surgeon General's Office, but there are some modifications of and deviations from that plan which require notice. In the building the front hall is widened from 5 feet to 6½ feet. The hall being used as a waiting-room for those presenting themselves at surgeon's call, and the number of these from twelve companies being sometimes large, a greater space than

FORT D.A. RUSSELL, W. T.

General Plan.

Scale: 320 feet to 1 inch.





allowed in the plan was required. The dispensary and office are necessarily slightly diminished in size, but are still sufficiently large. In order to better light the staircase and upper hall a skylight was put in the roof immediately over the stairs. It was, therefore, unnecessary to leave the space over the front hall open, so this was inclosed and is used as a linen-room. It was thought inconvenient to use one of the upper rooms for post-mortem purposes, and a small building, 12 by 18 feet, was provided in the rear of the hospital. All parts of the building are lined with planed boards, which, in the ward and lower part of the main building, are covered with tarred sheathing-paper, and papered. The lining of boards and sheathing-paper does not make the building as warm as plaster would, but it is preferable, as buildings here are so much shaken by the wind that plaster is constantly liable to fall off. For this reason, (the severity of the winds,) and also the low range of temperature, particularly at night, the special arrangements provided in the prescribed plan for ventilation cannot be much used. The air channels in the floor of the ward, though constructed, were never opened, and it has been impossible to allow the openings for ventilation at the ridge to remain open except for two months in the year, July and August. The shafts through which the stove-pipes pass are always open. To increase the facility of heating the ward the past winter, a temporary ceiling of tarred paper was put up. It was considered unnecessary to construct any ventilating shafts in the main building. The hospital is convenient, and would be comfortable were it not that the shingles on the roof have warped so that the snow blows in to some extent in winter. The battens also have warped, so that on the exposed side of the building the snow finds its way through the cracks. These defects will probably be remedied this summer (1870) by reshingling and putting weather-boards on the sides. The hospital is warmed by wood-stoves, of which the ward has two large ones with drums, and the office, dispensary, and mess-room each one. The building is lighted by hanging kerosene lamps. The dispensary is furnished with convenient shelves and counter. There are two wards, each accommodating twenty-four beds. The east ward (the most sheltered) is the only one occupied by patients, the other being used as a chapel. Each bed has 66 superficial feet, and since the ward was ceiled 1,011 cubic feet of air space. One of the little rooms at the end of the ward is fitted up with a bath-tub and as a lavatory. The sink for attendants and convalescents is about 85 feet in rear of the east ward. For the sick in bed two night chairs are provided, usually kept in the bath-room, each deposit being covered as soon as made with dry earth to disinfect and deodorize it.

The bake-house, a wooden building situated between the store-houses, has an oven with a capacity of 600 rations. The stables, eight in number, are situated in a bottom near the creek, east of the post. They are long buildings of rough boards, with a row of stables on each side. There is no post library. The Ninth Infantry has a regimental library, and some of the cavalry companies have libraries. There is a hospital library, not medical, of about 200 volumes.

The garrison receives its water supply chiefly from Crow Creek. Attached to a saw-mill situated in the bottom, west of the post, is a steam-pump which forces the water from the stream up into an elevated wooden tank on the bluff. A water-wagon is filled daily from this tank, and delivers the water for the officers, enlisted men, and laundresses into barrels near their quarters. The water is also made to flow from this tank through a ditch around the parade, thus supplying the trees there planted. There are wells behind the officers' quarters and barracks, but they are not used, because they run dry in summer, and the other plan of supply is at all times more convenient. The commanding officer's residence and hospital have each a well in its inclosure, supplying their occupants with water.

The water from Crow Creek is a little turbid at times in spring when the stream is swollen by heavy rains, but generally the water from both sources is colorless, tasteless, and free from odor. An examination by the soap test gives the following result:

Crow Creek water, hardness (Clark's test) before boiling, 3.5; after, 1.75

Hospital well water, hardness (Clark's test) before boiling, 5.95; after, 1.75

An analysis has been made to determine the amount of solid matter and organic matter in the water. The amount of the former is small, and of the latter very minute, but I have not sufficient confidence in the accuracy of my results to quote them, owing to the imperfect apparatus at hand.

For extinguishing fire, dependence is placed chiefly on an ample supply of buckets, kept con-

stantly full, in all the barracks, store-houses, and hospitals. There is also a special water-wagon, with force-pump attached, kept filled near the tank, which can be hauled to any point when needed. Each building has one or more ladders kept near it. At the quartermaster's depot there is a hand fire-engine.

There being a gradual inclination of the ground on which the post is built toward the creek, the natural drainage is efficient. From this cause, and the gravelly subsoil, water remains but a very short time upon the surface. The kitchen slop and offal are removed daily by persons who raise swine. Dry refuse collected by policing is carried to ravines a short distance below, or east of the post, and burned. The cultivation of gardens has not received as much attention as is desirable, but this neglect has been somewhat from causes beyond control.

This post has been since its foundation a sort of rendezvous or depot for distribution of troops. The entire garrison has been changed several times, and the change of commanders is frequent. While there is a large garrison in winter, in early spring, and before the planting season arrives, almost the whole garrison is sent to various points along the railroad, leaving hardly enough men to perform the guard duty and other necessary work for so large a post. For these causes a post garden has never been planted. There is much less need of one here than at more isolated posts. Potatoes and other common vegetables are brought from Colorado, Nebraska, and Salt Lake, and the commissary has them on hand almost constantly at very low prices.

In the summer of 1868 a hospital garden was planted near the creek, and some early vegetables, such as beans, squashes, and cucumbers, were produced, but as the ground had to be watered by hand, and the grasshoppers destroyed all the plants in August, the result hardly paid for the labor expended, and no subsequent attempt has been made. Some few vegetables are raised in hotbeds in the hospital inclosure. There was a large garden planted in 1869 at the quartermaster's depot by the depot commissary, but from some cause—probably insufficient irrigation—it did not produce much. A number of cows are kept at the garrison. The hospital has one, and also pigs and poultry. The post commissary has a large variety of subsistence stores, including, as before mentioned, generally fresh vegetables.

Medical supplies are obtained once a year from the purveyor at St. Louis, Missouri.

A daily mail is received at the post, it taking about four days for a letter to reach Washington.

Excepting the town of Cheyenne, three miles distant, which has a population probably of about 2,000 persons, the country around is almost uninhabited. There are but very few farms or ranches in the vicinity.

The general sanitary condition of the post is very good. There are no preventable causes now operating to produce disease, as far as can be discovered. In summer, from July to September, the prevailing disease is acute diarrhœa, excited probably by the great difference in temperature between the day and night. Errors in diet cannot easily operate as a cause, as fresh fruits are not easily obtained. In cold weather, from December to March, the prevailing diseases are, in order of frequency, acute bronchitis, tonsillitis, acute rheumatism, and inflammation of the lungs. These diseases arise from the impression of cold acting in many cases upon constitutions somewhat enfeebled by excess, fatigue, or exposure. Soldiers lead such irregular lives from the nature of their duty, going on guard, escorting trains, &c., and many are so incorrigibly negligent in protecting themselves, that these affections will occur in spite of precautionary measures. It is believed that one source is the habit of many men of secretly visiting the town of Cheyenne, between tattoo and reveille. In the winter of 1867 and 1868, the command being then in tents and huts, inflammation of the lungs was common, but the cases have been few since the buildings were occupied. Cases of typhoid fever occur rarely, one each summer. Intermittent fever is not uncommon, but I have been unable as yet to find a case in which there had not been previous attacks, when the patient was residing in some distinctly malarious part of the country. It would seem, therefore, that the disease does not originate here, but is excited or redeveloped by some cause, possibly the sudden alternations of temperature.

During the past winter a soldiers' theater and an officers' theater have been kept up, and have afforded much entertainment to the garrison. During the winter there was a billiard table for the use of the men. Since the season has permitted, outdoor sports, particularly base-ball, are very popular.

Statement showing mean strength, number of sick, and principal diseases at Fort D. A. Russell, Wyoming Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	589.91	907	1	76	126	123	16	79	1	215	7
1869	435.08	413	1	24	65	51	11	29	1	97	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT LARAMIE, WYOMING TERRITORY.

REPORT OF ASSISTANT SURGEON H. S. SCHELL, UNITED STATES ARMY.

Fort Laramie is situated on the west bank of Laramie River, $1\frac{1}{2}$ mile above its junction with the Platte. Latitude $42^{\circ} 12' 38''$ north, longitude $104^{\circ} 31' 26''$ west; elevation above the sea 4,519 feet. The reservation, as declared by the President, includes 54 square miles.

The geology of this part of the country pertains to the most recent tertiary period. For miles along the North Platte, Laramie, and its tributaries, there extend vertical bluffs of gray indurated arenaceous clay, in which are intercalated, without apparent order, occasional horizontal strata of a moderately hard and fine gray sandstone. The vertical thickness of this bed is at some points 200 feet. About a mile and a half west of the post is a bed of red quartzite conglomerate, superimposed on the clay, striking due north and south, becoming prominent when it crosses the Laramie and Chugwater, by forming high, bold, and massive bluffs, having a thickness at these points of 50 to 100 feet. North of the Platte the same formation makes its appearance in a range of low hills, which are the most prominent objects in the immediate vicinity of the garrison. At the junction of the Laramie and Platte Rivers are a series of rounded hills, made up entirely of the débris from the bed of conglomerate. Twelve miles due west from the fort a bed of limestone makes its appearance at the warm and cold springs. It is about ten feet in thickness and associated with red arenaceous rocks, all of which are probably carboniferous. The same red beds form high bluffs at what is known as the Warm Spring Cañon of the North Platte, 20 miles above the post, and attain a thickness of not less than 500 feet. Between this point and the Black Hills the jurassic beds prevail, possessing lithological characters which are very well marked, having been identified by the same fossils which prevail in other localities. The thickness of the jurassic here is about 300 feet. Around the Black Hills is a bed of massive silicious rocks, containing among other layers a pudding-stone, which forms occasionally projections of great boldness, and which possess an appearance of having been intentionally constructed for purposes of defense or habitation. The nucleus of the Black Hills themselves is formed of a coarse reddish, feldspathic granite, which is much eroded in places, and gives to them at a little distance the peculiar sombre hue to which they owe their name. The dense growth of pines and larches, which have found a foothold in the interstices of these rocks, no doubt contributes also to this name.

The mean annual temperature is 50.6° F., having an extreme range of 123° , rising in summer to 102° , and falling in winter to -21° . The mean annual rain-fall is 19.98 inches. The climate is healthy; autumn and winter mild; summer, dry and sultry; spring, usually rainy; high winds are prevalent throughout the year.

The only aboriginal inhabitants residing at this time near the post are a few of the Ogallalla and Brulé Sioux. By the treaty which was concluded with the Indians in the spring of 1868, they were to have reserved for them a large tract of land bordering on the Upper Missouri, and nearly all have removed to their reservation or confine themselves to their hunting grounds north of the

North Platte, only coming to the post occasionally to beg or trade. The individuals who still remain, however, belong to a large tribe which call themselves Lakotas, or, in the northern lands, Dakotas. The sign by which they designate themselves is that of the cut-throat, viz., by drawing the radial edge of the right hand across the throat. They occupy all the country from the North Platte to the Red Buttes, and from the Yellowstone River to the Big Horn Mountains. The Brulé and Ogallalla Sioux are said to number from 12,000 to 16,000, but their strength is annually decreasing from war and disease. Consumption and scrofula prevail among them, and many are carried off by stricture of the urethra, which is supposed to be caused by the manner and extent of their horseback riding.

As a people the Lakotas are tall and muscular and well formed; the average height of the men about 5 feet 9 inches. Their skulls belong to the brachy-cephalic and orthognathous types, and their most remarkable feature is their high cheek-bones.

Before the white man made a permanent habitation where Fort Laramie now stands, the whole of the country on that part of the North Platte was a hunting ground and war-path for many tribes of Indians. Countless herds of buffalo held the ground in fee-simple—not even a red man laid claim to it. In 1834 two men, named William Sublette and Robert Campbell, coming to this part of the country to trap beaver, found themselves obliged to construct some sort of protection against the roving bands of vagabond Crows and Pawnees, which occasionally swept along the Platte, stealing where they could. Sublette and Campbell built in that year, upon the present site of Fort Laramie, a square fort of pickets, 18 feet high, with little bastions at two diagonal corners and a number of small houses inside for their employés. In 1835 they sold out to Milton Sublette, James Bridger, and three other trappers, who went into partnership with the American Fur Company, and continued the beaver-trapping business. In the same year the Fur Company sent two men named Kiplin and Sabille to the Bear Butte and Northern Black Hills, to persuade the Sioux Indians to come over and hunt their game and live in the vicinity of the fort, and their ambassadors succeeded so well that they returned with over one hundred lodges of Ogallalla Sioux, under their chief, Bull Bear. This was the first appearance of the powerful Sioux nation in this part of the country, which they speedily overrun, driving away Cheyennes, Pawnees, Crows, &c., from its very borders. Of course the fort speedily became a trading post, where the Indians bartered a buffalo robe for a knife, an awl, or a drink of fire-water. Anything the company had to trade was at least of the value of one robe. An American horse brought fifty of them; any pony was worth twenty or thirty. Any old scrap of iron was of great value to the Indians, and would be by him speedily converted into a knife. Fire-arms, he had none, and his arrow-heads were all made of pieces of flint or massive quartz, fashioned into proper shape by laborious pecking with another stone. The Sioux had then no horses, but herds of wild horses were abundant at the time of their arrival, and it was not many years before they learned their use.

In 1836 the picket fort began to rot badly, and the American Fur Company rebuilt it of adobes at an expense of \$10,000. The people who lived inside of the fort at this time, named it "Fort John," but the name could not be popularized. The fort being built on the Laramie River, not far from Laramie Peak, the American Fur Company's clerks, in their city offices, had labeled it Fort Laramie, and by that name it was destined to be called. It seems that Laramie was a trapper, one of the first French voyageurs who ever trapped a beaver or shot a buffalo in the Rocky Mountains. He was one day killed by a band of Arapahoes on the headwaters of the stream which has ever since been called by his name.

The American Fur Company retained possession of the fort until 1849, when they sold it to the United States Government for four or five thousand dollars. Bruce Husband was the last representative of the company who had charge of Fort Laramie.

The first troops which arrived here came in July, 1849, under command of Major Sanderson, of the mounted rifles. They were Companies C and D of that regiment; Company G of the Sixth United States Infantry arrived in August of the same year, under command of Captain Ketchum. In the summer and fall of 1849 a large number of additions were made to the buildings of the post.

During the year 1850 an account was kept of all the trains, &c., crossing the Laramie River below the fort on the route to California and the West. One result was as follows: "About 40,000 animals of all descriptions." The book in which the account was kept was destroyed by fire a year or two afterward.

On the 19th of August, 1854, a Mormon train was encamped about ten miles below the fort on the Platte River. The Indians having killed a cow or ox belonging to the train, complaint was made by the Mormons to the commanding officer, who sent Lieutenant Grattan, of the Sixth United States Infantry, with thirty men of G company and two howitzers, to recover the cow and bring the thieves to the garrison. They met a large number of Indians (Sioux) under a chief named Mat-to-i-o-way, about eight miles from the fort, where a collision ensued, and Lieutenant Grattan's command, with the exception of one man, was annihilated. The survivor was hidden in the bushes by a friendly Indian, and brought the same night to the fort, where he died two days afterward. The bodies of the slain were buried in one grave where they fell, and a large pile of stones is all that marks the spot.

A portion of the old adobe fort was standing until 1862, when it was entirely demolished and the adobes used in the construction of the front portion of the magazine.

The barracks occupy the northeast and southeast sides of the square parade, and are six in number, four sets of wood and two of adobe. The barrack on the northeast side contains quarters for three companies. The entire length of the building is 287 feet, but a portion of each set of quarters is occupied by a room for the first sergeants and a baggage-room, so that the net size of each room assigned to a company is 81 feet long, 30 feet wide, and 11 feet high. These rooms are ceiled with half-inch boards, but not plastered. The building is of framed timbers filled in with adobes, plastered inside and weather-boarded outside. They are one story high, raised about two feet above the ground, but without cellars. Each room contains twelve windows, six on a side. The rooms were constructed when the companies were filled to the maximum; they contain 26,730 cubic feet of air space each.

Of the two barracks on the southeast side of the parade the first contains quarters for two companies; the second for one company. These buildings are constructed in every respect like the foregoing, except that the net size of the rooms in the first is 103 by 29 feet, having an air space of 46,298 cubic feet, and that of the other building 96 by 20 feet, with an air space of 26,880 cubic feet. The barracks are all in good repair, heated by means of stoves, well lighted and ventilated. The cracks in the floors are wide, and in winter the air which comes up through them makes the rooms not a little uncomfortable. The barracks are all furnished with two tiers of movable bunks, constructed of rough white pine lumber, two men occupying each bunk when the companies are at the maximum. A few of the men have buffalo robes. The most of them are fain to protect themselves against the rigor of the winter by eking out their scanty covering with their overcoats. They nearly all complain of sleeping cold. Each set of barracks is provided with a sink. These sinks are wells, with rough board houses built over them. They are kept in tolerably good order, and lime is thrown into them once a week. In the rear of each set of quarters is a commodious kitchen and mess-room; there are but two in rear of the barracks first described; one is divided into two portions; the east end is used as kitchen and mess-room by the company occupying the quarters on the west end of the barracks, and the other is divided between the other two companies. Kitchens for the other sets of quarters are similarly arranged, and all are provided with cooking-stoves, tables, and benches. Most of the companies are in possession of good mess furniture, consisting of delf plates, bowls, and knives and forks.

There are seventeen sets of quarters for laundresses or married soldiers, viz., twelve sets contained in four frame buildings, and five sets contained in four adobe buildings.

Officers' quarters occupy the northwest and southwest sides of the parade. The captains' quarters are in a one-story frame and adobe building, 65 feet 6 inches by 16 feet 6 inches, with frame kitchens, 25 by 18 feet. This building is serviceable, but old and rickety. Three sets of quarters are adobe huts of two rooms each, with porches in front and a shed in the rear. The huts are 34 feet front and 18 feet deep. In a line with the last mentioned is a two-story frame building, erected in 1849. It has a two-story porch, front and rear, and contains four sets of captains' quarters. The building has two wings, which contain the kitchens, 26 by 16 feet. An adobe hut, 70 feet front by 19 feet deep, with two kitchens, 15 by 15 feet each, is divided into four rooms, and has a porch in front.

In addition to the officers' quarters, described as forming two sides of the parade, there is near the bank of the river, and convenient to the quartermaster and commissary store-houses, a low frame building, the frame filled in with adobes, having a porch along the front, which is 130

feet long; the house is 26 feet 6 inches deep, and contains fourteen rooms, which are occupied as officers' quarters.

The commanding officer's quarters consist of a building, 46 feet front by 36 feet deep; porch 9 feet wide on three sides; a wing, 14 by 32 feet, containing the kitchen. The house is new, and contains four rooms.

The commissary and quartermaster's store-houses are five in number, all wooden buildings, rough boards and battened, excepting the clothing-room, which is frame, and in good condition. Two commissary buildings are each 120 by 30 feet, and 9 feet to eaves. A similar structure is occupied by the quartermaster as an office and issuing store-house. The grain-house is 50 by 100 by 20 feet, and has a capacity of 100,000 cubic feet. In addition to the above an old frame building, which was formerly used as barracks, is now converted into a store-room for the use of the quartermaster. The ice-houses for the post, two in number, will hold, together, 386 tons of ice. The carpenter's shop, wheelwright shop, blacksmith's shop, saddler's shop, paint shop, coal house, &c., are located at the extreme northeast portion of the post, are new, and admirably constructed for the purposes for which they were intended, and are kept in good order.

The guard-house is situated in rear of the barracks on the southeast side of the garrison, and near the bank of the river. It is constructed of stone, 20 by 36 feet, one story high in front, and two stories in rear. The upper story contains two rooms, one for the guard and the other for the officer of the guard. They are plastered and ceiled, and contain in all six windows. The larger room contains a rough board bed, where all the members of the guard who are off duty may lie down, a couple of chairs, and a desk. The basement room is of rough stones, whitewashed, has one door and a window toward the river, and on the opposite side, at the top, two small windows for ventilation. Two cells are partitioned off on the south side for refractory prisoners. The prisoners are kept in the basement room, which contains no furniture. This room is neither warmed nor lighted. The situation of the guard-house is badly selected.

The hospital is a one-story building, constructed partly of adobes and partly of wood. A portion of this building was erected in 1856, of adobes, and is still occupied as wards, if occasion requires. It consists of two rooms, each 20 feet square, separated by a hall and dispensary, which communicate with each; the large rooms have an air space of 4,200 feet, and contain eight beds. They are warmed by open fireplaces, and are not ceiled, the roof being of heavy logs, with a covering of shingles; their walls are 20 inches thick. The rooms are well lighted by windows, which also, in connection with the fireplaces, afford ample ventilation. The dispensary is 13 by 12 feet in size, and is well furnished.

In 1858 a considerable addition was made to the building just described by the erection of a long wing, placed at right angles to the hospital, and with it forming two sides of a square. This portion of the hospital is constructed of frame-work filled in with adobes, and comprises the steward's room, dining-room, kitchen, store-room, and the laundry; the cellar is to the rear of this building; excavated five feet below the surface, and covered with a gable roof of shingles.

During the winter of 1866-'67, the hospital had been so full that it was found necessary to have three hospital tents pitched all winter, in addition to the hospital accommodations. A number of soldiers were affected with scurvy, as were also many of the quartermaster's employés. The winter was unusually severe and stormy, and the tents, although pitched on frames in the most secure manner, were repeatedly blown down, and by the time spring came were torn into ribbons. Accordingly, in the summer of 1867, the last addition to the hospital was made, comprising a large ward, a bath-room, water-closet, and a hall, the latter 10 feet wide and 25 feet long, separating the ward from the rest of the building and affording easy access to either the front or back porch, or to the dining-room, under cover. The ward is 25 by 55 feet, and contains an air space of 13,750 cubic feet; it has five windows on each side and a door opening into a hall at either end; it contains twenty beds; the ceiling is lathed and plastered; two ventilators, each 18 inches square, run from the ceiling through the roof; this ward is heated by two stoves. At the further end of the ward are the bath-room and the ward-master's room, separated by a hall; the first is 10 by 10 feet, furnished with a bath-tub and a tin-lined trough, with a shelf which accommodates four wash-basins. The corral incloses about 2 acres of ground with an adobe wall 10 feet high and 2 feet thick; it has also strong bastions at two diagonal corners, and would serve as a stronghold in case of an attack by Indians.

There is a post library in the adjutant's office containing about 300 old, nearly worn-out books; a number of papers and periodicals are subscribed for from the post fund and kept in the library room, to which the enlisted men have access. The hospital library also comprises about 300 volumes, a majority of which are religious works.

The water supply at this post is ample. The Laramie River, which bounds one side of the garrison, is a constantly running stream of an average width of thirty feet and depth of two feet. Its gravelly bed is always plainly visible through the clear water except in the time of the spring freshets. The water used for culinary and household purposes in the garrison is chiefly obtained from the Laramie River above the post, and is hauled around in a large tank on wheels and dispensed as necessity may require. Good water may be obtained anywhere in the valley of the Laramie by digging eight or ten feet, but all the old wells seem to have fallen into disuse, except one in the post garden, which furnishes very cold clear water in the summer time. There is also a spring in the bank of the river in the rear of the telegraph office, which furnishes good water.

It is probable that water might be brought directly into the post by means of an acequia a mile and a half long, and the question of its practicability, &c., has been frequently agitated, but as yet no steps have been taken for putting it into execution.

In an imperfect analysis made of the river water collected above the post, it was observed that there was no reaction before boiling, but a marked alkaline reaction after boiling. There was but a trace of organic matter; chlorine, about three grains to the gallon; phosphoric acid, a trace; nitric acid, a trace; nitrous acid in perceptible quantity; ammonia, none; iron, none. Twenty-four fluid ounces of water deposited only a few grains of sediment, which, upon microscopic examination, proved to be composed of grains of sand and particles of clay and decaying vegetable matter, together with eleven species of infusoria, and some confervoid vegetation.

In an examination of the spring water there was no reaction before boiling, but a slight alkaline reaction afterward, and also a trace of organic matter. It contained from six to eight grains of chlorine to the gallon; a trace of phosphoric acid, nitric acid, and less nitrous acid than the river water; no ammonia nor iron. There was scarcely more than a grain of sediment in twenty-four fluid ounces of the water, and a microscopical examination showed it to be composed of particles of sand, clay, decaying vegetable matter, confervoid vegetation, and five species of infusoria.

There is also a spring in the ravine behind the adjutant's office, which furnishes a perfectly clear, sweet water. This spring runs about two gallons per minute; the first spring described runs about ten gallons per minute.

The means of extinguishing fire throughout the garrison consist in an ample supply of water barrels which are kept standing constantly filled at all the buildings. About four hundred gallons of water are kept on hand at the hospital and fire-buckets hung in every room. Many of the buildings are also provided with fire-ladders as well as buckets.

The post is drained naturally. It stands on an elevated bench, containing about ten acres, the sides of which slope in all directions, except toward the bluffs back of the hospital, where the soil is gravelly and moisture sinks out of sight immediately. There is no artificial drainage at the post. All refuse, slops, &c., are collected daily and thrown into the river below the post.

The men bathe freely and constantly, in pleasant weather when off duty, in the stream above the post. There are many places in the river where the water is ten to twelve feet deep, affording opportunities for swimming. No bath-houses have as yet been erected, principally because their need has not been felt.

The post cemetery is located about half a mile from the post. There is a post garden, containing about three acres, which is cultivated by enlisted men under the direction of the post chaplain. There is no hospital garden, the post garden being large enough to supply the hospital and garrison with fresh vegetables. In August, 1868, a dense cloud of grasshoppers made their appearance and settled down upon the post and adjacent country; after nine days' visit they disappeared, having eaten all the potato and carrot tops and much injured the corn and cabbage. September 16, of the same year, a heavy frost killed all the vegetables in the garden. Peas, beans, cucumbers, corn, and early cabbage thrive, but owing to the shortness of the season no late vegetables arrive at maturity. Potatoes seem to run mostly to tops.

There are at the hospital constantly kept on hand two cows, about one hundred chickens, a

number of pigeons, and hogs, so that the sick are liberally supplied with milk, eggs, poultry, &c. Almost every officer and laundress in the garrison keeps a milch cow.

Rations are furnished by the subsistence department according to existing regulations, and are sufficient and good. Fish and mutton cannot be procured here except at exorbitant prices. Occasionally vegetables are brought to the post for sale by hucksters from the Cache la Poudre River. The nearest quartermaster and subsistence depots are near Cheyenne, eighty-nine miles distant. The route of supply is from Cheyenne, (on Union Pacific railroad,) by Government wagons, throughout the year. Six months supply is usually kept on hand.

Medical supplies are obtained upon requisition from the medical purveying depot at St. Louis, Missouri, and are received and kept in good condition. There are two ambulances at the post—one in good order and the other unserviceable.

In the summer of 1849 the cholera was on the Plains, but came no nearer to the post than Scott's Bluffs, 50 miles below, on the Platte River. The emigrants were the persons chiefly attacked by it, and more particularly the men. Many trains passed through the post conducted only by women and children, the men being dead.

In the winter of 1849 the scurvy was prevalent among the troops at the post. About one-fifth of all the men were on crutches. Wild onions and water-cresses were issued in large quantities by the commanding officer, Indians having been employed to gather them; and in the following spring many of the diseased soldiers were transferred to the general hospital at Leavenworth, Kansas.

In May, 1859, the cholera made its appearance. Fifteen cases and three deaths are reported in the hospital register for that year.

There are almost no cases of malarious disease at the post, and what few there are arise from ordinary, now preventable, causes. The prevailing diseases at the post and vicinity are rheumatic affections and venereal diseases, cases of the latter being quite numerous. Diarrhœa and dysentery are rendered less frequent by attention to the diet of the company messes.

Statement showing mean strength, number of sick, and principal diseases at Fort Laramie, Wyoming Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	460.33	507	3	16	179	25	1	4	25	3	124	8
1869.....	386.58	227	.....	18	64	6	5	.....	24	.....	29	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT FETTERMAN, WYOMING TERRITORY.

REPORTS OF ASSISTANT SURGEONS C. MACKIN AND F. LE BARON MONROE, UNITED STATES ARMY.

Fort Fetterman is situated on a plateau on the south bank of the North Platte River, about 600 feet from, and 130 feet above, the stream. Latitude $42^{\circ} 8' 3''$ north, longitude $105^{\circ} 7' 4''$ west; elevation above the Gulf of Mexico about 8,500 feet. The plateau rises from the river bottom by steep, almost precipitous bluffs, and then, rising gradually, merges into the Black Hills, fourteen miles distant.

The nearest post, and the one through which all communication with the East passes, is Fort Laramie, 80 miles to the southeast.

The lowest geological formation noted near the post is one of the later portions of the carboniferous period, containing a soft, jet black coal. Immediately above this is a very hard silicious sandstone of a gray color, stained here and there with iron. This has been extensively quarried

and used for building purposes at the post. No fossils have been found in it, and it is considered as a metamorphic rock of the earlier portion of the tertiary period. The cretaceous system is entirely wanting (so far as known) within 60 miles of the post, a limestone bed being found at that distance on the road to Fort Laramie.

This post was established in July, 1867, and in the following month the Indians in the vicinity were actively hostile. It received its name in honor of Brevet Lieutenant Colonel W. J. Fetterman, captain Twenty-seventh Infantry, who was killed in the Indian massacre near Fort Phil Kearney, December 21, 1866.

The average temperature for the year 1869 was 43.25° F., the extremes being 111° and -20° F. High winds are prevalent; hail-storms are frequent; and much snow falls during the winter. Game is tolerably abundant in the vicinity. Buffalo are not found within 30 miles, though in former times this spot was in the midst of their range. The most important animals and birds are the following: Common and black-tailed deer, antelope, Rocky Mountain sheep, black and grizzly bears, beaver, otter, wolves, lynx, wild cat, and cougar; prairie chicken, sage hen, mountain grouse, ruffed grouse, plover, snipe, curlew, wild geese, and ducks.

The barracks and officers' quarters are on the sides of a rectangular parade, a high plank fence inclosing the whole. The hospital, laundresses' quarters, and store-houses are outside the inclosure. The post furnishes accommodations for three companies of infantry. The company quarters are adobe buildings, each 100 by 25 feet, and 14 feet high, lighted and ventilated by ten windows and two doors, and heated by wood-burning stoves. They are fitted up with double bunks in two tiers, and were intended for two companies, which would have allowed about 210 cubic feet air space per man. A kitchen and dining-room and a small wash-room are connected with each barrack. There are six sets of married soldiers' quarters contained in an adobe building, 94 by 28 feet, and 10 feet high. The officers' quarters consist of a double set built of logs, of three rooms on first floor of each, besides a kitchen. Above, in the most easterly set, is a rough division of the attic into two rooms. There has been heretofore no finish of any account on the inside of the building, but now it is being plastered and made fit for habitation.

A large adobe building is used as quarters by unmarried officers; it is 60 by 36 feet, and 12 feet high to the eaves, and is divided into six rooms, the attic being unfinished. A plank building lined with adobe, 36 by 44 feet, and 10 feet to the eaves, is used as lieutenants' quarters; the rooms, three in each set, are nicely plastered and finished. A block of buildings, 116 by 30 feet, built of plank, lined with adobe, contains one set of major's and two sets of captains' quarters. A small log building, 26 by 20 feet, and 10 feet high, is occupied temporarily as officers' quarters.

The commissary store-house, 100 by 136 feet, and 16 feet high, is built of plank lined with adobe; a fine root cellar underlies the building. The quartermaster's store-house is of adobe, two stories high, 125 by 36 feet.

The guard-house is a log building, 50 by 20 feet, one story high, and divided internally into three apartments. The first room, 14 by 18 feet and $13\frac{3}{4}$ feet high, is used for an office for the commandant of the post. The guard-room measures 18 by 17 by $13\frac{3}{4}$ feet, and contains two windows and two doors, one of the latter opening into the apartment designed for prisoners. The latter room is divided by partitions into a prison, 17 by 7 by $7\frac{1}{2}$ feet, and four cells, each 4 by 6 feet 9 inches, and 7 feet 5 inches high, with doors opening from each into a hall, 17 by $3\frac{1}{2}$ feet, in the center. The rooms are comfortably warmed by means of coal stoves. No special arrangement is provided for ventilation, excepting the windows in the main rooms. In the prison-room and cells prisoners have knocked out the plaster between the logs, so that the result is attained.

The average number of occupants in the guard-house for three months was 13; the maximum number, 17.

The hospital is a poorly constructed log building, 92 by 20 feet, with L extensions, the northern being 18 by 13 feet; the southern, 36 by 16 feet. It is 9 feet high to the eaves. The building was a second-hand affair, having been formerly in use at Fort Caspar, now abandoned, and brought to this post in the fall of 1867. Until recently it has remained in its original condition, a mere shell, with no internal lining of any kind, or ceiling, and no flooring at all in some of the rooms. Owing to the wretched condition of the roof both light and snow were freely admitted, while the ventilation was more than could be desired. During the present summer steps have been taken for the

completion of the building, by ceiling and flooring the apartments and placing it in a proper condition for the reception of the sick.

The ward, 20 by 40 feet, contains fifteen beds, with a cubic air space of 640 feet to each. There is no lavatory or bath-room, nor convenient latrine; the only structure of the latter kind is a board arrangement situated about 150 feet east of the building.

There is a post bakery at Fort Fetterman, the oven of which is composed of an iron arch, surrounded and based with adobe and sandstone.

The only stables at the post are small buildings located in the yards of the officers' quarters for private horses. There are sheds around the inside of the corral for the shelter of the public animals.

The post library numbers about 250 volumes, and is kept in a room assigned for the purpose. The books are as good a selection as could be expected in so small a collection.

The water used for domestic purposes at this post is derived from the North Platte River, and, like all other waters in this section, is impure and, to a considerable extent, alkaline. No arrangements have as yet been made for the collection of rain water, or melting snow from the roofs of the buildings thus far erected. Two imperfect analyses of the water supplied have been made, one in August when the river was high, and one in December when it was frozen. Specific gravity on first occasion 1004; on the second, 1002. After immersion red litmus shows a bluish tint; lime tests show a very small quantity of that mineral; but since the examinations were so imperfectly conducted, little credence can be placed in them. There is no doubt but that large amounts of the sulphates are dissolved. Tests for magnesia exhibit quite a quantity of that substance in the water, though the combination is undetermined. Iron is exhibited in large amount. Sulphur is shown to be present not only by tests, but also by taste and odor. The organic impurities are not of much amount; sulphate of soda, which is a very constant impurity in the waters of this section, exists to an infinitesimal amount in the waters of the Platte. Of course its flavor to one unaccustomed to it is disagreeable, yet the general good health of the garrison, and its exemption from certain well-known diseases, prove that the water at this post is as good as could be desired considering the generally bad quality of the water on the Platte.

The drainage is natural and very good; débris is taken from all parts of the post by a police wagon every morning and buried.

The post garden is about 4 acres in extent, and cultivated by enlisted men who are paid from the post fund. The yield of early vegetables, such as radishes, peas, lettuce, and onions, is abundant for the use of the garrison only. There is no hospital garden. A considerable variety of vegetables, canned fruit, butter, cheese, &c., are obtained from the post commissary, the nearest supply depots being at Camp Carling, near Cheyenne, Wyoming Territory, about 130 miles distant. As nearly every family has a cow, chickens, and pigs, the supply of eggs and milk is ample.

The barracks and quarters are well furnished. The quartermaster's department supplies more articles of furniture than is usual at posts, as the nearest market is 160 miles distant. Fort Laramie is reached by means of wagon trains, which are liable to interruption from snow and Indians. The mails are received and sent once a week; the escort from Fort Fetterman meeting the Laramie party and exchanging mail-bags. It requires six days for a letter to reach department headquarters. From January to June of the present year, mails were received only twice a month. There are no inhabitants in the immediate vicinity of the post. The Sioux, Cheyenne, Arapaho, and Crow Indians occupy the country to the north.

The general sanitary condition of the post is good; in fact, since the establishment of the post there has been no death from disease.

The prevailing diseases during the past six months have been of the throat and the eye. In many cases there is a constitutional predisposition, and doubtless a favoring cause in the dryness of the air, the frequency of winds, and abundance of dust. Malarial, pulmonary, rheumatic, and bowel affections are not prevalent, though an occasional sporadic case of each occurs.

The general duties of the garrison have been guard duty, escort duty for the mails, cutting and hauling logs to the post, making adobe bricks, ferrying Indians across the Platte, and military drill. The guard posts number from five to seven. The amusements of the soldiers consist of ball playing, hunting, and general gymnastic exercises. A dramatic society has recently been organized.

Statement showing mean strength, number of sick, and principal diseases at Fort Fetterman, Wyoming Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	295.66	663	38	177	29	14	5	3	65	1	89	2
1869.....	214.08	232	8	33	7	.....	3	1	31	.....	29	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT SANDERS, WYOMING TERRITORY.

REPORT OF SURGEON J. H. FRANTZ, UNITED STATES ARMY.

Fort Sanders lies on the Union Pacific railroad, on Laramie Plains, one and three-fourths miles west of Big Laramie River, and about seventeen miles south from its junction with Little Laramie, where the two form the Laramie River; latitude $41^{\circ}13'4''$ north, longitude $105^{\circ}30'22''$ west; altitude above the sea, 7,161 feet. Five miles to the eastward extends the low, dark range known as the Black Hills; and about 30 miles to the west lie the Medicine Bow Mountains. Fort D. A. Russell is 56 miles due east, and Fort Fred Steele, 128 miles northwest of the post. Laramie City, situated about three miles north, is the nearest town.

The post was established in July, 1866, pursuant to orders from Major General Pope, commanding the department, and named Fort John Buford. The name was changed to Fort Sanders in September, 1866, in honor of Brigadier General W. P. Sanders, United States volunteers, captain Second United States Cavalry. The original design of the post was for the protection of the Denver and Salt Lake stage, and the Lodge Pole Creek emigrant route, from the incursions of Indians, as both of these routes passed near the site selected. The Union Pacific railroad was completed to this point late in the spring of 1868. The reservation contains an area of 81 square miles, lacking about 145 acres on the east bank of the Laramie River, north of the fort, on which is the incorporated town, City of Laramie. It contains good grazing ground, watered by two streams flowing from springs, and by the Big Laramie River. The surface of the reservation is gently undulating, a rolling prairie. The site of the post is slightly elevated above the surrounding plain, and slopes in three directions, affording good natural drainage. The soil, made up of sand and gravel, is quite permeable, and evaporation from it is rapid, owing to its nature and to the winds which prevail almost constantly. A substratum of soft sandstone, apparently ten or fifteen feet in thickness, is found from three to five feet below the surface of the earth. Limestone abounds in the immediate vicinity of the post, and sandstone, easily quarried, within six miles. The latter, when first taken out, is soft and readily cut, but hardens on exposure, and is a very excellent building stone.

The City of Laramie, exempt from military authority, but within the reservation, is a town of about 1,000 inhabitants. Pine, quaking aspen, and cottonwood are the principal indigenous trees of the vicinity. Few or none flourish within the limits of the reservation. Gooseberries are found in the hills in the vicinity.

The most important wild animals found within a circuit of 25 miles are the prairie wolf or coyote, swift fox, badger, grizzly bear, (very rare,) black bear, (rare,) striped gopher, prairie dog, beaver, (very rare,) muskrat, prairie hare, sage hare, American elk, black-tailed deer, and prong-horned antelope.

The principal birds are the sparrow hawk, burrowing owl, night hawk, American raven, sage hen, killdeer, curlew, coot, wild goose, mallard, green-winged teal, shoveler or spoonbill, red-head, and American widgeon.

Suckers abound in the Big Laramie River and neighboring lakes; brook trout are found in the mountain streams. Spring Creek, which runs by the post, is a living stream whose source is in several springs rising in a limestone region about three miles east-southeast of the post. A reservoir was constructed by damming the stream about three-quarters of a mile from the post, and the water is brought in ditches through the rear yards of the officers' quarters, the parade ground in front of the barracks and hospital, and into the post gardens. The water is hard, but palatable.

A circular artificial pond, about one hundred yards in diameter, on which are boats for the use of the garrison in summer, and on which the men are allowed to skate in winter, is kept filled with fresh water from the same reservoir. About eight miles southwest of the fort are four small lakes or large ponds, on which, except when icebound, are quantities of aquatic wild fowl.

The climate is dry, but subject to high winds. The temperature is very variable, the mercury in the thermometer frequently rising and falling 40° F. in the course of the three regular daily observations, occasionally varying over 50° F. in the same time. The following table exhibits the mean temperature for the year ending June 30, 1870, the mean of each month, and the extremes of each month, and the rain and snow (melted) fall of each month, for the same time :

Temperature, &c.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.
	°	°	°	°	°	°	°	°	°	°	°	°
Mean monthly*.....	66.97	67.76	53.88	40.28	36.90	22.14	25.33	29.87	26.03	41.28	51.96	59.67
Extreme heat.....	95	97	82	80	73	63	55	49	60	68	74	87
Extreme cold.....	51	50	24	2	12	-29	-5	-13	-21	10	30	35
	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>	<i>Ins.</i>
Rain-fall, (inches†).....	.27	1.77	.44	.03	.....	.....	.....	.....	.....	1.36	.90	.67
Snow-fall, (inches†).....	.....	.....	.21	.35	.56	.03	.06	.65	.72	2.27	.20	.20

* Mean of year, 43.24°.

† Total, 5.44 inches.

5.26 inches melted.

The relative humidity, saturation being considered 100, for July, August, September, April, May, and June, calculated by Glaisher's formula, was about 61. The prevailing winds are from a westerly direction. In spring, rain and snow are generally accompanied with northerly and easterly, winds; in summer, with southerly and easterly; in autumn and winter, with northerly and westerly. The warm season is short. Spring, as experienced in the same latitude on the Atlantic coast, is scarcely known. Snow is not infrequent in June, and snow and ice are generally seen early in September.

The post was originally built for four companies, with a parade ground, 223 by 400 feet, two barracks on the north and south sides respectively, officers' quarters on the east, and store-houses on the west. The post has been enlarged so as to accommodate six companies, and the store-houses on the west side of the parade have been transformed into officers' quarters, while two new barracks have been erected at right angles to those on the north side of the parade, and new officers' quarters have been built on the north prolongation of the old line of officers' quarters. The barracks are built of logs, the interstices filled with mortar, and are unceiled. The two new barracks are well lighted, sufficiently ventilated, and the flooring is raised from the ground about twelve inches, affording access of air underneath; the others are badly lighted, and the flooring is raised an insufficient distance above the earth. The six buildings contain each a dormitory for the accommodation of one company, the kitchens and mess-rooms being separate from the barracks. Three of them have verandas, 6 feet wide, in front. The dimensions of the dormitories average from 60 to 61½ feet in length by 25 feet in width, and 9½ feet high. One room, however, measures 87 feet by 25 feet 2 inches by 9 feet 6 inches.

Each building has two ventilators on the roof, and from six to eleven windows in the sides. The air space per man is about 241.5 cubic feet. As the dormitories differ somewhat in size, this calculation is based upon the measurements of the majority of them. There are two large stoves in each. Ordinary double wooden bunks, in one and two tiers, are used. Each company has a rude wash-room, being a room in which is a shallow trough about 12 feet long, inclined so as to carry off the water. There are no bath-rooms.

The privies are ordinary trenches, covered with frame buildings. The different kitchens and

mess-rooms are not symmetrical, so only their average areas are given. The former average about 21 by 15 feet. They are each furnished with a good large cooking-stove, with complete fixtures, and with closets and bins for storage of rations. The mess-rooms average 28 by 23 feet. The laundresses' quarters are five in number, and consist of two rooms each. Four of these are frame structures, poorly constructed, and barely habitable. The other, occupied by the hospital matron, is placed in rear of the hospital, built of logs, and contain two rooms, which are sadly in need of repairs.

There are seven buildings used as officers' quarters. They are one story high, built substantially of logs, with verandas in front and on the sides. Internally, some are lathed and plastered, others lined with tarred sheathing-board and papered, and a few rooms in two of the houses lined with plain lumber, painted or stained. Each building, comprising two sets of quarters, consists of a main building, with an L in rear, the latter containing kitchen and dining-room. Water is brought from the reservoir through ditches which run through the rear yards of each set of quarters. During cold weather water is hauled in water-carts. These quarters are furnished with the ordinary trench water-closet, placed in rear. There are no bath-rooms. The quarters are heated by stoves, in which wood is used as fuel. They are well lighted, and may be well ventilated by means of the windows, at the option of the occupants. There are two quartermaster's store-houses, each 100 by 30 feet, and three commissary store-houses, each 30 by 30 feet, and 10 feet high. They are built of logs. The bake-house and magazine, each 30 by 30 feet and 10 feet high, are built of stone. Three ice-houses, a smith and wheelwright shop, a saw-mill, and a block-house, constitute the buildings not above enumerated.

The guard-house, erected in 1869, is a substantial stone building, admirably adapted to its purpose. It is divided into guard and prison-rooms; dimensions of the former 16 by 23½ feet; of the latter 23½ by 24 feet; height to ceiling 11½ feet. In the prison-room are two cells, each measuring 4½ by 6 feet, occupying adjacent corners. The building is warmed by wood-stoves. The prison room has four windows, each 1 foot 10 inches by 2 feet 4 inches, and a ventilator, 14 inches square, in the ceiling, extending through the roof, thus affording ample light and ventilation. In the guard-room are three windows, each 2 feet 4 inches by 3 feet 8 inches, and a ventilator, 40 inches square. The average occupancy of the guard-house is 16.

The hospital building is constructed of logs, one story high, for the plan of which see Figure 44.

A, ward, 22½ by 52 feet; A, small ward, 13½ by 22½ feet; D, dispensary, 14 by 15½ feet; E, steward's room, 6½ by 14 feet; K, kitchen, 13 by 22½ feet; S, store-room, 13½ by 22½ feet. The height of the rooms is 9 feet 9 inches. A veranda, 6 feet wide, extends the length of the building on the south side. The rooms are lathed, plastered, and ceiled, and the whole building is in tolerable repair.

That portion of the figure marked N B represents the ground plan of a two-story log building, 35 by 36 feet, outside measurement, each story 10 feet in height, with a one-story building (N K) attached, the latter measuring 13 by 23 feet, and intended for kitchen purposes.

These buildings were commenced and more than half finished, when work was suspended because of the inadequacy of the garrison to the work which had to be done, and, owing to the same cause, work has not since been resumed upon them. The wards are warmed by wood-stoves, and are each supplied with ample ventilation and natural light. The larger ward has three ventilators in the ceiling; one 1½ by 2½ feet, and two 19 by 20 inches. In the small ward there is but one ventilator, which measures 1½ by 2½ feet. Air passes to the attic, thence through two ridge ventila-

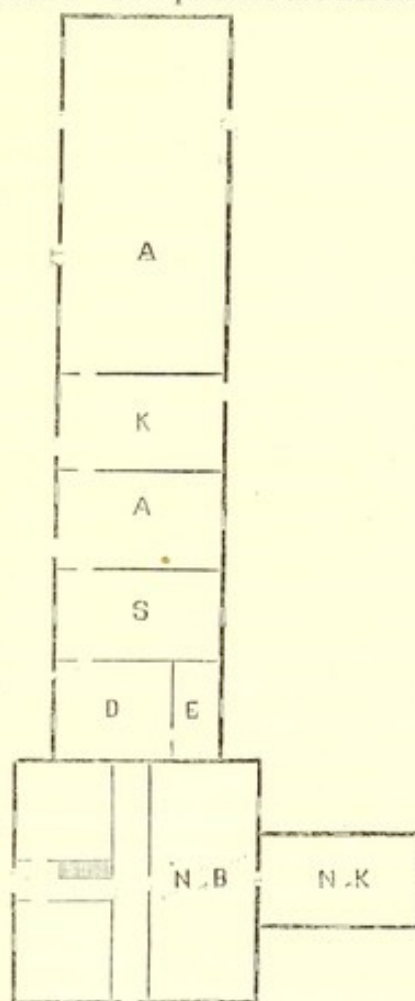


Figure 44.—Scale, 30 feet to 1 inch.

tors, in dimensions 2 feet square. All the windows in the building are 2 feet 4 inches by 3 feet 8 inches in size. The wards have a capacity for four and twelve beds respectively, giving, in the larger, 950 cubic feet, and in the smaller, 747 cubic feet, per bed. There is no lavatory or bathroom. Bath-tubs are used in the wards. The sink is about 120 feet in rear of the hospital. If the new buildings were properly finished, the hospital would be amply adequate to accommodate the sick and wounded of the garrison under ordinary circumstances.

The post bakery is a building, 30 by 28 feet, with a patent oven attached, in which may be baked 350 loaves at one time. There is no post library.

The cavalry stable is of logs, 230 by 32 feet, and 12 feet high. The corral is 200 feet square.

The water used at the post is pleasant to the taste, colorless, and free from smell. The permeability of the soil and the infrequency of rain render the surface drainage all-sufficient. Slops, &c., are hauled away from the post daily.

There are no regular arrangements for bathing. The stream affords facilities during warm weather.

The post garden, under charge of the adjutant, furnishes vegetables to the staff officers and hospital. Companies are furnished from their respective company gardens. About 25 acres of ground are under cultivation this season. The officers in charge of the gardens report the following kinds and amounts of products raised last season, viz: Potatoes, 840 bushels; beets and turnips, 300 bushels, cabbage, 1,200 heads; and peas, beans, lettuce, and radishes in sufficient quantity to keep those for whom they were designed amply supplied during their respective seasons.

There being a railroad station at the post, daily mails are received and sent regularly, requiring about thirty hours for a letter to reach department headquarters. The inhabitants are nearly all in the city of Laramie. There are a few ranch men outside of the town, who engage in stock-raising and agriculture.

The general sanitary condition of the post is good. The prevailing diseases during the past year have been constipation, catarrh, tonsillitis, and chronic rheumatism, their relative frequency being in the order of their enumeration. As a class, affections of the more external organs of the respiratory system are most common. The high winds, to which the command is subjected, carry with them quantities of fine particles of dust with which more or less alkali is intermingled, and by their inhalation cause irritation of the air passages. The sudden changes produced in the temperature at the post, caused by winds as they sweep down from the ever snow-covered summits of the Snowy Range on the west, undoubtedly assist in producing this class of diseases; and it is only because the pores of the cutaneous surface are constricted by the dryness of the atmosphere and consequent rapid evaporation that the more deeply-seated respiratory organs are not more frequently affected. Of pneumonia or pleurisy there has not been a case during the year. In phthisis there have been but few opportunities for observation. It is believed, however, that the irritating properties of the winds and the sudden changes in temperature would prove deleterious, especially in the latter stages of the disease. Chronic rheumatism occupies a prominent place among the diseases of the country, and the neuroses, especially among people who lead sedentary lives, and uterine diseases among females, are by no means uncommon.

Statement showing mean strength, number of sick, and principal diseases at Fort Sanders, Wyoming Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	380.5	734	.....	163	135	57	.....	11	4	46	1	96	7
1869.....	198	239	8	12	37	12	1	7	.....	32	.....	31	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy

FORT FRED STEELE, WYOMING TERRITORY.

REPORTS OF ASSISTANT SURGEON J. K. CORSON AND ACTING ASSISTANT SURGEON R. A. CHRISTIAN,
UNITED STATES ARMY.

Fort Fred Steele is situated on the west bank of the North Fork of the Platte River, at the point of crossing of the Union Pacific railroad; latitude $41^{\circ} 48'$ north, longitude $107^{\circ} 09'$ west from Greenwich; elevation above the sea about 6,700 feet. The reservation, as declared by the President, includes 36 square miles. The bluff on which the post is placed is about thirty-five feet high, composed of ten feet of loose gravelly alluvium lying on a bed of soft clay slate. Immediately below the railroad crossing, the river makes an abrupt angle to the west, running along the base of the high, bare, bluffs called Rattlesnake Hills. To the south and east are ranges of low sandhills, above which can be seen Elk Mountain and the Medicine Bow Range. St. Mary's, the nearest town or settlement, is about twelve miles distant. There are coal mines at Carbon, forty-one miles distant, and there appear to be numerous beds of coal of varying quality at points more accessible to the post. Near Rawlings's Springs, twenty miles west of this place, coal of good quality is said to exist in large amount. The rocks forming the bluffs directly opposite the post, beyond the Platte, are sandstone of an excellent quality for building purposes, and easily quarried. At some points they appear to be a silicious sand-rock, the seams stained with iron. Moss and wood agates, carnelians, and jasper are quite plenty in the vicinity. Numerous specimens of fossiliferous rocks, containing numbers of marine shells, have been found in the railroad cuts, 6,000 feet above sea-level; large masses of conglomerated oyster shells have been also discovered in similar localities.

The soil, being alkaline, is unproductive without irrigation, except in some sheltered bottoms along the river, where grass of a tolerably good kind is found, and from which the forage necessary for the animals at the post is sometimes obtained. A garden has been attempted, but the result seems to warrant the statement that the season is too short generally for garden vegetables. Timber, other than cottonwood, is very scarce nearer than Elk Mountain, twenty-five miles east, where pine is found in abundance. Some pine and fir exist to a small extent on the bottoms. The fuel furnished this post is cottonwood, more or less decayed.

The gray wolf and the coyote abound, the latter coming close to the camp at night in search of offal. Game is abundant; immense herds of antelope and elk can be found within a few miles of the fort, and black-tailed deer and mountain sheep are also plentiful. Of the smaller game are found the jack rabbit and sage hen, the latter assimilating to the grouse, and living on the wild sage. Very few fish are found in the North Fork.

The climate is exceedingly dry, rain during the fall and winter being almost unknown, and snow very light. The hottest day was August 3, 1869, when the thermometer indicated 96° ; the coldest day was December 21, 1869—mercury standing 20° below zero. The days are generally mild and bracing; the nights, from midnight until daylight, intensely cold. The river, which is exceedingly rapid, has been in winter frozen in places almost to solidity.

The post was established in June, 1868, and was ordered to be built of such material as the region afforded. Stone was at first selected, but subsequent orders having been issued to use timber, parties were sent to Elk Mountain, before referred to, where large numbers of pine logs were cut, and drawn to the post. Two steam saw-mills were set up near the river, about half a mile from the post, and the logs prepared for building. The barracks, five in number, were commenced almost simultaneously, and occupied by the men before December 1, 1868. They were built on stone foundations, without cellars, of pine logs, squared on three sides, and set in substantial frames, the interstices filled with mortar. Each company barrack is 80 feet long by 35 feet wide, with a piazza, 10 feet in width, which extends along the entire front, with the exception of the space taken up at each end by rooms 9 feet square, which are occupied by the first sergeant and quartermaster's sergeant as offices. The interior of the buildings is in one large room, warmed by two stoves with drums, and well lighted by numerous windows. The chimneys are of stone. The

dormitories are calculated for 100 men each, allowing 456 cubic feet of air space per man. Ventilation by open fireplaces through the chimneys. Double bunks are used, with ordinary bedsacks and blankets. Large and well-constructed frame sinks are placed 100 feet in rear of each company quarters, each provided with two ventilators. Temporary kitchens of three-framed wall tents are in rear of each company barracks, and are provided with a good cook stove, and a cellar for roots. Company bakeries, of adobe, are located under the bluffs.

The commanding officer's quarters is a stone building one and a half stories high, with an additional frame building in rear. The dimensions of the main part are 44 by 36 feet, containing eight rooms; the back building contains three rooms, and is 28 by 25 feet. Four frame buildings, one and a half stories high, furnish quarters for officers of the command. Each is 44 by 34 feet, and is divided into two halls, with rooms on either side, dining-room, and kitchen, each 10 by 14 feet. Two large buildings for quartermaster's store-rooms and offices are on the opposite side of the railroad from the barracks; they cover an area of 130 by 30 feet, and are similarly constructed. The commissary building near by is 80 by 30 feet, furnished with an excellent cellar, and arranged with convenient offices and sales-room. A branch from the railroad runs along the side of both store-houses.

The guard-house is located between the barracks and the edge of the bluff, and consists of a log house, 19 by 16 feet, without windows, and covered with shingle roof. It is warmed by stoves.

Previous to the erection of the present post hospital, five hospital tents were used for a ward, three for dispensary, store-room, and attendants, placed at right angles to the former; and, at the other end of the ward, one hospital tent and two small tents were used for mess-room and kitchen, the whole forming irregularly three sides of a square. These tents were framed and provided with doors; the inside of the ward was lined with blankets obtained from the quartermaster; it was heated by stoves, and ventilated by three ventilators inserted in the ridge, each 6 inches square, made to be opened and closed at pleasure. This establishment proved tolerably comfortable. The building now used as a hospital is one of the original company barracks, divided by partitions into one large ward, and two small rooms for store-rooms and office. The arrangement is shown in Figure 45.

A, ward; D, dispensary; E, private room; O, steward's room; P, porch; S, store-room.

The building is warmed by large wood-burning stoves, lighted by twelve large windows, and ventilated by fireplaces through chimneys. The ward, 54 by 20 feet, has a capacity for twenty beds, and allows 1,549 cubic feet of air space to each. No bath-room nor water-closets are attached to the hospital, and the sinks are the same as those in rear of company quarters.

The corral covers an area of 250 feet square, and is located 20 yards below the post. It is built to accommodate 260 animals.

The post is supplied with water from the North Platte River. During the rainy season this water is filled with alkali washed from the plains; for this reason, cisterns have been recommended to be used during high water. The water from the river at other times is of unusually good quality, and is clear and cold. An engine has been erected, and pipes are being laid for conducting water to all parts of the garrison.

Drainage, from the loose, gravelly nature of the soil, is excellent. Artificial policing of camp is rendered almost superfluous, as the violent west winds, which frequently prevail, sweep almost everything loose off the bluff. From the nature of the climate, putrefaction is almost impossible.

There are no special arrangements for bathing at the post.

There are no gardens at the post. Vegetables are procured from the commissary and post trader in sufficient quantities for sanitary purposes, and obtained by purchase with company funds.

There are no inhabitants in the vicinity unconnected with the railroad or post. Very few Indians have been met with.

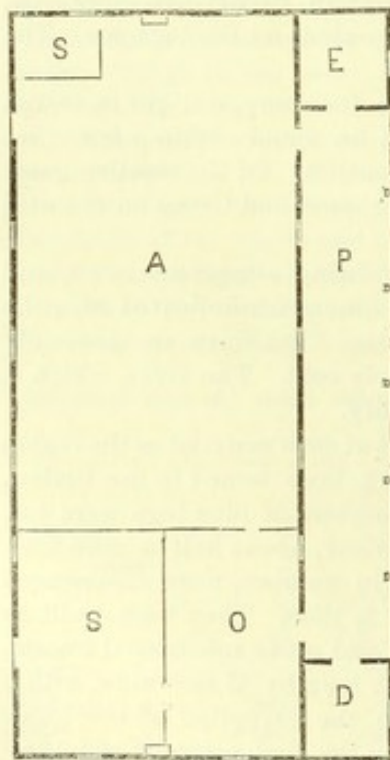


Figure 45.—Scale, 26 feet to 1 inch.

Malarial fevers are not prevalent, and never occur except in cases fresh from other localities. Pulmonary disease of any kind seldom occurs; occasionally a case of pneumonia has been reported of which none have proved fatal. Bowel affections are prevalent during the months of July, August, and September, on account of alkali washed by rains from the plains into the river; at such times the water is of a milky hue. Acute rheumatism may be said to prevail to a considerable extent, but generally in those who have just come to the post. Chronic rheumatism is usually cured in this climate with but little medical treatment. A great tendency to erysipelas, and a disposition of all wounds to take on erysipelatous inflammation, has been observed.

Statement showing mean strength, number of sick, and principal diseases at Fort Fred Steele, Wyoming Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	299.14	324	6	9	72	2	5	1	.....	49	49	.....
1869.....	247.66	531	.....	106	83	15	.....	14	1	38	97	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BRIDGER, WYOMING TERRITORY.

REPORT OF ASSISTANT SURGEON W. E. WATERS, UNITED STATES ARMY.

Fort Bridger is located in Uintah County, Wyoming Territory, in a valley, or rather basin, through which runs the Black Fork of Green River. It is surrounded on all sides by table-lands rising in a succession of benches.

By the survey of Captain Simpson, of the Topographical Engineers, the latitude is made $41^{\circ} 18' 12''$ north, the longitude $110^{\circ} 32' 38''$ west from Greenwich, and the altitude 7,010 feet. The latter was determined by barometric measurement, and is probably too great, as the more recent surveys, in locating the Union Pacific railroad, make Carter Station, 11 miles distant, 6,550 feet above the sea. There can be but little difference in the altitude of the two localities, judging from the topography of the country between them. The post is about fifty miles north of the Uintah Mountains. A spur of the Wahsatch, with perpetual snow on their tallest peaks, and Carter Station, Union Pacific railroad, is directly north and 11 miles distant. There are no towns of any importance nearer than Ogden, in Utah, 128 miles west on the Pacific road, and Salt Lake City is about the same distance by the old overland stage route. The only settlers in the vicinity are a few frontiersmen, who earn a livelihood by raising cattle and selling wood and hay to the post, and on the railroad. After the necessity for which the post was established had ceased, its garrison has been useful in protecting the overland stage route, on which it was located, and in keeping in subjection the Ute and Shoshone tribes of Indians, who roamed in the vicinity. The utility of the post at present consists in its being a base of supplies for troops serving at the Wind River Indian agency and Sweetwater mining district, and as a wintering place for the cavalry operating in that country during the summer. It doubtless has also a healthful influence over a tribe of Ute Indians, who are regarded as treacherous and dishonest.

The post was established in June, 1858. The immediate locality had long been known as Bridger's Fort, the trading post of James Bridger, a noted trapper and guide, whose history is associated with that section of country for many years. In its establishment it was intended as a base of supplies for the army of General Albert Sidney Johnston, moving against the Mormons in Salt Lake Valley in 1857 and 1858. That winter the entire command encamped in the valley just

above where the fort is now situated, and upon its removal the permanent post was located. Nearly all the labor was furnished by troops, and the logs of which the post was built were hauled from the foot hills of the Uintah Mountains, about twenty miles distant. The reservation, as originally laid out, extended 25 miles from north to south, and 20 from east to west. In November, 1869, it was curtailed so as to include only four square miles, and as surveyed by Brevet Colonel W. E. Merrill, United States Engineers, and designated by a general order of the department commander, it now extends four miles from north to south, beginning at a bluff half a mile north of the post, and one mile from east to west, beginning just beyond the eastern limits of the garrison. The present reservation takes in all the grass lands of the valley. When the reservation was reduced a town site was surveyed near its eastern boundary, and a few buildings have been erected, but there is nothing in the location that will build up a town. In all the valleys, and on the terrace lands, extending over a wide range of country, are extensive alluvial deposits, indicating the existence of inland seas after the general upheaval of the great Rocky Mountain region. A characteristic feature of the country is the butte formations, where the earth's crust seems to have yielded to the subterranean pressure so gradually or uniformly as to allow an upheaval in regular form, constituting hills perfectly flat on the surface. On the sides of these buttes or hills, as well as along the terraces of the table-lands, and where streams have washed their beds in the sides of bluffs, a remarkable uniformity in structure may be observed. Lowest of the strata thus exposed we find a green sandstone, often of very considerable thickness; next above it a shaly formation; above that a drift deposit of pebbles and boulders, and above all the alluvium on the surface. Coal, of a bituminous character, similar to that found in many other parts of the Rocky Mountain region, has been discovered in several places within a few miles, but no experiment has yet been made to determine the practicability of using it as fuel at the post. Limestone abounds in the vicinity, and, when calcined, makes excellent lime for building purposes. Within three miles of the post is a large bed of silicious limestone, with horizontal fractures, converting it into slabs of uniform thickness, so that it is easily obtained without blasting. This has been used of late in erecting store-houses at the post, and makes a good building material. None of the precious or useful metals have been found in the mountains of the vicinity. The soil is fertile and yields abundantly of all the cultivated vegetables whose growth is not interfered with by the shortness of the season. Potatoes, turnips, and nearly all the summer table vegetables have been successfully cultivated. For three years past, however, the entire crops of all the vegetables, except the potato, have been destroyed by the grasshoppers. Wheat, rye, barley, and oats have been raised in the vicinity, though the frequent failures of the crops rendered their cultivation since the completion of the railroad unprofitable. There are but few indigenous trees in the vicinity. On the borders of the streams may be found a few aspen and small cottonwood trees, and a very thick growth of a herbaceous variety of willow. There are but few wild animals in the immediate vicinity of the post. Of these the coyote, rabbit, prairie dog, gopher, and a few beavers in the streams are the principal. In the mountains to the south, and among the foot hills, they are more numerous, and in greater variety. We there find the grizzly and black bear, the wild cat, lynx, wolverine, badger, porcupine, fox of several varieties, and many others. There are also of wild game the elk, black and white-tail deer, and antelope to be found in the same region. The sage hen is very numerous. The wild goose, mallard and green-winged teal ducks are found in limited numbers in the streams.

The streams abound with trout, which are caught in great numbers during the summer and fall months. They weigh from six to twenty ounces, and are marked with black spots. During the summer and fall months, when the streams are low, they will rise and take the fly, but the grasshopper has always proved a better bait. The only other varieties of fish caught in the streams of the vicinity are the common sucker, where the streams are larger and more sluggish, and a peculiar variety of a slim, gray fish, pronounced by some English tourists to be identical with the grayling of England and the continent of Europe.

The climate is temperate and salubrious the greater part of the year. The weather during the fall months is mild and delightful, excepting a few snow-storms of short duration. No severe weather occurs before the middle of December. After that time there are frequent storms, and high winds prevail. Cold weather continues late in the spring, and the grass does not begin to grow until May. During that month and June there is a greater rain-fall than in all the other

months; although the post is in the valley with streams all around and through it, the atmosphere is comparatively dry, the reading of the wet and dry-bulb thermometers varying from ten to fifteen degrees. The prevailing winds are from the west, and blow from that quarter twenty-eight days in a month. The rain-fall for last year amounted to 7.97 inches. In consequence of the very high winds that prevail during snow-storms, and the drifting, it has been impossible to ascertain, even approximately, the quantity, and measurements have not been made. The highest temperature of the year has been 85° F.; the lowest —19° F., and the mean 43.12°.

As before intimated, the fort is located near the northwestern corner of the reservation, and all that portion of it is low and level, with only sufficient slope to afford good drainage. Black's Fork, a short distance above the post, divides into five branches, all of which unite again within a mile below. One of the larger branches runs through the parade ground from south to north, dividing it into two unequal parts. The buildings are but a few feet above the water level, but the slope of the surface in and around the fort is so regular that it is well drained.

Of the eleven barrack buildings only six are used as quarters for the men. Two are occupied by laundresses, one as adjutant's office, school-room, and library, another as guard-house, and the third as shops for mechanics, carpenters, and wheelwrights. These buildings are in two rows on each side of the parade; are each 76 feet long, those nearest the parade being 18 feet and the others 22 feet wide. On the parade front are porches extending the length of the buildings. The rear buildings are used in part as sleeping-rooms, and also contain the company mess-rooms, store-rooms, and kitchen. The buildings are heated by large wood-stoves, and lighted by windows in the sides. The bunks are arranged in two tiers. The sinks are built in rear of the quarters. Vaults are used, and as they fill near the surface, are covered and new ones dug. The quarters for the laundresses are similar buildings to those occupied by the men, but divided by partitions into small rooms, which are heated by fireplaces, except in some instances where cooking stoves have been purchased by the laundresses themselves. The officers' quarters consist of six buildings of uniform size and like arrangement, about forty feet apart in a row and facing west, and of other sets on the flanks opposite to and facing each other. The six buildings are of logs, one story, with four large rooms, two on either side of the entrance—a hall room for servants—and to most of them have been added frame shed summer kitchens. The quarters of the commanding officer, however, have a more substantial log back building.

Of the quarters on the flanks, two sets are on the north side, built of boards and containing each two rooms, a kitchen and servants' room, while on the south is a single set, consisting of a log building, with frame additions, containing two large rooms and a kitchen. These buildings are well plastered and many of the rooms papered, furnishing very comfortable, if not elegant quarters.

The six buildings in line have in each room a fireplace and one window. The other quarters are heated by stoves. Narrow ditches, extending from the stream above the fort, run in front, and through the yards in the rear, of the quarters, furnishing an abundant supply of pure water. There are neither water-closets nor bath-rooms connected with the buildings. Detached privies are built in the yards. As before remarked, two of the buildings intended as barracks are now used as adjutant's office and guard-house. This was rendered necessary by a department order forbidding fires in or near any store-house at a military post, and the building erected for a guard-house being in close proximity to the quartermaster's store-house, and the adjutant's office in the same building with the commissary store-house, this change was made. If the post is continued, a new adjutant's office and guard-house will be erected. The quartermaster's and commissary store-houses are three large stone buildings in front of the parade, facing east, and are the most substantial, and best adapted to the purpose for which they were designed, of any at the post.

The hospital is situated about forty yards south of the last of the row of officers' quarters, and consists of an L-shaped building, 113 by 18 feet on the long side, running from east to west, and 62 by 20 feet in the addition running north and south. The whole is built of logs, and the wing, or the extension to the south, is an addition made in the fall of 1869. The longer portion of the building is divided respectively into a dispensary, ward No. 1, ward No. 2, bath and wash-rooms, and attendants' room, and the wing into a steward's room, store-room, dining-room, and kitchen. Ward No. 1 and the dispensary are plastered and hard-finished, and ward No. 2, bath-room, attendants' room, steward's room, and dining-rooms, are lined with felting and covered with

wall-paper. The building is badly adapted to the purpose for which it was designed. The medical officer on duty at the time it was erected disclaims all responsibility for its bad design, and says his opinions were ignored by the quartermaster who constructed the building. The ceilings in the ward are only seven feet high, but as there is a large superficial space, and but few patients in hospital at one time, the beds can be arranged so as to give 600 or 800 cubic feet of air space to each.

Adjoining the hospital on the east is a shed containing a medicine wagon, and used also as a dead-house, and beyond, and separated only a few feet, is the sink for the hospital. The wards are heated both by stoves and fireplaces, the latter being inadequate during the very cold weather. The ventilation is by side windows during the summer, and by air shafts, through which the stove-pipes run, and the chimneys during winter. A small ditch runs the entire length of the hospital, and furnishes water to the officers' quarters.

The post bakery is situated a little north of the buildings already described, is built of logs, with a good stone oven, and well supplied with the necessary fixtures for a bakery. The stables are frame structures, situated northeast of the garrison, over 200 yards distant. They form two sides of a square, and contain stalls for two hundred animals. A stockade extends the other two sides of the square, forming, with the stables, a corral.

There is but a small library belonging to the post, consisting of works of history, some of the standard novels, school-books, &c.

The water supply is abundant and convenient without labor in constructing cisterns, digging wells, or any artificial means of conducting it to the quarters, other than a few surface ditches along the regular slope, by which it is made to run convenient to all the barracks, and an abundant supply is thus obtained during the greater part of the year. In winter it must be carried in buckets from the stream that runs through the post. The convenience of water in an unlimited quantity has prevented any serious accident from fire since the establishment of the post. The stream furnishing the supply has its rise in the Uintah Mountains, and is fed by never-failing mountain springs, yielding water free from mineral impurities, and, running through a gravelly bed, it reaches the post almost as pure as at its source.

The natural drainage being good, no artificial drains or sewers have been made. The slops and offal from the kitchens of the company quarters, as well as from the officers' quarters, are collected in barrels kept on the premises, and every morning hauled below the post and thrown into the stream.

There is an old cemetery in the valley half a mile northeast of the post, but it is no longer used. A new one has been started on higher ground, about a mile and a quarter distant in a southerly direction. In both the graves of citizens who have died at or in the vicinity of the post largely predominate. There are but four graves of soldiers in the new cemetery, which has been used for more than two years.

There has been cultivated but one garden at the post, the products of which have been divided proportionately among the companies, the hospital, and the officers, each paying at the end of the season a *pro rata* of the cost of seeds and garden implements. In consequence of the devastation occasioned by grasshoppers, before referred to, the yield for the last three seasons has been almost entirely of potatoes, but the quantity of this one vegetable obtained has amply repaid for the labor and expense of cultivating the whole.

Eggs, chickens, and fresh vegetables are scarce, and command high prices. They are brought a considerable distance for sale at the post.

The officers' quarters are provided with a few of the more necessary articles of household furniture, such as bedsteads, tables, washstands, &c., made by the quartermaster; but aside from these articles no furniture can be procured in the vicinity. It is desirable for officers going from the East to purchase furniture at Omaha, and ship it by the Union Pacific railroad.

Medical supplies are obtained from the medical purveyor at St. Louis, on semi-annual requisitions. There is now on hand in the store-room of the hospital a liberal supply. The troops serving in Wind River Valley and Sweetwater mining country are furnished from this post, and in order to meet this demand the medical director has authorized the drawing of supplies in excess of the usual allowance for the garrison. The post being contiguous to the Pacific railroad, communication with the depot whence supplies are obtained is easy and not liable to interruption.

There is a daily mail from both East and West, and communications are received regularly and promptly, being only two days in reaching the post from Omaha.

The general sanitary condition of the post is good, and the hospital records, from its establishment, will show a state of health that will compare favorably with other posts on the frontier. Never in its history has the garrison been visited by an epidemic. Scurvy, the scourge of remote and isolated posts, prevailed to a very inconsiderable extent before the days of railroad communication, and when no vegetables were cultivated in the locality. The largest number of cases appearing in the register for any one month was in April, 1859, when eight cases were reported. At no time, during the last four years, has a soldier been excused from duty because of this affection, though some slight scorbutic derangement has been occasionally observed. Though the post is situated in an elevated region, with no marshes, or extensive vegetable decomposition going on in the vicinity, it has never been entirely free from malarial fever during the summer and fall months. That the cause exists in the locality is proved by the prevalence of a periodical form of fever known as "mountain fever" among the "mountaineers" who have long resided here. This fever has all the characteristics of remittent fever of known malarious districts, and promptly yields, in its early stages, to the same remedies. If no treatment is adopted, however, and every sanitary measure disregarded, as was often the case with emigrants traveling with wagon trains over the country, the patient rapidly sinks into a typhoid state and dies. During the past winter, and indeed every winter, rheumatism and catarrhal affections have been the prevailing diseases of the locality. The latter class of diseases, however, has consisted of only the milder affections of the respiratory organs, seldom extending to pneumonia.

Statement showing mean strength, number of sick, and principal diseases at Fort Bridger, Wyoming Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	275.5	453	55	111	18	1	.....	25	1	127	1
1869.....	182.25	461	89	60	14	6	5	33	2	137	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP DOUGLAS, UTAH TERRITORY.

REPORT OF SURGEON W. C. SPENCER, UNITED STATES ARMY.

Camp Douglas, Utah Territory, is situated on a plateau at the base of the Wahsatch Mountains, two and a half miles east of the business portion of Salt Lake City, at an altitude of 730 feet above it, and of 5,030 feet above the sea; latitude $40^{\circ} 46' 2''$ north, longitude $111^{\circ} 53' 30''$ west from Greenwich. It is placed in the center of a reservation two miles square. The land, which slopes gently toward the city, is arable, consisting of a light, sandy soil, and well irrigated by perennial streams from the adjacent mountains. The scenery is extremely fine. Behind and at the right and left is the Wahsatch Range, the loftiest peaks of which, "The Twins," are 11,400 feet in height and covered with perpetual snow. Directly in front and in full view lies the city, nine miles beyond Great Salt Lake, with its mountainous islands; at the southwest, twenty miles distant, are the Oquirrh Mountains; while between the two ranges there is a fertile and beautiful valley, through which flows the river Jordan.

The post was established October 26, 1862, by Colonel P. E. Connor, Third regiment California volunteer infantry, who had been ordered to command the district of Utah, comprising the Territories of Utah and Nevada, with headquarters at or near Salt Lake City.

Rich deposits of gold, silver, copper, lead, and iron have already been discovered in the vicinity, although until very recently mining has been neglected on account of the opposition of the Mormon authorities. Sandstone, limestone, and granite are found in abundance. There is but little timber near the post, but in some of the cañons, at a distance of from eighteen to twenty-five miles, white pine and cottonwood are procured. The ground in the neighborhood of the camp is covered in great part with sage brush and scrub oak, but the grass is sufficient to afford good grazing. Mallard and teal ducks, wild geese, snipe, grouse, prairie chickens, sage hens, and rabbits are occasionally found in considerable numbers at no great distance. Black and brown bears exist in the mountains. The streams of the cañons furnish excellent trout.

The supply of water is derived principally from a creek which emerges from Red Butte Cañon, immediately in rear of the post. The minor streams into which this creek is divided are distributed through the camp and serve to sustain shade trees and fruit trees, to irrigate the gardens, and to drain the post through the ravines at each flank, which constitute a natural and effectual system of sewerage. Near the mouth of the cañon an artificial pond has been formed, from which is obtained all the ice needed by the garrison. Water is also brought in wagons from a spring one mile distant. The water from both sources is clear, cold, and pleasant to the taste. It contains a considerable percentage of chloride of sodium, sulphate of lime, and of the carbonates of soda and magnesia.

The camp faces and commands the city on the west. The parade is 375 feet long, 275 feet broad, and has a stream of water upon three sides. Seven one-story double cottages at the head of the parade are set apart for officers' quarters. They are built of hewn logs, whitewashed, are lathed and plastered inside, and have shingled roofs. Each building, comprising quarters for two officers, is 46 feet 6 inches long, 26 feet 6 inches wide, and 9 feet high in the clear; contains eight rooms, including two kitchens, and has a veranda, 7 feet wide, in front. In a line with these houses, at their right, is a large, one-story-and-a-half adobe building, containing twenty rooms. At each side of the hospital there is a one-story cottage, containing six rooms. All these quarters are comfortable and in good repair.

The barracks, ten in number, are built of hewn pine and cottonwood, and are floored and shingled. The dimensions of each building are—length, 85 feet 5 inches; breadth, 28 feet 8 inches; height of side walls, 10 feet 9 inches; of peak, 16 feet 2 inches. Capacity per man, with average number of occupants, 500 cubic feet. They are all provided with open fireplaces and with ridge ventilation. In front of each extends a veranda, 60 feet long and 9 feet broad. One of the barracks is used as a chapel. These structures are so much dilapidated as to be unfitted for their purpose. It is probable that new ones will be erected during the present year.

The laundresses' quarters consist of five one-story-and-a-half double frame buildings, battened and lined with adobe, and of three smaller ones, all built in the fall of 1869. They are situated at the rear and left of the camp.

The hospital, situated 160 yards in rear of the parade, was erected in October, 1863. It is built of roughly-hewn white pine timber, resting on a sandstone foundation, and is shingled. The interior is lathed and plastered throughout. It is a rectangular edifice, 88 feet long, 36 feet wide, and 27 feet high to the peak of the roof, with a veranda in front, 8 feet 5 inches wide. The arrangement is shown in Figure 46.

A, wards; B, bath-room; C, clothes-room; H, hall; I, dispensary; K, kitchen; M, mess-room; N, shed; O, office; P, porch.

The second floor is divided into two comfortable bed-rooms and three store-rooms. Each ward is 51 feet 3 inches long, 16 feet 9 inches wide, and 10 feet high; is well lighted, and has an open grate at each end. Two ventilating shafts extend from the ceiling to the roof. There are ten beds in each ward; area per bed, 85.82 square feet; air space per man, 858.20 cubic feet. Although the building is faulty in design in several essential particulars, it is in good repair and comfortable. Its site, which is considerably more elevated than that of the barracks and nearer the mountains, is well chosen.



Figure 46—Scale, 32 feet to 1 inch.

The hospital garden, comprising an area of two and a quarter acres, is directly behind the building. Extensive company gardens have been made in front of the post. By means of irrigation all the ordinary varieties of vegetables are raised in abundance. The surrounding country supplies cereals, fruits, vegetables, and poultry of excellent quality at moderate prices. The crops, however, are subject to the visitations of grasshoppers, which frequently inflict great damage. Salt Lake City, with a population of about 16,000, contains well-stocked stores, and affords a good market.

At the western face of the parade are three adobe buildings, occupied respectively as an ordnance store-house, magazine, and guard-house. The latter is 60 feet long, 18 feet broad, and 18 feet high to the peak of the roof. It contains a sergeant's room, guard-room, general prison-room, store-room, and a corridor with cells. The cells, three in number, are each 6 feet in length, 5 feet in breadth, and 7 feet in height. There are no means of warming the cells or the general prison-room.

The store-houses, located at the left of the camp, consist of seven large wooden buildings. Two large stables are placed in line with them. A short distance behind the store-houses, and parallel with them, are four frame structures which are used as shops by the mechanics of the post.

The cemetery, three-fourths of a mile southeast of the post, has an area of nearly an acre. It is surrounded by a substantial stone wall. An unfailing rivulet runs through the inclosure.

The general health of the post is most excellent. Very few diseases are encountered which are not the result either of errors of diet or of exposure to cold.

The climate from April to December is delightful. During the winter it is very variable, but ordinarily without a great range of temperature. The following table may be of interest:

Summary of meteorological observations at Camp Douglas, Utah Territory, from June, 1869, to June, 1870.

Temperature, &c.	1869. June, July, August.	1869. September, October, November.	1869-70. December, January, February.	1870. March, April, May.
Highest temperature.....	97°	85°	58°	85°
Lowest temperature	55°	28°	17°	3°
Average temperature.....	72°.34	53°.35	32°.62	46°.62
Greatest difference between dry and wet bulbs...	29°	19°	8°	18°
Least difference between dry and wet bulbs.....	3°	1°	1°	1°
Average difference between dry and wet bulbs....	9°.53	9°.35	5°.14	4°.22
Average height of barometer.....		25.221 in.		
Snow.....			7.85 in.*	
Total rain-fall, including melted snow.....	1.52 in.	4.60 in.	3.98 in.	10.07 in.
Prevailing wind	East.	East.	East.	East.

* Including March.

Total rain-fall, including melted snow.

Years.	Inches.	Years.	Inches.
1863.....	7.47	1867.....	24.60
1864.....	14.92	1868.....	17.55
1865.....	17.56	1869.....	23.32
1866.....	24.89	1870, (January 1 to June 1)...	12.76

The annual rain-fall has greatly increased for the past seven years. As a consequence the level of Great Salt Lake has steadily risen, while the water has decreased in density. During the spring, summer, and autumn a fresh, cool breeze from the cañons arises in the evening, and in warm weather contributes very materially to the comfort of the garrison.

There are no hostile Indians near the post. The tribes in the vicinity are the Utes, Pi-Utes, Bannocks, and the Shoshones or Snakes. Their friendship is the result of their defeat by General Connor at Bear River, Washington Territory, January 29, 1863, and at Spanish Fork, Utah Territory, April 5, 1863, by Colonel G. S. Evans.

The remaining residents of the neighboring country constitute two classes—the Gentiles and the Mormons. The former include individuals who are sometimes known as “Jack Mormons,” from their subserviency to the saints. The number of Gentiles in the city has diminished of late, the effect of the injury to their business resulting from the efforts of “Zion’s Coöperative Mercantile Institution.” The development of the mineral resources of the Territory, however, will undoubtedly cause a large immigration.

The Mormons are divided into four sects—the Brighamites, the Morrisites, the Josephites, and the Godbyites. The Morrisites are believers in the doctrine of the transmigration of the soul, but unite with the other schismatics in opposing the despotic rule of Brigham Young, and in upholding the theory and practice of polygamy. Several hundred Morrisites, expelled from Salt Lake City by religious persecution, lived in “dug-outs” in the ravine at the left of Camp Douglas, and were gratuitously fed by the United States from the autumn of 1863 until the spring of 1867, when nearly all went to their old homes at the East, leaving behind them, however, many victims of the bloody policy of the Mormon Church. The followers of the prophet, Joseph Smith, or the “Josephites,” are inimical to polygamy, and their influence in this portion of the country is increasing. The Godbyites, or members of the Church of Zion, constitute the liberal party of the church, and are denounced as apostates by the adherents of Young.

The president of the “Church of Jesus Christ of Latter Day Saints,” and almost all the members of his hierarchy, are Americans, but the great body of the people are English, Welsh, and Scandanavians of the lower classes, imbued, like their leaders, with hatred of the Government of the United States.

The health of the Mormon people is generally good. In the city, however, the mortality among children is quite large, arising less from the frequency and intensity of epidemics than from neglect, insufficient food, and the practice of the “laying on of hands” by the dignitaries of the church to the exclusion of remedial measures. Prostitution, in its usual form, and the diseases incident to it, are almost unknown.

It is estimated that the actual polygamists do not number more than one-tenth of the population of the Territory, although the ratio is greater in the large towns.

Statement showing mean strength, number of sick, and principal diseases at Camp Douglas, Utah Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	238.33	231	2	28	43	16	1	6	8	12	1	11	.....
1869	243.66	395	1	117	50	20	.....	.....	8	18	1	51	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF DAKOTA.

POSTS DESCRIBED.

Fort Snelling, Minnesota.
Fort Ripley, Minnesota.
Fort Abercrombie, Dakota Territory.
Fort Wadsworth, Dakota Territory.
Fort Ransom, Dakota Territory.
Fort Totten, Dakota Territory.
Fort Randall, Dakota Territory.
Fort Sully, Dakota Territory.

Fort Rice, Dakota Territory.
Fort Stevenson, Dakota Territory.
Fort Buford, Dakota Territory.
Fort Benton, Montana Territory.
Fort Ellis, Montana Territory.
Camp Baker, Montana Territory.
Fort Shaw, Montana Territory.

FORT SNELLING, MINNESOTA.

INFORMATION FURNISHED BY SURGEONS R. H. ALEXANDER AND A. HEGER, UNITED STATES ARMY.

Fort Snelling is situated on a high bluff between the Minnesota and Mississippi Rivers, near their junction. Latitude $44^{\circ} 52' 46''$ north, longitude $93^{\circ} 4' 54''$ west; altitude above the river 300 feet, above the sea 840 feet. St. Paul, Minnesota, is distant 6 miles.

In 1805 Lieutenant Z. M. Pike, commanding an exploring expedition, held a conference with the Sioux on the island at the mouth of the Minnesota River, which now bears his name. By this conference a tract of land was obtained for military purposes extending from the junction of the Mississippi and Minnesota Rivers to the Falls of St. Anthony, and nine miles on each side of the Mississippi. In 1819 Lieutenant Colonel Henry Leavenworth, of the Fifth United States Infantry, arrived with his regiment to locate a post upon the reserve selected by Lieutenant Pike. The first monthly report was rendered for September, 1819. Owing to scurvy among the troops work was not commenced until the spring of 1820. In May, 1820, Lieutenant Colonel Leavenworth moved his regiment across the Minnesota to the west bank of the Mississippi, and encamped near a spring half a mile above Fort Snelling. The site then chosen for the post was the present military cemetery, and preparations were made to commence the work, but Colonel Josiah Snelling, Fifth United States Infantry, arrived in August, assumed command, and selected the location where the fort now stands. The work was actually commenced September 10, 1820, and steadily prosecuted until October, 1822, when the post was first occupied. During this time Colonel Snelling was in command, and his regiment engaged in the work. Upon the recommendation of Colonel Snelling the fort was called Fort St. Anthony, and was so known until 1824, when it was visited by General Scott, at whose suggestion, complimentary to Colonel Snelling, the name was then changed to Fort Snelling.

The defenses and some of the store-houses and shops were built of stone, but the quarters were generally single log huts until after the Mexican war, when the post was garrisoned by the Sixth United States Infantry, and the interior assumed the present appearance. During the year 1856 it was abandoned by the Government, but was reoccupied in 1861. The post has never been attacked or threatened.

The reservation is not yet declared. From six to seven thousand acres are held reserved. On the Mississippi side the bluff upon which the fort is situated descends abruptly to the water, the river running there almost in a cañon. On the Minnesota side the slope is more gradual, and ends in low marshy flats, which extend from one-third to one-half mile on both sides of the river, and are frequently submerged during high water. A stone wall about nine feet high incloses the fort, and rests on the east side nearly on the edge of the bluff.

From observations made in the last six months, the highest temperature was July 16th, when

the mercury stood at 98° F.; the lowest was December 11th, when it stood at -19° F.; average for the six months, 50° F.; rain-fall, 17.75 inches; first frost September 17th; first snow September 24th. Mississippi and Minnesota Rivers frozen over December 9th.

The fort is an irregularly shaped bastioned redoubt. Immediately inside the wall, and running almost entirely about the fort, is a roadway, from which stairs lead at various points to the parade.

The parade at the gorge is eight feet above the roadway, but the latter, by a gradual ascent along the flanks, arrives on the same level at the shoulder angles. It is 100 feet above the ordinary height of the rivers, and forms nearly a rhombus, inclosed principally by five buildings on its outer edges.

The arrangement of the post is shown in Figure 47.

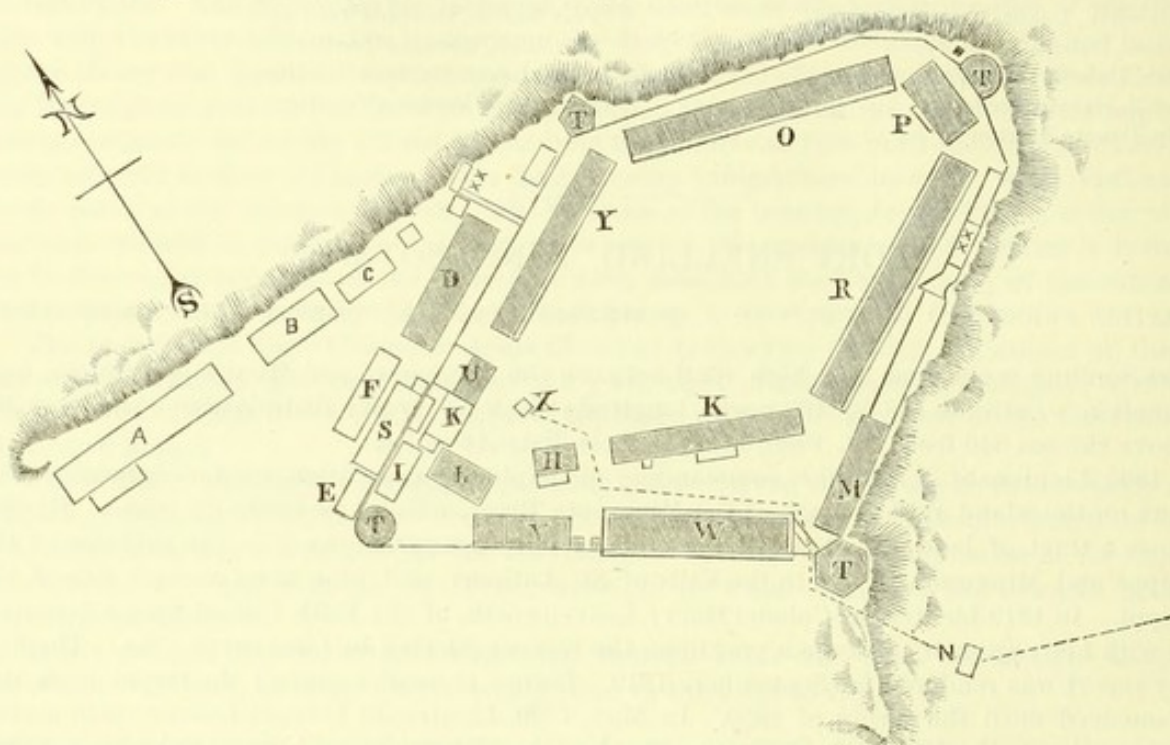


Figure 47.—Scale, 200 feet to 1 inch.

A, stables; B, gun-shed; C, bakery; D, prison; E, carpenter shop; F, ice-house; H, church; I, quartermaster's store-house; K K, offices; L, magazine; M, old commissary store-house; N, engine house; O, company quarters; P, commanding officer's quarters; R, officers' quarters; S, store-house; T, towers; U, sutler's store; V, guard-house; W, hospital; X, cistern; Y, band quarters; x x, sinks.

The buildings represented shaded are of stone. All other buildings are frame.

The quarters for officers and men are built of stone. The dimensions of the company quarters are, for basement rooms $21\frac{1}{2}$ feet wide and 8 feet high; for sleeping rooms, each 31 by $21\frac{1}{2}$ by 9 feet. The usual number of occupants is 12 men to one room. Behind the magazine are some frame buildings comparatively new, used as store-house and offices by the quartermaster. A frame building in the vicinity, the exterior side of which was in part formed by the wall of the left face of the fort, used as a store-house by the commissary, was burned in December last. By the same fire was also destroyed the roof and interior of the tower at the salient angle.

The hospital is a stone building, two stories high, separated from the offices which front on the parade by the road previously described. On the lower floor the building has doors and windows on the north side only. The dimensions of the ward on this floor are 31 by 18 by $8\frac{1}{2}$ feet. It contains five beds, giving 948 cubic feet air space to each. The second floor is surrounded by a wooden porch, 5 feet wide. The dimensions of the wards here are 31 by $14\frac{1}{2}$ by $9\frac{1}{2}$ feet. Each contains five beds.

On the right of the parade is the present guard-house, its outer wall being part of the wall

which surrounds the fort. It consists of a rectangular stone inclosure, with wooden floor, and roof sloping from the outer to the inner wall, divided by a wooden fence into two rooms, one for the prisoners and one for the guard. It has windows and doors only to the north. The ventilation of the above buildings is entirely natural, and, from the construction, must necessarily be defective. No bad results have been observed recently, as the quarters have not been crowded. The large number of cases of pneumonia in the spring of 1867 seems to have been due to want of ventilation. The second floor of the hospital can be thoroughly ventilated by its doors and windows. The fort having been built over forty years ago, with a view of protecting a small garrison from hostile Indians, when it was the aim to place the largest number of soldiers into the least possible space without any regard to the demands of hygiene, an opinion as to the merits of the construction of buildings is entirely out of the question.

The stable, workshops, ice-house, and other necessary buildings are outside the wall on the bank of the Mississippi, in front of the salient angle of the fort. During the rebellion a number of wooden barracks, store-houses, and stables were erected a short distance above the post, which still remain.

The post was until recently supplied with water from the spring half a mile above by means of water-wagons. This being a great expense to the Government, it was deemed best to supply the post with water from the Minnesota River. This was done in August last. The water is forced by a steam-engine through an inch pipe to a reservoir on the edge of the parade between the chapel and the sutler's store; from the reservoir pipes conduct the water to the quarters, barracks, hospital, stables, &c. Owing to this water being largely impregnated with decaying vegetable matter from the marshes along the Minnesota River, it is only used for washing purposes, and it is found necessary to still supply the post with drinking water from the spring by means of a water-wagon.

The means for extinguishing fire are now good, hose having been recently supplied, and reaching to any building in the fort.

The post is drained by ditches leading into the Mississippi, for the most part good. In the early spring, when the snow thaws rapidly, there is some little inconvenience, but not sufficient to interfere with the health of the garrison.

The post garden supplies sufficient fresh vegetables during the summer, and potatoes for the winter.

The nearest quartermaster and subsistence depots are at St. Paul, Minnesota, the main depots being at St. Louis, Missouri, distant 631 miles by railroad, and 791 miles by the river. The route of supply is by the Mississippi River. Supplies are transported by steamboat from the mouth of May until navigation is closed by ice.

Statement showing mean strength, number of sick, and principal diseases at Fort Snelling, Minnesota, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	81.91	112	6	17	1	5	11	.....	16	1
1869.....	164.58	279	49	70	14	24	15	1	40	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT RIPLEY, MINNESOTA.

REPORTS OF SURGEON J. F. HEAD AND ASSISTANT SURGEON C. K. WINNE, UNITED STATES ARMY

In the year 1848, the removal of the Winnebago Indians to their reservation west of the Mississippi River having commenced, a post was ordered to be established near the junction of the Crow Wing and Mississippi, in the New Winnebago country. The post thus established was called Fort Gaines, and was intended for two companies. In 1850 the name of this post was changed to Fort Ripley. The following description of the post and vicinity by Surgeon J. F. Head, United States Army, published in Medical Statistics United States Army, 1839 to 1855, is referred to by Dr. Winne, as giving a good account of its present condition:

Fort Ripley is situated in latitude $46^{\circ} 10' 30''$ north, longitude $94^{\circ} 18' 45''$ west, upon the west bank of the Mississippi, elevated 20 feet above that river, and probably about 1,100 feet above the Gulf of Mexico. The little river Nokay empties into the Mississippi from the east, at about 300 yards north of this point. The post is built upon a sandy plateau, partially drained by shallow ravines at its northern and southern extremities, gradually sloping toward a narrow swamp about half a mile in rear of the fort. Beyond this is a range of thickly-wooded hills, rising to a height of 100 or 150 feet, which slightly shelter the post from the northwest winds of winter. To the westward of these hills again is a belt of broken surface thickly covered with woods and swamps. * * * Above and below the fort the river is skirted by a narrow belt of swampy land, usually partially inundated in spring, supporting a growth of linden or bass-wood, elms, maple, and birch, which, with pine and poplar on the higher grounds, and a luxuriant undergrowth of hazel and other shrubs, constitute the *sylva* of this immediate neighborhood.

On the east side of the Mississippi (here about 180 yards wide) a gently undulating, sandy, and barren prairie, from a few hundred yards to three miles wide, extends from the mouth of the Nokay to the southward, bordered by a growth of oaks and pines along the river, and by a range of low hills, partially covered with oaks, on the west. Opposite to the post is a strip of land less sterile than the rest, which has been for several years under cultivation, and part of which is liable to overflow in the spring.

The soil generally is a sandy alluvium. No rock has been found within many miles, except scattered boulders of granite, from which was obtained the little stone necessary for building the post. The land, at least when first cultivated, is more productive than might be supposed, being what farmers term warm, and adapted to the short summers.

The climate is subject to great variations. * * * The extremes of temperature observed are 96° , in August 1849, and -39° , January 18, 1852. The latest killing frost in spring was on June 17, 1849, and the earliest on August 14, 1851. A variation of temperature of 30° or 40° in a few hours is not uncommon. Fires are necessary to comfort during a part of every month in the year, except occasionally July and August, and cattle must be foraged from seven to nine months. From about the last third of August till the ground is covered with snow, which usually occurs in November, the weather is generally clear and delightful, with a dry, bracing atmosphere, and equable temperature. After the first considerable fall of snow, the earth's surface remains constantly covered for about five months. The average depth of snow, as roughly estimated from the three winters since the occupation of the post, is from 2 to $3\frac{1}{2}$ feet. An idea of the severity of the winter may be formed from the fact that more than double the Government monthly allowance of fuel is required to warm the quarters, though used in large stoves.

The Winnebago Indians have ceased to exist as a tribal organization in Minnesota, and the principal reservation of the Chippewa Indians is now at Leech Lake, eighty-three miles north. Since the foregoing report was written, many small settlements have sprung up on the east bank of the river, on the post road between Crow Wing and Sauk Rapids, the present terminus of the St. Paul and Pacific railway. The nearest of these to the post are Belle Prairie, on the east, and Green Prairie, on the west bank of the river, seven miles south.

The military reservation at this post consists of two tracts of land. One, about ten miles long and four miles wide, on the east bank of the Mississippi, opposite the post, requires no description, as it was laid off simply "to prevent the near approach to the post, as well as to the Indians, of a class of population whose vicinity has always proved so pernicious to both."* On the other, or second tract, which is one mile square, on the west bank of the river, the fort is erected in the center of the river front of the reserve. The buildings are placed within an area once inclosed by a stockade on three sides, each side 450 feet long, (the fourth or south side being open to the river,) defended by two block-houses on the diagonal of a square. The buildings form three sides of a hollow square, with open angles, facing in to the parade as follows: The barracks occupy the whole

* Letter from Adjutant General of the Army to General Brooke, July 24, 1848.

of the northwest side of the parade, while on the remaining two sides are located the hospital, chapel, offices, quartermaster and commissary store-houses and officers' quarters; four sets of the latter on each side nearest the river. The permanent buildings (with the exception of the granite magazine) are frame buildings, clapboarded; the officers' quarters, barracks, and hospital filled in with brick, one story and an attic in height, with porticos, from 7 to 8 feet wide, extending the entire width of the several fronts. The officers' quarters are well constructed, ample in extent, and conveniently arranged with necessary cellars, offices, &c. The various offices and store-houses are commodious. The barrack, intended for two companies, is 263 feet long by 22 feet wide, with rear additions or wings on the flanks and center. The building is divided into two sections, each section comprising two sets of quarters for married soldiers, orderly-sergeant's room, company store-room or office, two dormitories, 20 by 32 by 11 feet, mess-room, and kitchen. These rooms are entered from small ante-chambers, opening upon the front portico. Although its general arrangement is fair, yet its ventilation is fatally defective. One small opening in the ceiling of each dormitory communicates with the attic, the air of which was expected to be renewed by two corresponding openings in the ceiling of the portico; but as there is but one small shaft of outlet the anticipated result is not attained. "Besides producing down-draughts, openings of this kind, communicating with one reservoir of foul stagnant air, common to a number of rooms, may, by the irregular action of the fires, supply the rooms with each other's foul air."* The ventilation is consequently entirely by the natural method, through open doors and windows, which, as the latter are on opposite sides, might be sufficient if they could be left open for a greater part of the time. The season, however, during which this is practicable, is so short that the ventilation in reality amounts to nothing, as during the long and rigorous winter the men must remain a greater part of their time in their barracks, when the windows are closed, and the air, heated by box-stoves and vitiated by exhalation, can neither pass out nor be removed except by draughts at irregular intervals.

Additional provision should be made for bathing. The present bath rooms consist of two small temporary log additions, in rear of the squad-rooms, without sashes or means of being warmed in winter, so that the men are compelled to use the dormitories for such purposes; a serious evil which could be remedied at small expense. One important defect connected with the barrack is, that the number of men occupying each dormitory is governed solely by the strength of the command present, at one time giving the men ample space, and at another crowding them fearfully. To quote the apt words of the commission previously referred to, "the only way to meet the evil effectually is to settle how many men are required at a particular station, and to provide proper room for them. Having done so, on no account to permit more men to enter the barracks than the regulation number, and to provide at the camps all the additional temporary accommodation necessary to meet the emergencies of troops returning from abroad or otherwise."

Until this is done and ordered by authority from which there can be no appeal, the system of over-crowding, which exists to day in the American Army, will remain as an opprobrium to the service, and an injury to the men.

The guard-house, near where was once the first sally-port, should be condemned as decidedly unfit for its destined purpose. The entrance corridor opens into the guard-room, a gloomy, ill ventilated, and badly arranged place, and consequently not adapted for its necessarily constant occupancy. The lock-up or prison room, with only one small grated aperture for light or ventilation, near the ceiling, opens into the guard-room, as does also the cell, 7 by 11 feet. The latter being without light, air, or warmth, has very properly been abandoned as a place of confinement since the post has been garrisoned by the present command. In all guard-houses particular attention should not only be paid to ventilation and other points which affect the health or comfort of those on duty, but in addition the cells and lock-ups should be so constructed as, while affording every precaution against escape, they would not be, under any circumstances, converted into torture-chambers for the prisoners.

The hospital, under the same roof with the chapel and offices, is divided into three sections; one for administrative purposes, flanked by halls extending the entire depth of the building,

* Report of Commission on Improving Condition of Barracks and Hospitals. London: 1861, page 39.

and communicating with one ward in the end sections; kitchen and mess-room in the rear wing. Its location in such close proximity to the barrack and other buildings is objectionable, but this may have been due to a paramount military necessity. No provision has been made for ventilation except by the windows. With the exception of the administrative part, which is conveniently divided into dispensary, surgeon's office, medical store-room, and linen-room, the plan of the hospital abounds in radical errors which demand especial mention. The first, a medical ward, 30 by 20 by 11 feet, cannot accommodate, at the lowest amount of air space, more than six men properly. The windows are unfortunately in the ends of the room, thus materially retarding currents, and producing more or less stagnation of air; and as the wood-house, latrines, &c., are placed at a distance of only twenty feet in rear of the windows, this defect is aggravated, as the out-buildings virtually form, with the angle of the wing, a dead court. The second, or surgical ward, as originally designed, had the same dimensions, &c., as the medical ward, with several additional errors peculiar to itself; it was lighted by windows in one side and end respectively, and communicated in rear directly with the mess-room, thus effectually precluding proper ventilation, and affording every facility for permeation of odors from the neighboring kitchen. But as no quarters were provided in the hospital for the steward, where it is essential for obvious reasons that this non-commissioned officer should remain, the ward was at some unknown period divided by temporary partitions into two rooms; one still used as a ward, though small and inconvenient, while the other, with the addition of the former mess-room, serves to accommodate the hospital steward and matron; the mess-room also being used as laundry, as in this climate all work of this kind must for a greater part of the year be done under cover. The other prominent defects of the hospital are, briefly, that it is without bath or wash-rooms, water-closet, or dead-house. No separate room is provided for the attendants, who are therefore compelled to sleep in the ward.*

The natural drainage of the post, aided by several surface drains on the bank of the river, is sufficient to carry off the snow and rain-fall. No artificial drainage has been attempted, and no system of the kind is at all practicable here; the sewerage, &c., is therefore necessarily collected in barrels, and regularly removed.

Statement showing mean strength, number of sick, and principal diseases at Fort Ripley, Minnesota, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	62	67	.....	1	7	1	1	14	11	.....
1869.....	67.16	97	1	21	11	1	8	3	19	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT ABERCROMBIE, DAKOTA TERRITORY.

REPORT OF ASSISTANT SURGEON W. H. GARDNER, UNITED STATES ARMY.

Fort Abercrombie is situated on the west bank of the Red River of the North, twelve miles north of the confluence of its two branches, the Bois de Sioux and the Otter Tail; latitude 46° 27' north, longitude 96° 28' west.

This post was established by act of Congress, approved March 3, 1857, agreeable to the provisions of which the following order was issued:

* Since this description was written the hospital has been burned.

HEADQUARTERS OF THE ARMY, June 24, 1857.

GENERAL ORDERS, }
No. 15. }

By direction of the Secretary of War, under the act approved March 3, 1857, a military post, to be known as Fort Abercrombie, will be established on the most eligible site near the head of navigation of the Red River of the North, at or in the vicinity of a place known as Graham's Point, Minnesota.

The post will be built for four companies, and as ultimately one of these is to be a company of cavalry, the necessary provision for such a garrison will enter into the plan of the work.

In obedience to this order Lieutenant Colonel J. J. Abercrombie arrived here with troops, and went into camp in a protected bend of the river, about two hundred yards from the present site of the fort, on the 28th day of August, 1858. The heat was intense, and the mosquitoes and buffalo flies intolerable, but the troops worked vigorously and soon had log quarters erected, which were sufficient to keep them comfortable during the winter. On the 25th of July, 1859, the post was abandoned, but after remaining entirely deserted until July, 1860, was reoccupied and the building resumed. In 1862 the post was besieged by about three hundred Indians of the Sisseton and Yancton bands of Sioux. They drove away the cattle, mules, and horses belonging to the post, and those of the citizens near by. The Indians made two assaults on the post—one on September 3d, the other September 6th—but neither were in large force, and were easily repulsed. There is no doubt but that the post was in imminent peril for many days, having no stockade, but fortunately many of the citizens were able and willing to assist in the defense, and a train loaded with goods for the Red Lake Indians being present, containing among other things sixty double-barreled shot-guns, the teamsters and other citizens were armed with them and formed a militia company, which rendered effective and valuable service.

In February, 1863, the stockade and block-houses were finished, and the post made defensible against almost any number of Indians.

The reservation, although not yet declared, was surveyed in 1867, and contains an area of 22 square miles, embracing both sides of the river.

The valley of the Red River of the North at Fort Abercrombie is about 1,700 feet above the level of the sea, and forms a perfectly flat prairie, broken only by the streams which drain it. It commences about fifty miles south of the post at the divide which separates the waters of Lake Traverse, one source of the Red River, from the waters of Big Stone Lake, the source of the Minnesota or St. Peter's River, and extends eastward into Minnesota to a high range of hills sixty miles distant, called Leaf Mountain; westward in Dakota to the Coteau des Prairies, fifty miles distant, and northward to the débouché of the river in Lake Winnipeg, only contracted at its western side by Pembina Mountain, which is probably the northern abutment of the Coteau des Prairies, once the western shore of the great water that filled this broad Red River Valley. The formation is alluvial; the surface a black, loose soil, deep and fertile, lying upon a horizontal stratum of stiff, grayish or bluish clay, with occasional small circumscribed beds of coarse sand and small gravel, while scattered over the prairie, along the banks and in the bed of the stream, are granitic quartzose, and occasionally limestone boulders of various sizes, from ten pounds to several tons in weight.

The river at its usual stage is about 150 feet broad at Fort Abercrombie, and from two to ten feet in depth, having a swift current, with probably a descent of four inches per mile. Shortly after the junction of its two branches, about twenty miles above, it passes through banks of drift eighty feet high, and over boulders, forming rapids. A mile or two lower down (according to Professor Owen) a ledge of magnesian limestone, containing fossils allied to the lower silurian system, outcrops at the edge of the banks. From a point three miles above Fort Abercrombie, to Pembina, near the British line, the banks of the stream are heavily wooded, chiefly with oak, ash, and elm, which come almost down to the water's edge to join the red willow and wild rice (*Zuzania aquatica*) growing there. Since the Red River flows northward into a colder climate, the snow and ice which form in the water melt on its sources before its outlet is free from ice, and from this cause overflows of its banks frequently take place. The tortuous course of the river also causes in the spring, when the ice breaks up, frequent gorges of ice, and then the country behind the gorge is rapidly flooded, the current seeking new channels and bearing along with crushing force immense fields of ice that sweep away trees, houses, and everything in its path. Georgetown and Pembina, lower down the river, have frequently suffered from these causes, and it is recorded that the waters of

the river at one of these spring floods came up into the parade ground of the fort, at least forty feet above the usual level of the water.

Frequent mention has been made of the presence of coal near this locality, and an Indian scout once reported that the ground near which he had passed about thirty miles from here was on fire and had been burning for several days. As far as can be ascertained these reports are entirely without foundation, though the story of the Indian scout, if true, is readily explained by supposing that possibly a peat bog had been ignited by the burning prairie.

All the cereals and vegetables grow well and abundantly in the valley. The country is excellent for stock-raising, all kinds of prairie grass being plentiful. Timber is found only along the river bank.

In May, as soon as the ice on the streams breaks up, a large species of fish, called by the Indians and half-breeds "buffalo fish," can be seen in large numbers in the streams, evidently coming from Lake Winnipeg to deposit their spawn. They are not found after June about here. They frequently are caught weighing twenty-five or thirty pounds. Another fish common in the river is the "sheep-head." It is very similar, in general appearance, to the sheep-head caught in Chesapeake Bay, (*Sparis oris*), except that the teeth are like the teeth of perch. They are frequently caught weighing twenty-five or thirty pounds, and in taste somewhat resemble their marine namesake. These fish are said to make a grunting or drumming noise at night, and from this cause they are sometimes called drum fish. Lake trout are sometimes seen; also a beautiful perch, with white silvery scales, small, and a very delicate pan fish.

Insect life in the summer fills the wood and the prairie, and, though the varieties are few, the numbers of each are incalculable. Cockroaches have not yet reached this outpost of civilization, but the valley of the Red River is infested with frequent visitations of locusts, that come in countless swarms, and before they leave destroy every green thing. They usually arrive in July, not in installments, but the whole army at once. Their flight is high and vigorous, though the direction of their migration is usually determined by the wind. They commence their ravages as soon as they arrive, and by the time they are ready to deposit their eggs, in September, the crop, with the exception of potatoes and other tubers, is entirely destroyed. The eggs deposited the previous year hatch usually in the latter part of May or early in June, and the young commence at once the destruction of the young crop. It would seem that the vitality of their eggs is not destroyed by freezing, since it is impossible from the length of the ovipositor of the female that the eggs can be placed in the earth at a greater depth than one inch; (I have frequently dug them up, and never from a greater depth than this;) but even supposing that they were placed in the ground three inches below the surface, it would still not place them beyond the reach of frost, for during the winter the earth is frequently frozen to a depth of two feet, and even to a greater depth when the first heavy snow is delayed until late in December. Last year the Red River Valley, about Fort Abercrombie, was free from them, but sixty miles west of here their ravages have caused destitution and famine. Some idea may be obtained of their numbers when it is known that about Fort Gerry, Red River Settlement, British America, in many places where the wind had blown them, their dead bodies are piled three feet deep, and their putrefaction caused such a stench that many people had to desert their homes until the nuisance had abated. It is supposed by some that the spread of agriculture in this country by diminishing prairie fires (one great cause of their destruction) will tend to make the locusts more numerous, but it is more probable that prairie fires which destroy many locusts destroy also a great many of their enemies and competitors, and thus give the locusts the advantage in the struggle for existence. The introduction and spread of agriculture would not only prevent prairie fires, and the consequent destruction of birds and other enemies of locusts, but would also bring into the question many new enemies, such as domesticated poultry, now very uncommon here, and would also introduce not a few competitors, all of which would tend directly or indirectly to keep them down.

The climate is very cold during four or five months of the year, frequently being 40° below zero, and in the summer rising to 100° in the shade. Between these extremes the mean annual temperature is 39°.

Fort Abercrombie is a rectangle, 675 by 625 feet, inclosed by a stockade of logs projecting above the ground from 8 to 12 feet, surmounted at the northeast, southeast, and southwest by block

houses of hewn logs, which are pierced with loopholes for small arms, and embrasures on the outer side for artillery. The surface inclosed is almost level down to the immediate crest of the bank of the river, and is easily drained by two main drains (uncovered) on the eastern and western sides. The level of the parade ground is about thirty feet above the usual level of the river.

The company quarters are three buildings, each one story high, boarded outside, and lathed and plastered within, divided into bake-room, store-room, kitchen, dining-room, orderly-room, and two squad-rooms, each 33 by 25 feet, and 9 feet high; each squad-room being intended to accommodate thirty-two men, giving 232 cubic feet of air space per man. Fortunately these rooms are not very close, for the only ventilation is an air shaft consisting of a stove-pipe put up alongside the chimney, and opening into it above, nor are they usually occupied by their full complement of men. Deducting those who sleep out of the quarters—perhaps not even twenty men ever sleep in one squad-room at one time—even this, however, will give but 371 cubic feet of air per man. It requires but little knowledge of the necessities of air-breathing animals to know that the largest estimate allowed per man in any of these squad-rooms is not over one-third of what each man should have, and undoubtedly this deprivation of fresh, pure air for a great part of the day is a permanent and enduring source of disease even in this healthy climate. Moreover, even this small allowance of air is additionally vitiated by the large cast-iron stove which heats it, and the lamp which burns during part of the night. The latrines, ten or twelve feet deep, are close to the line of the stockade. These are disinfected at short intervals, and as far as can be ascertained have been no cause of disease.

A small isolated frame building is used as quarters by the commanding officer; it contains three small rooms and a kitchen down stairs. North from this building is a set of captains' quarters, containing three good-sized rooms down stairs, including the kitchen, and two low attic rooms up stairs. Next beyond this building is a row of log buildings, 17 by 142 feet, used as quarters by the ordnance sergeant, hospital steward, hospital matron, and containing the post school-room, lieutenants' mess-room, and quartermaster's store-room. There is a large frame building containing five rooms and a kitchen on the lower floor, and two upper attic rooms. It is used for offices by the commanding officer and the adjutant, and contains the quarters of the post surgeon. Adjoining this building is a small frame building containing two rooms, attached to the next set of quarters, which is a frame building lathed and plastered inside. It contains three rooms, including kitchen, on the lower floor, and up stairs three low attic rooms. Next on the north is another small building but one story high. Adjoining this little building, on the north, is a long one-story frame building, clapboarded, lathed and plastered, and divided into six rooms for lieutenants' quarters; in the rear of which, and ten feet distant, is a building, unfinished at present, the same length as those quarters, divided into rooms for kitchens for each set of quarters. Opposite the north end of this building is a granary or store-house, 20 by 83 feet, running east and west.

Between two of the company quarters is a small building fronting the parade ground, 20 by 16 feet, built of hewn logs, which is the guard-house. The interior is divided into one large, and two small rooms or cells, about 7 feet square. These are secured by small barred windows, and holes have been made through the logs for ventilation. The average number of prisoners in the guard house during the past six months is a fraction less than five. The number of guard has been very variable, ranging between eight and eighteen. The hospital is a two-story frame building, 38 feet square, lathed and plastered within, the interval between the clapboards and plastering being filled in with brick. The lower floor is elevated from two to three feet above the ground; the height of lower rooms is 10 feet, the upper 9½. The lower floor is divided into an office, a dispensary, a kitchen, and a dining-room. A hall separates the rooms, and also contains the stairs. Between the kitchen and the dining-room is a pantry, 10 feet long and 4 feet broad. The upper floor is divided by a hall, 8 feet wide, on one side of which is a large room or ward, 14 by 28 feet, and adjoining this room a small one, 14 feet square. Across the hall there are three rooms, two 14 feet square, with a small room, 14 by 10 feet, between them. All the rooms in the hospital are heated with cast-iron stoves, and, except the large ward, have no means of ventilation but the windows and doors. The large ward is ventilated by a shaft passing up by the side of the chimney; it contains five beds, allowing about 800 cubic feet of air space to each man. This, though hardly half enough in a southern latitude, answers very well here, for the difference between the temperature of internal and external air is so great that diffusion and currents of air occur through the smallest crevices;

besides which, all of the beds in this room are seldom filled. Under the kitchen is a cellar, 10 feet square and 6 feet deep, which so far has kept vegetables from being frozen. The post bakery is a newly erected frame building, 16 by 30 feet. The ice-house is a pit, 40 by 20 feet, lined with rough logs, covered with thatch, and well banked around with earth. This ice-house is capable of containing over three hundred tons of ice, this supply usually being ample for three companies during the summer.

The garrison is supplied with water for all purposes from the river. The water is tasteless, inodorous, and colorless, except in summer and when swollen by the spring floods. Two gallons of the water, carefully filtered and evaporated to dryness, left a yellowish residuum, which, when thoroughly dried, weighed twenty-six grains. This residuum effervesces freely with nitric or sulphuric acids, and under the blowpipe loses weight and degrades into a whitish friable mass that shows the usual reactions of lime. This residuum does not color the flame of the spirit-lamp either bluish or yellowish. This water is hard and requires quite a large quantity of soap to produce a good and permanent froth. It acts freely upon lead. A piece of lead pipe measuring four square inches was allowed to stand in four fluid ounces of the water twenty-four hours, and on passing a current of sulphureted hydrogen gas through the fluid, after the lead was taken out, a copious black precipitate was immediately obtained. It contains oxidizable organic matter. One hundred cubic centimeters of the water was colored to a perceptible pinkish tinge by the addition of one cubic centimeter of the standard solution of permanganate of potassa, which color was entirely destroyed in thirty-five minutes. One and a half cubic centimeters of the permanganate solution additional to the same amount of water, (100 cubic centimeters,) was destroyed in a few minutes less than an hour, while the deep pink tinge communicated to 100 cubic centimeters of the water, by the addition of two cubic centimeters of the permanganate solution, was not entirely destroyed until after the lapse of two hours. With a solution of nitrate of silver, the river water gives a tolerably copious white precipitate, which is redissolved upon the addition of a few drops of nitric acid. From all of which reactions it is shown that this water is a tolerably healthy drinking water, but that, like most river waters, it is hard; that its hardness chiefly depends on the carbonate of lime; that it contains oxidizable organic matter, but not in any marked degree; that it contains some chloride of sodium, and that it contains no sulphates or sulphuric acid. As good water as this, and as easily attainable, will probably prevent any experiments in well-digging about the river banks, at least for some years, but cisterns might be constructed with but little labor and expense, which would collect the rain-water from the immense roof surface here exposed, and would be better in many respects for the purpose of the lavatory and the laundry, not to mention the great advantage which might accrue in case of fire.

The nearest quartermaster and subsistence depots are at St. Paul, Minnesota, 245 miles distant, the route of supply being by rail to St. Cloud, thence by wagons in the summer, and by sleds in the winter. During November, and after severe storms, the roads are frequently impassable for either wagons or sleds, and during the latter part of April, and nearly all of May, the streams rise, making the roads impassable for loaded wagons. July, August, and September are the best months for transporting supplies. A tri-weekly line of stages connects with the railroad at St. Cloud, the time being three days.

From the establishment of the post up to the present time it has possessed a remarkable immunity from disease. Scurvy has prevailed to some extent, owing to a want of care in providing the troops here with sufficient vegetable diet. However, the causes acting on the troops temporarily, and supposed to cause scurvy, act on the aboriginal inhabitants almost continually, and yet we never hear of, and certainly never see, an Indian suffering from scurvy. The Indians about here use in their diet a tuber like the artichoke, called Indian turnip, wild plums, and also cranberries and gooseberries, in the seasons when they are ripe, but these fruits are inconstant, and make but a small portion of their diet.

Phthisis pulmonalis, pneumonia, and most other lung diseases are rare. The only diseases which seem of endemic origin, are a peculiar pharyngitis and tonsillitis, and asthma, which are usually made worse when already existing, and sometimes brought on when not before known to exist. Both of these diseases may have their origin in the fungus of the wild grasses of the prairie surrounding the post, though I have made no experiments which make this statement anything more than a rational hypothesis.

Statement showing mean strength, number of sick, and principal diseases at Fort Abercrombie, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	165.83	228	3	38	2	54	4	1	13	27	.....
1869.....	90.16	148	10	12	5	.....	15	.....	17	29	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT WADSWORTH, DAKOTA TERRITORY.

REPORT OF ASSISTANT SURGEON B. KNICKERBOCKER, UNITED STATES ARMY.

Fort Wadsworth is situated near the head of the Coteau des Prairies, in the eastern part of Dakota Territory, latitude 45° 43' 30" north, longitude 97° 30" west; height above the sea about 2,000 feet. The country consists of high rolling prairie, in the hollows of which are many lakes standing at levels of from forty to eighty feet below the site of the post. A tract of 9 by 15 miles is held reserved, but the reservation has not yet been declared. The borders of the lakes are sparsely timbered with oak, water elm, lynn, and cottonwood.

The Coteau des Prairies is an extensive deposit of drift on a silurian base, rising about twenty miles north of the post from the bed of an ancient lake, and extending thence about two hundred miles to the southeast. This drift has remained apparently unmodified, except by disintegration from atmospheric causes, since its deposit in the glacial period. Granite, syenite, sandstone, limestone, feldspar, and clays are mingled with gravel and sand, the more deeply imbedded fragments varying much in size, and having angular projections. A rich vegetable mold, with a slight admixture of sand and clay, light and friable, from one to five feet in depth, forms the surface. A well sunk to the depth of 60 feet revealed, after 40 feet, nothing but sand and coarse gravel, with boulders. Water was not obtained, and nothing like hard pan has been found.

The soil is fertile and well suited to cereals and vegetables. Hay made from the Indian and herd grasses is of excellent quality. The yellow and red varieties of the *Prunus americana* are found everywhere in profusion, and the gooseberry, raspberry, red and black currants, and grapes also flourish. The extension of the larger trees is prevented by the fires which sweep over the prairie every spring and fall. The waters of the lakes are rendered alkaline from surface drainage of an ash-covered soil; in the larger lakes not so much so as to be unpalatable, but in the smaller it becomes offensive, and in the warm months putrefaction is rapidly set up in their alkaline waters, holding in suspension a large amount of vegetable matter.

The principal wild animals, birds, &c., found in the vicinity are as follows: Buffalo, antelope, elk, deer, prairie wolf, large gray wolf, red fox, black bear, badger, otter, marten, beaver, bald eagle, black hawk, kestrel, kite, goshawk, snowy owl, screech owl, blackbird, red-winged blackbird, robin, thrush, American lark, meadow lark, prairie hen, water hen, wild-rock pigeon, crane, curlew, snipe, woodcock, wild goose, summer duck, teal, grebe, coot, pintail, goosander, spirit duck, loon, gull, pelican, and swan.

The fish are pike, perch, mullet, and bullhead.

The climate is mild and dry. Average temperature 44.05° F.; extreme daily means 78.33° F. and 11.66° F. There are no dews. There are no streams in the vicinity.

The location of the fort with reference to other points is as follows: Fort Rice, Dakota Territory, is west-northwest 170 miles; Fort Ransom, Dakota Territory, north-northwest 65 miles; Fort Abercrombie, northeast 76 miles; Missouri River, west 150 miles; James River, west 38

miles; Sauk Center, Minnesota, east 136 miles; nearest railroad, now nearly completed to Breckinridge, Minnesota, northeast 73 miles.

Fort Wadsworth was established as a military post in July, 1864, in consequence of the outbreak of Indian hostilities on the northwest frontier. The fort is five hundred feet from and fifty feet above the surface of Rose Lake, which furnishes the water supply. It incloses about nine and a half acres, has sod-reveted breastworks, and is surrounded by a ditch. The barracks on the east of the parade are two stone buildings, each 200 by 45 feet and one story high, and have a capacity for four companies. The general arrangement is shown in Figure 48.



Figure 48.—Scale
60 feet to 1 inch.

A A, orderly rooms; B B, squad rooms; C C, kitchens; D D, mess-rooms; E E, wash-rooms. They are inconveniently arranged. The flooring is bad, and the ventilation and lighting imperfect. Wood-stoves are used for heating. The dormitories of each company measure 73 feet 8 inches by 14 feet 8 inches by 10 feet, furnishing a cubic capacity of 10,816 feet, or an air space of 169 feet per man, allowing 64 men to sleep in quarters. Single wooden bunks are used, furnished with the usual bedding. The sinks, 60 feet distant from the barracks, are pits 30 feet long and 3 feet wide, sheltered by frame work. The kitchens, $23\frac{1}{2}$ by 19 feet, and the mess-rooms are contiguous to the squad-rooms and dormitories, communicating by a door and window. The laundresses and married soldiers' quarters are nine log houses, gable roofed, one story in height, and containing from one to four small rooms, with low ceilings, and small doors and windows. They were constructed by the volunteers in 1864, but now afford inadequate shelter during the winter months from want of repair. As the Government regards these structures of no value, they are not reported as quartermaster's property.

The commanding officer's quarters is a two-story brick building, of that peculiar color resulting from absence of iron from the clay, 38 by 47 feet, containing four rooms, 20 by 18 by 9 feet, on each floor, and four attics under a gable roof. The rooms are divided into pairs by halls, and contain each a fireplace and three windows, which afford the only means of ventilation. The four sets of officers' quarters are constructed of brick, 38 by 95 feet, height to eaves 11 feet, to ridge 25 feet, with a Mansard roof. Attached in rear are two back buildings for kitchens and wood-houses, to which on the same line are smaller double salients of brick for water-closets, all under gable roofs. Half stories in the former secure servants' rooms. The two middle quarters have a large hall in common, with which the two lower rooms of each set of quarters communicate. From this hall stairs ascend to a like hall, with two attics on either side with similar communication. The lower rooms, 20 by 17 feet, are connected by folding doors. Attics, 20 by 10 feet, have each a dormer window. The end quarters are the same as the middle, except in the possession of a private hall. From all the halls stairs descend to cellars, with dry, gravelly bottoms, under the back rooms.

The adjutant's office is a three-roomed stone building, 19 by 25 by 12 feet, situated on the south side of the parade. Immediately in its rear is the magazine, also a stone structure, 13 by 25 by 8 feet in dimensions, arched with stone and roofed, with small openings for ventilation.

The hospital, a brick structure fronting the parade, is 60 by 32 feet, 12 feet to the eaves, and 25 feet to the ridge. A hall, 6 feet wide, extends through the center of the building, and contains a staircase leading to the upper floor. The plan of the building is shown in Figure 49.

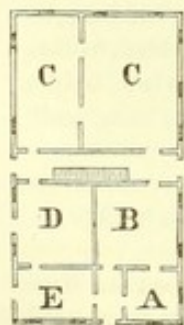


Figure 49.—Scale,
40 feet to 1 inch.

A, office, 10 by 10 feet; B, dispensary, 15 by 15 feet; C, ward, 24 by 18 feet; C, ward, 24 by 12 feet; D, kitchen, 15 by 15 feet; E, wash-room.

All the rooms are 10 feet high, plastered and ceiled; warmed by radiating stoves, and artificially lighted by kerosene oil.

The wards, dispensary, and kitchen have each a wooden tube three inches square entering at the eaves; in both wards it passes through the ceiling at the center and descends one foot. In the dispensary and kitchen the tubes pass through the ceiling at one side and terminate a few inches below. These are intended for the admission of fresh air.

The two wards have a capacity of twelve beds, with an air space of 600 cubic feet to each. The larger only is used for patients.

A large store-room is on the second floor, occupying the space over the wards below. Here the baggage of patients is stored. Two rooms, each 7 by 22 feet, are on the opposite side of the hall, and are occupied as dormitories for attendants. The rooms on this floor have sloping sides, corresponding to the pitch of the roof, to within two feet of the floors, from which to the level ceiling is eight feet. The wash-room contains a bath-tub, basins, and other necessary appendages for cleanliness. The hospital was very much slighted in its building, especially about the doors and windows, through the openings of which a great quantity of snow was blown into the building, above the ceilings, into the wards, dispensary, office, kitchen, and all the other rooms. The hospital was most wretchedly plastered; in the dispensary the plastering has entirely fallen from the ceiling, through which the wind has free access. The roof, ill-constructed, freely admits wind and snow. Considerable portions of plastering have also fallen from the ceilings of the wards and other rooms of the building, with the same unpleasant results.

Two buildings are appropriated for quartermaster's and commissary's storage; one a stone structure, 200 by 45 feet, originally designed for company quarters; the other, a log building, 145 by 24 feet. The latter is used by the quartermaster, and has a cellar one-third of its extent. The four block-houses, one at each corner of the post, are two stories in height, except the one at the south-east corner, and are now occupied as store-houses.

The guard-house is a one-story brick building, 20 by 50 by 13 feet. It contains two rooms and two cells; the latter, 4 by 8 feet, are damp and dark, with no ventilation except by a small half circular opening, three inches in diameter, at the top of each cell door. The rooms are warmed by wood-stoves; have no ventilation, and bad floors. The building has a capacity for about twenty men.

The post bakery is a log building, ill ventilated and lighted, having two ovens with a combined capacity for 470 rations of bread.

The stable, situated outside the fort and finely constructed of stone, is 240 by 36 by 15 feet, and contains 78 stalls.

The post library comprises 94 volumes of a miscellaneous character.

There is an abundant supply of water, but unfortunately of poor quality. The heat of summer producing great evaporation, causes extreme shallowness, and the water is filled with animal and vegetable life, in addition to alkaline and earthy ingredients. The water of melted ice is used almost exclusively in summer by a great number of the command in consequence of the unpalatableness of the warm lake water.

The drainage is good. There is no system of sewerage. Water from rain and melted snow finds an outlet through excavations made in the embankments, and owing to the sloping nature of the interior of the garrison it is generally dry and in good condition.

Bathing is freely indulged in during summer, but during the cold season there are no special arrangements for that purpose.

The gardens are three in number, and distant over a half mile from the post. That belonging to the hospital contains a little over seven acres, which was under cultivation last season. The officers' garden is located east from the post, and embraces about two acres. The company garden yielded last year 350 bushels of potatoes.

The commissariat is well supplied. The nearest depot of supplies is at St. Cloud, Minnesota, 197 miles distant. Twelve months' supply is usually kept on hand. No eggs or chickens are procurable in the vicinity.

A stage nominally makes one trip a week to Sauk Center with the mails. It is, however, very irregular, being liable to interruption from snow and floods. The shortest mail time to St. Paul, department headquarters, is five days; the longest about thirty days.

From fifteen to thirty miles east of the post are small settlements. The nearest Indians are the Sisseton and Wahpeton bands of Sioux. About 1,200 are settled on Lake Traverse reservation, within 70 miles of the fort. They are chiefly occupied in agricultural pursuits.

The general sanitary condition of the post is excellent. Intermittent fever, however, undoubtedly exists, produced in part, if not wholly, in the dark and stony quarters of the troops, the open floors permitting the passage of putrescible matter. The guard-house is in a much worse condition, from the same cause. At present the general health of the garrison is good. The prevailing

diseases during the past year were miasmatic and inflammatory. Bowel complaints are comparatively infrequent. The respiratory, nervous, and muscular organs are more frequently affected.

Thermometrical and hygrometrical changes, together with the unpleasant emanations from the eastern extremity of Hampson's Lake, immediately south of the post, and the shallow pond on the west, between the post and cemetery, from the latter of which it receives the drainage, and the unpleasant emanations from the ground underlying the quarters of the troops, are believed to be the principal if not the only disturbing causes.

Statement showing mean strength, number of sick, and principal diseases at Fort Wadsworth, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	207.25	326	.....	27	34	7	9	14	4	40	4
1869	103.16	86	1	21	1	.....	2	2	.....	19	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT RANSOM, DAKOTA TERRITORY.

REPORT OF ASSISTANT SURGEON C. E. MUNN, UNITED STATES ARMY.

Fort Ransom is situated on the Cheyenne River, about seventy-five miles above its junction with the Red River of the North. Bear's Den Hillock, an exceptional elevation to the surrounding prairie country, at the foot of which the post is built, is differently located on three maps published by authority of the War Department. The mean of the position given by these maps is nearest latitude 46° 35' north, longitude 97° 47' west from Greenwich.

The surrounding country to the south and east is gently rolling prairie. To the north and west, immediately behind the post, the land rises abruptly into a chain of sand-hills, the highest of which has given the name to this locality. The Cheyenne River winds through a beautiful valley within half a mile of the fort, rendering the scenery remarkable by contrasting a broad belt of well-wooded bottom land with boldly sloping banks of treeless prairie. The stream approaches the post from the north, and at its nearest point makes a sudden bend to the east, which general direction it then pursues through the reservation. Its average depth is eighteen inches, though frequently it is found to be five or six feet deep above obstructed points. Near the fort it is from eighteen to thirty feet in width, and flows with a moderate current. To the west and north, between the post and the hillock, is a ravine which divides the hills from the prairie. Near the head of this ravine are numerous springs, the more important of which have been improved for the use of the garrison. About three miles south from the post a depression from the ordinary prairie level occurs, which receives the waters from the melting snows, forming a small lake in the spring. On this low land abundance of hay may be cut to supply all prospective wants of the Government animals. The soil of the post is a light porous alluvium, with a stratum of cobble stones at a depth of from one to two feet beneath; they are bedded in and underlaid by fine gravel. This insures a rapid absorption of the rain-fall, and practical experience in the company gardens has demonstrated their susceptibility for successful cultivation. Limestone and clay are found, which will prove useful for building purposes. Lime has been made at the post already, in considerable quantity.

There are in the vicinity of the post numerous mounds, which appear to be of ancient and artificial origin; none of them have yet been opened for examination.

The soil of the vicinity is good, and most garden plants of the isothermal of 45° can be suc-

cessfully cultivated. The river valley has a fair growth of timber, mostly scrub oak and elm. Maple, ash, iron wood, wild cherry, plum, and willows are also found.

Among the wild animals found in the vicinity of Fort Ransom are the black bear, grizzly bear, common otter, little black mink, common mink, little ermine, white weasel, common badger, gray, red, black, and silver foxes, gray wolf, beaver, muskrat, rabbit, deer, antelope, and buffalo. The principal game birds are wild pigeons, plover, snipe, wood duck, brant, and wild geese.

The average temperature for the year 1869 was 38.36°. Extremes 103° F. and -27° F. February 19th, 1870, the thermometer fell to -32°. Total rain and snow-fall, 15.77 inches.

Ten miles square is held reserved. June 17, 1867, a battalion of the Tenth United States Infantry, consisting of Companies G and H, commanded by Brevet Major George H. Crosman, Captain Tenth United States Infantry, arrived at Bear's Den Hillock from Fort Wadsworth, and encamped near the present site of the post. Some days previously General Terry, commanding the Department of Dakota, had arrived and selected a location for a new post. In special field orders No. 2, dated June 18, 1867, he commanded Major Crosman to construct temporary quarters and other necessary buildings for his men and animals, assigning to him the command and directing the post to be named Fort Ransom. In accordance with instructions, work on an inclosing breastwork was first commenced and finished in August. Abundance of oak timber being found near the post, logs were exclusively used for the walls of all the structures. These buildings are arranged in a hollow square within an earth breastwork, 350 by 400 feet, and, with the exception of two, are of one story. The quarters of the men are under one roof on the north side of the square, and are divided into four large and two small rooms, the latter being used as quarters for first sergeants. The squad-rooms are 29 by 23 by 8½ feet, and are ventilated naturally, and by a small trap in each ceiling. There is no ventilation under the floor. The quarters are warmed by box-stoves, and each squad-room has three windows. The kitchens are attached, and are uniformly clean and wholesome.

The other buildings at the post in different stages of completion are store-houses for quartermaster and commissary, quarters for married men, granary, bakery, office for commandant and adjutant, stables for public stock, and the magazine. All these are inside the earthwork, and are kept well policed. Quarters for the Indian scouts are outside the inclosure, and consist of two small temporary structures. The commanding officer occupies a two-story house of hewn logs, with four rooms on the ground floor, and two chambers. The quarters for the captain commanding the second company are essentially the same, but at present are not so near completion; while those for the other officers are under one roof, in a building 150 feet long and 35 feet wide, divided by partitions and spaces into five sets of quarters, three single and two double sets, each set containing two rooms about 16 feet square and 8 feet high. The double sets have four similar rooms, divided by a space, 5 feet wide, which serves for an entry. Each room is well lighted by two windows, and most of them are lathed and plastered. But two sets of the lieutenants' quarters are yet painted. There are two serious defects in these otherwise pleasant and roomy quarters, viz., absence of ventilation beneath the floor, and the position of privies, these last having been placed immediately in the rear of the quarters against the building.

The guard-house is 30 by 20 by 10 feet, and is divided into a main room and two cells. One of these cells, 10 feet square, is seldom used. It is constructed solely with a view to severe punishment, and, when the door is tightly closed, is absolutely without light or ventilation. The guard-room is warmed by a stove, and lighted by one window. The building has always been well policed.

The hospital building is still unfinished. It consists of a main building, 37 by 32 feet, and an addition, 20 by 18 by 8 feet; a dispensary, 18 by 12 by 8 feet, kitchen, dining-room, and nurses' room. One ward, 24 by 18 by 9 feet, lathed and plastered, contains six beds, with an air space of 648 cubic feet per man; no ventilation, except by doors and windows; no bath-room, wash-room, nor water-closet. An ordinary privy is situated 20 yards distant from the building. The addition is neatly fitted up with shelves for use as a store-room, and may be used also as a ward for contagious diseases. This store-room is the only finished room in the building, the others being unceiled. In its unfinished state, the hospital building is totally unfit for the accommodation of the sick in the colder season, at which time the thermometer frequently indicates

the freezing point when suspended in the ward a few feet from a good fire. By an order discharging citizen employes its erection was stopped, and the post commander, though fully conscious of the importance and urgent necessity of the work, expressed his entire inability to furnish skilled men, by reason of the depleted condition of the companies. The magazine is built of stone, the only structure of this material at the post. The post bakery has an oven capacity for 240 loaves. It is a model of cleanliness and order, and produces bread of an excellent quality. The stable at the post measures 174 by 31 feet, and is 10 feet high.

The water supply is from a fine spring 600 yards from the post. A partial examination showed it clear, without odor and tasteless, containing total solids, 14 grains per gallon; volatile solids, 4 grains per gallon, chlorine 2.5, organic matter in an extremely small, and lime in large amount. The gradual slope of the ground from the post makes thorough drainage comparatively easy, though this advantage is as yet unimproved. In summer the enlisted men frequently bathe in the river. There are no arrangements for bathing in winter. Situated outside the breastworks, and about 75 yards distant from the men's quarters, is the men's sink. There are 8 acres of land at this post appropriated for garden purposes, each company cultivating about three acres, and the remainder giving gardens to the hospital and officers. The soil is fertile and susceptible of high cultivation. Some potatoes have been raised, but the main crop of vegetables has been destroyed by grasshoppers, which come in clouds from the northwest, and in a few hours destroy the entire garden. There are no cows at the post. One has usually been kept for the hospital, but was lost on the prairie in October, 1868. The character of food procured from the post commissary is of good quality, sufficient in quantity, and of fair variety. The nearest point to purchase furniture is at St. Cloud, Minnesota. A certain amount of rude furniture for barracks and quarters has been made at the post.

The medical and hospital supplies are received from St. Louis, Missouri. Owing probably to so long and difficult transportation these supplies are seldom received in other than a damaged condition. Communication is had by quartermaster teams to Fort Abercrombie, Dakota Territory, and by tri-weekly coach thence to St. Cloud, Minnesota. In winter the route from here to Abercrombie is especially dangerous from storms, and in spring communication is often stopped by floods on the Wild Rice River. The weekly mail, on horseback, via Abercrombie, is often interrupted, as above, and requires about eight days to reach St. Paul, Minnesota.

The inhabitants of the surrounding country are principally Sioux Indians, though but few lodges winter here. A few Dakotas, mostly Sisseton and Wahpetons, remain about the post. Their disposition seems friendly, and some are willing to work; the majority, however, hunt and trap.

The prevailing diseases at the post and vicinity are principally catarrhal. One-fourth of the sickness reported has been from slight accidents, until the new command, coming from Louisiana, brought with them a great number of cases of intermittent fever. Cases of phthisis pulmonalis are frequent among the resident Dakotas.

Statement showing mean strength, number of sick, and principal diseases at Fort Ransom, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Venereal diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	99, 16	119	6	14	2	.....	4	7	28	.....
1869.....	73, 66	194	11	24	11	9	14	11	61	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT TOTTEN, DAKOTA TERRITORY.

REPORT OF ACTING ASSISTANT SURGEON J. F. BOUGHTER, UNITED STATES ARMY.

Fort Totten is situated on the south side of Lake Minnewaken, (commonly called Devil's Lake,) about 900 yards from the lake shore. Latitude $47^{\circ} 59' 6''$ north, longitude $98^{\circ} 54'$ west, and 1,480 feet above the sea. Cheyenne River, the only stream in the vicinity, is six miles south. Turtle Mountain, an isolated group of hills covered with timber, said to be a resort of tribes of hostile Indians, lies about 70 miles northwest of the post near the British frontier. Fort Stevenson is distant 126 miles south of west and Fort Abercrombie 165 miles southeast. The nearest towns are St. Joseph and Pembina, the former 100 miles distant by road, the latter about 130 miles. About ten miles square is held reserved. The country in the vicinity of the post is rolling and well wooded, oak, ash, elm, poplar and maple being the principal trees. The soil is loam, on a bed of sand and gravel, superimposed on clay, and is suited for cultivation. Many granite boulders, some of great size, are scattered over the neighboring hills and valleys.

Devil's Lake is about forty-five or fifty miles in length, and from five to fifteen miles in width, dotted with a great number of islands, several of which are more than two miles long, all well timbered. No streams enter or leave the lake, hence the inference that it is fed by springs. Its waters, though salt, are much less so than those of the ocean. Its principal salts appear to be chloride of sodium, and sulphate and carbonate of soda, with lime and magnesium salts. The specific gravity is about 1004.

The principal wild animals of the vicinity are the wild cat, wolf, red fox, kit fox, white weasel, mink, otter, badger, black bear, squirrels, beavers, muskrats, and rabbits. The moose, caribou or reindeer, and American elk, are rapidly disappearing from this vicinity. Antelope and buffalo, as late as 1865, were numerous, but now have almost entirely disappeared.

Of birds the following are the most important: Turkey buzzard, duck hawk or peregrine falcon, sparrow hawk, red-tailed hawk, American fish-hawk or osprey, great-horned owl, mottled or screech owl, snowy or white owl, wild pigeon, sharp-tailed grouse, sand-hill crane, great blue heron, bittern or stake driver, killdeer, western plover, black-bellied plover, long-billed curlew, mud hen, common rail hen, American swan, trumpeter swan, snow goose, Canada or wild goose, brant goose, mallard duck, black duck, green-winged teal, blue-winged teal, shoveler or spoonbill, summer or wood duck, red-head duck, butter-ball or dipper duck, and it is said that the canvas-back duck has been seen on Devil's Lake.

Of fish the common pickerel (*Esox reticulatus*) is the only species observed in Lake Minnewaken.

The climate is very dry. Sudden changes of temperature are common, (a difference of 35° to 40° in twenty-four hours is not unusual,) but do not appear to affect the health as in climates where the atmosphere is more humid. The air is pure and bracing. The contrasts of the seasons are well marked, *i. e.*, the range of temperature between the extremes is very considerable, *viz.*, 132°F . The mean temperature (from August 1, 1869, to April 30, 1870) is 37.80°F .; extremes 94°F ., August 8, 1869, and -38°F ., February 19, 1870. The average dew-point for the month of August, 1869, was 54.51°F .; September, 1869, 43.74°F .; October, 1869, 27.24°F .; November, 1869, 19.42°F .; and of April, 1870, 34.06°F . The rain-fall during the same period (*i. e.*, nine months) was 3.80 inches; quantity of snow 1.84 inch. Owing to the difficulty in collecting the snow, on account of the high winds during the winter, the above quantity (1.84 inch) perhaps represents a little less than the actual quantity.

The prevailing winds during the cold season, and for a greater portion of the year, are from the north and west; south and southwesterly winds prevail during the warm season. Northwest winds in winter bring snow-storms and very cold weather; in summer, sometimes rain and cool weather. The winds at all seasons of the year blow with considerable force. Winter is the longest of the seasons, and may be regarded as commencing November 1, and ending March 31, although light falls of snow occur in both October and April. Vegetation first appears in April, and is killed by the heavy frosts of October.

The site was first occupied as a military post in July, 1867. The original fort was designed to be temporary, the buildings being constructed of rough logs, to be occupied only until suitable structures could be erected for a permanent post. The present fort is still in process of completion and is situated on a comparatively level tract of prairie, about 800 yards south of the old temporary post established by General Terry. Owing to the unfinished state of many of the buildings, the old fort is still occupied in part. It stands on a small hill close to, and about 50 feet above, the level of the lake. It is 200 yards long, by 100 yards wide, and is surrounded by a stockade, 18 feet in height. The buildings forming the garrison having been originally intended only for winter quarters, and hastily erected, are necessarily very defective in some respects, are in a very bad state of repair, and unfit to live in.

The new post, when completed, will comprise twenty buildings, forming a parallelogram, and so arranged that the post is defensible without a heavy stockade, which tends to obstruct ventilation and demoralize the troops. The arrangement is shown in Figure 50.

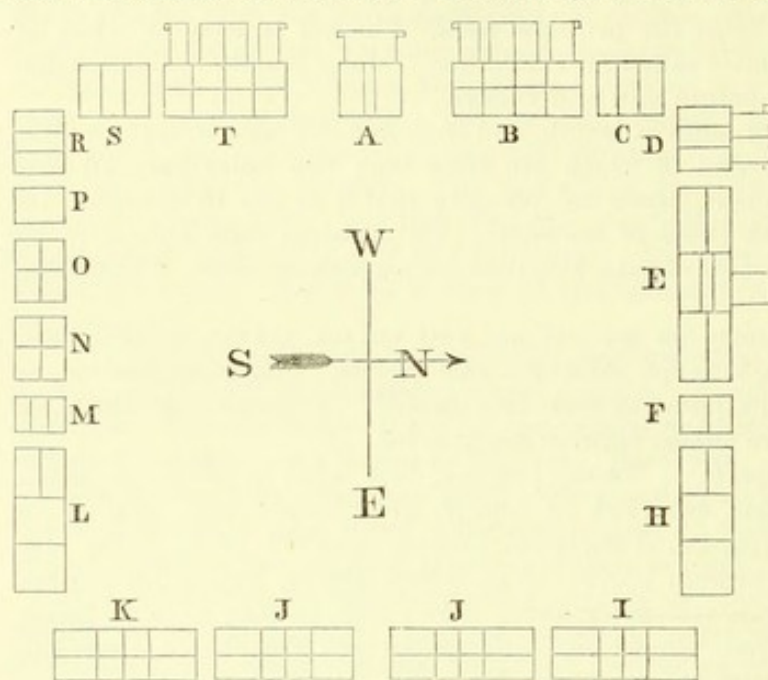


Figure 50.—Scale, 144 feet to 1 inch.

A B C D S T, officers' quarters; E, hospital; F and M, magazines; H, quartermaster's store-house; I J J K, company quarters; L, commissary store-house; N, workshops; O, offices; P, school and court-martial room; R, company offices.

The foundations of the buildings are of boulders, rocks, &c., found on the lake shore; the brick were made at the post. The exterior walls have an air-chamber of $2\frac{1}{2}$ inches in the clear, making the walls $15\frac{1}{2}$ inches thick. The interior and gable walls are 9 inches thick. This description of the masonry and brick-work is applicable to all the buildings. The company quarters are alike in dimensions, finish, &c. The buildings are 98 feet long by 32 feet wide, two stories high, the first story 11 feet,

and the second story 10 feet in the clear from floor to ceiling. The entrance is from the outside into a hall, and thence to the rooms of the men. Two flights of stairs in each hall conduct to the upper hall leading into the rooms as below. The ventilation of the buildings is as follows: To provide for fresh air there is an air-duct under the floor of each compartment leading through the walls to the outside of the building, with an iron register fitted into the center of the floor and communicating therewith; these ducts are 8 by 10 inches in dimensions, and the outside openings are covered with wire screens. The smoke flues (two in number) for the second stories are continued to the first story, and have openings in the wall near the ceiling fitted with a register communicating with each flue, and fitted with registers placed in the walls of the second story—one near the floor, the other near the ceiling. These quarters are heated by stoves and well lighted by large windows. The compartments on the lower floor, each 30 by 30 feet, have each a capacity of 6,600 cubic feet; those of the upper story, 30 by 20 feet, have 6,000 cubic feet; giving a total capacity in each building of 50,400 cubic feet. The bunks are of wood, painted; each accommodates two men. One sink for each company is situated fifty yards in rear of the barracks, and consists of a deep ditch, sheltered by log buildings. Each company has a kitchen and mess-room in a large log building in the rear of the barracks. At present, but one of these buildings is occupied by the enlisted men, the others being used as quarters for officers, adjutant, commissary, and quartermaster's offices, hospital, and dispensary. The log houses at the old fort, formerly quarters for officers of the command, are now occupied by laundresses and married soldiers.

The commanding officer's quarters is a two-story brick building, 41 feet front by 32 feet deep,

with a one-story wing to the rear. To the left of these quarters is one set of quarters for two captains and two lieutenants. These two buildings are finished and occupied. The main portion of the commanding officer's quarters contains two large rooms on the first floor, and four rooms on the second floor, divided on both floors by halls running from front to rear. The wing contains the kitchen and dining-room, a cellar beneath, with a place for a cistern. The floors in this building are laid double, of one-inch boards, and the principal rooms and halls on the first floor have two coats of mortar and hard-finish. The captains' and lieutenants' quarters, referred to above, consist of a building 90 feet long by 32 feet wide, and two stories high. Each set of quarters consists of two rooms on the first floor, and two on the second floor, with a small hall-room or pantry. The rear wings of this building have each a dining-room and a kitchen, with a cellar beneath. A cistern is to be placed under the dining-room. The water-closets are attached to the wings; they are separated from the cellar under the kitchen only by a wall, 18 inches thick, constructed of stone and lime. The close proximity of the privy to a wall that in time may become permeable appears to be objectionable, as it may at some future day prove a source of annoyance; it is understood, however, that it is the intention to have the privies drained. The rear wings of the center building are built under one roof; those of the outer quarters are separate wings. These buildings are heated by means of stoves, and are well lighted by windows. Their ventilation is effected as described for the company quarters. The quartermaster's and commissary's store-houses are finished and occupied. Each is 100 by 30 feet, and divided into three rooms, with a fire-proof wall between each room, to be entered from the outside only; one room in each building has a cellar underneath. These buildings can be driven around and through, and have lofts for storing light and dry articles. A small log building, located on the south flank of the post, is used as a temporary guard-house; it consists of a room for the guard, 12 by 14 feet, and one for prisoners, 14 by 16 feet; each room, 10 feet from floor to roof. The ventilation, warming, and lighting of the guard-house are good. A new guard-house has been ordered to be built, for the plan of which see Figure 51.

1, section of end.—A B, ground line. 2, ground floor.—C, prison-room, 34 by 15 feet; D, hall, 5 feet wide; E, cells, 8 by 6 feet; F, guard-room, 30 by 20 feet; H H, cold-air box for ventilation; the rooms are 10 feet high.

The new hospital, it was thought, would be completed during the season (1869) just past. The foundation walls and a portion of the brick walls had been finished, but the lateness of the season, inclemency of the weather, together with a partial destruction of the already built walls during severe high winds, combined to prevent its completion. It is the first building to be finished the coming season, and it is probable may be ready for occupancy by June. The plan is in accordance with that from the Surgeon General's Office, Circular No. 4, dated April 27, 1867. The dormitories in one of the completed barracks are temporarily occupied as a hospital; the apartment used as ward is on the second floor, and has a capacity of 6,000 cubic feet, giving each bed a superficial area of 75 feet, and air space of 750 cubic feet.

There is a post library, containing 200 volumes.

The command is at present using water brought from a spring about a quarter of a mile from the old fort. This water is clear and of agreeable taste; it is hard, and contains lime, chloride of sodium, carbonates of soda and magnesia, and organic matter in very small amount. There are numerous springs in the vicinity, but the water from them is very hard. Cisterns have been built

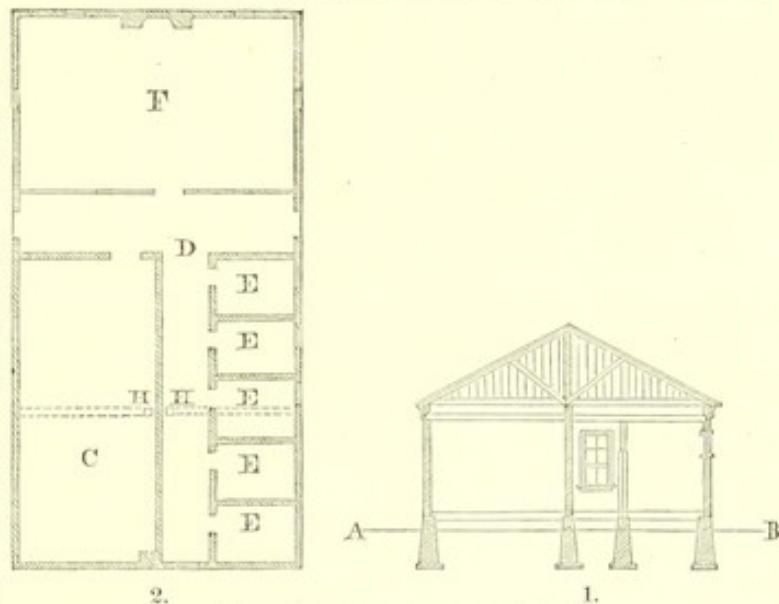


Figure 51.—Scale, 24 feet to 1 inch.

under the center compartment of the quartermaster and commissary store-houses, having a capacity of 400 barrels each; also under the ends of one of the finished company barracks. It is designed to place similar cisterns under each of the barracks to be erected. The drainage of the new fort will be effected by means of grading, the ground gently sloping from the outside, on the north, east, and south sides; on the west side, or in the rear of the officers' quarters, the ground is more level. A post garden was attempted last year, but the grasshoppers destroyed the crop.

The nearest supply depots are at St. Paul, Minnesota, 395 miles distant. The route of supply is, at present, by the Missouri River to Fort Stevenson, thence by wagon road. The overland route is considered the best. The river route, though not so certain and expeditious, is cheaper, although but very little—not enough to pay the risk of loss on the river, together with damage and wastage, which are great. Twelve months' supply is usually kept on hand at the post. The means of communication are by wagons to Fort Abercrombie, and thence by stage. There is a weekly mail. Time to department headquarters, eight to ten days.

The inhabitants of the vicinity comprise half-breeds and Indians—of the former about sixty. They are Cree and Chippewa half-breeds. In winter they cut wood for the contractors, and during the summer they hunt far to the west; they are very quiet and peaceable, giving no trouble; generally very poor, and suffer during the winter for the want of food. The Indians number five-hundred and twenty on the reservation; they are Sissetons generally, with the exception of eighteen or twenty Wahpetons, (Sioux;) they are quiet, and well behaved and industrious; last season cultivating thirty-five acres of land, using axes and hoes made of roots and elk-horns. They suffered severely last winter for the want of food.

Statement showing mean strength, number of sick, and principal diseases at Fort Totten, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Phtisis.	Catarrhal affections.*	No. of deaths.
1868	277.83	688	2	22	91	18	49	79	50	.....	66	2
1869	136.25	230	.....	7	42	4	20	4	15	1	54	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT RANDALL, DAKOTA TERRITORY.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS G. P. HACKENBERG AND A. I. COMFORT, UNITED STATES ARMY.

Fort Randall is situated on the right bank of the Missouri River, latitude $43^{\circ} 1'$ north, longitude $98^{\circ} 12'$ west; altitude above the river, 50 feet; above the sea, 1,245 feet. The post was established by General Harney in 1856, and was named after Surgeon B. Randall, United States Army, now retired. From the river bottom the land rises by successive plateaux for about two miles, when it becomes hilly. Beyond the hills it spreads out into prairie. Masses of a soft, impure carbonate of lime rise like walls from the borders of the first terrace. The stone is easily cut, but is unfit for building purposes. Limestone fit for the kiln is found within three miles. The soil of the bottom lands is a stratified alluvium, generally fertile. The prairie is dry and unproductive. The climate is dry, uniformly cold in winter, with frequent snow-storms. The average temperature for the year ending June 30, 1870, was 47.33° F.; the extremes were 104° F. and -17° F. The amount of rain and snow-fall for the period above mentioned was 18.42 inches. The winds are strong and continuous. The plateau on which the post is built is about a quarter of a mile from the river, which, at this point, is about the same distance wide.

Five buildings are used as barracks. Four of these are of hewn logs of the style known as "billet" or French log houses. These were brought from Fort Lookout in 1857. They stand on rotten piles, and the joists and sills are much decayed. The fifth set is of unhewn logs. These buildings measure 93 by 22½ feet, and 10½ feet to the eaves. Each set of quarters is intended for fifty men, giving 261 cubic feet air space per man. The officers' quarters are nine one-story buildings, three frame, and six log. The log quarters are lined and ceiled with boards. The commissary and quartermaster's store-houses are conveniently located, and are appropriate for the several uses to which they are assigned. The guard-house is 50 by 20 feet, and 10 feet high, divided into guard-room, prison-room, and three cells.

The hospital is a substantial building of hewn logs, constructed in 1857. It consists of a main building, 100 by 21 feet, which is divided into five rooms, 19 by 19 feet, and 9 feet high, the three central being used as wards, and the end rooms as steward's quarters and dispensary; and two wings, each 19 by 19 feet, one used as a store-room, the other as dining-room and kitchen. A piazza, 10 feet wide, runs along the front and rear of the building.

The post library contains nearly 300 volumes. It is patronized liberally by the enlisted men. The authors most read are Dickens, Charles Reade, Muhlbach, Marryatt, Wilkie Collins, and Cooper. There are no works on science. Appleton's Encyclopedia has scarcely been referred to. Prescott's works, the only ones on history, have been read by one man. Works of travel and geography are read to some extent. The works of Lewis and Clark, and of Collins and Schoolcraft, are much needed in the library of every frontier post in the Indian Territory.

There are no arrangements for bathing at the post.

During the summer months there is irregular communication by steamboat with Yankton, Sioux City, and other points. There is communication by stage during the entire year with the above-named places, occasionally interrupted by snow storms and swollen streams. Letters from this post reach department headquarters in seven or eight days.

Opposite the post, and three miles above, are 210 lodges of Indians. They are peaceable and well disposed, so long as subsisted on their annuities.

The diseases most common in this vicinity are of the bowels in summer, and of the lungs in winter. The prevalence of pneumonia at Fort Randall during the winter of 1869-70 may be attributable to the following causes: First. The over-crowding of unacclimated troops into ill ventilated quarters, with insufficient air space, (130 cubic feet per man.) Second. Want of uniformity of temperature of the apartments which, by day, sometimes reaches 90° F., and by night falls below the freezing point. Third. Insufficient clothing worn about the chest, often only a flannel blouse (unbuttoned) and a coarse merino shirt. Fourth. Decomposition of the logs of which the barracks are built. Several cases of phthisis have been developed under my observation about the months of February and March.

Statement showing mean strength, number of sick, and principal diseases at Fort Randall, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	104.25	431	1	26	74	4	14	1	34	.....	115	.....
1869	100.25	169	.....	4	12	1	9	.....	5	1	72	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT SULLY, DAKOTA TERRITORY.

REPORTS OF SURGEON C. C. GRAY AND SURGEON J. P. WRIGHT, UNITED STATES ARMY.

Fort Sully is situated on the east bank of the Missouri River, twenty miles below the mouth of Cheyenne River; latitude $44^{\circ} 30'$ north, longitude $100^{\circ} 50'$ west, at an elevation above the sea of about 2,000 feet. The nearest town is Yancton, 300 miles below by river. The nearest posts are Fort Randall, 200 miles below, and Fort Rice, about the same distance above. The post is about half way between the head of navigation (Fort Benton) and the mouth of the Missouri, and is 1,480 miles above St. Louis. It is built on the "third terrace," a level plateau, 160 feet above low-water mark, and about the same distance below the summit level proper. On the south the surface slopes rapidly into a deep ravine, dry, except in early spring. On the west the descent is abrupt to the second terrace, a strip one hundred yards wide, on which are the stables, granary, saw-mill, smithy, interpreter's house, tavern, &c. Still further below is the river bottom, of varying width, frequently subject to overflow, moderately well timbered and very fertile. Here the company and hospital gardens are situated.

The construction of the present post was begun in August, 1866. The original post of the same name was established by General Alfred Sully in the fall of 1863, and was situated on the same side of the river, thirty miles below. It was abandoned because of the unhealthy character of the site. During the winter succeeding the arrival of the troops at the present site, their labors were severe, and the only quarters were such as could be constructed of slabs and shelter tents. The barracks for the men were completed early in 1867, and soon after the post hospital and store-houses were occupied. The officers' quarters were not completed until 1868.

The reservation includes about 27,000 acres. The geological formation belongs to the cretaceous period, which is that of the entire region of the Upper Missouri. It is overlaid from the mouth of the Yellowstone by a layer of modified drift, containing boulders of large size, principally of granite and syenite. The soil is fertile, but the extreme drought of mid-summer and the intense heat suspend vegetable growth to a great extent. During the spring and early summer the grazing is excellent, and during the winter cattle graze on the dried grass with evident relish and advantage. A few of the more common trees are the cottonwood, buttonwood, white and scrub oaks, ash, red cedar, willows, yellow and red plums, the hackberry, chokeberry, Juneberry, and wild cherry. Among shrubs, vines, herbs, &c., are found wild roses, wild currants, the bull or buffalo berry, elder, frost grape, poison oak, honeysuckle, pea vine, pomme blanche, tower and hedge mustard, artichokes, winter and water cresses, horse and spear mint, catnip, Turk's cap, and Canadian garlic. Some of the more important animals are the buffalo, elk, antelope, common and black-tail deer, Rocky Mountain sheep, grizzly and brown bears, the American lion or cougar, white, gray, and prairie wolves, beaver, common and white weasels, foxes, the otter, mink, badger, rabbit, hare, lynx, Canada porcupine, prairie dog, and small marmot. Some of the birds are the swan, wild goose, brant, mallard, teal, and wood duck, the pelican, gull, colored and white cranes, green-legged and killdeer plover, the sand piper, snipe, curlew, grouse, passenger pigeon, sparrow hawk, buzzard, snow and common owls, the swallow, cedar bird, sand martin, and the bald eagle. Among reptiles are the rattlesnake, moccasin, black snake, frog, and common and tree toads.

The cottonwood greatly outnumbers all other trees in this vicinity, and is of prime importance to both native and sojourner. It is the sole reliance of this country for fuel and lumber, serving in the latter case, however, but an indifferent purpose. Red cedar, though scarce, is obtained in sufficient quantity for special purposes. The wild plum and grape, the service berry, and berries of the species *ribes*, are abundant in their season. The fruit styled "buffalo or bull berry" is abundant in autumn; and an esculent root called "pomme blanche" is much used in early spring, and highly esteemed by the natives. No cultivated fruit grows here. There are no trees nor shrubs in the immediate vicinity of the post.

Of the carnivorous mammalia, the small wild cat and several of the varieties of wolf and fox are quite numerous. The cougar and grizzly bear, though very rare, may be claimed for this

country. Of the ruminants, antelope and common deer abound. Immense herds of buffalo have been seen here within eight years. Since the post has been established only an occasional stray bull has been observed in the vicinity. Beaver are numerous. Of the birds, those most interesting to the sportsman, and which are sufficiently numerous, are the pinnated grouse, wild goose, duck, plover, snipe, and curlew. (The varieties of duck are very numerous.) Of the venomous reptiles the rattlesnake and moccasin are the most frequently met with. No cases of snake-bite have occurred.

The range of temperature is great, from 106° F. to -40° F., the average for the year being about 45° F.

The post is intended for four companies. The men's quarters consist of two buildings, each 350 feet long by 17 feet wide, placed end to end, with an interval of 15 feet, which forms the sally-port. They are built of cottonwood logs, covered with pine siding, are lathed and plastered, the ceilings being 12 feet high. Transverse partitions divide the buildings into dormitories, mess-rooms, kitchens, &c. The squad-rooms measure 20 by 17 feet, are intended for 16 men each, allowing about 255 cubic feet air space per man. The experiment was tried for one company of removing the partitions and throwing the small rooms into one, but it was thought that this weakened the building too much. There are no wash or bath-rooms. Ablution must be performed out of doors. It is in contemplation to build a piazza for each building. The dormitories are fitted with rough wooden double bunks in two tiers. The privies, ordinary earth latrines, are 75 yards distant. The ventilation of the barracks is very defective. There are three sets of laundresses' quarters, in a large one-story house similar to the officers' quarters.

For officers' quarters there are nine detached frame buildings, built of pine, on brick foundations, with cellars underneath. Each set has a back building of one story, as a kitchen. All the rooms are lathed and plastered. Three of the houses are one and a half stories high, and contain each four rooms, a hall, store-room, and pantry. Two cottages are of one story, while two others, of one and a half stories, are divided each into two sets of quarters of four rooms. None of these quarters have bath-rooms. The guard and prison-rooms are in the ends of the barrack building next the sally-port. The prisoners' room is 15 by 15 feet. The quartermaster's store-houses, two in number, measure 230 by 22 feet and 120 by 24 feet. The commissary's store-houses, also two in number, measure 228 by 17 feet and 50 by 22 feet.

The hospital is located near the brink of the ravine, to the south of the post. The dimensions and general arrangement are shown in Figure 52.

A, ward; B, bath-room, 8 by $15\frac{1}{2}$ feet; D, dispensary, $15\frac{1}{2}$ by $16\frac{3}{4}$ feet; E, steward's room, 15 by $15\frac{1}{2}$ feet; K, kitchen, 14 by $15\frac{1}{2}$ feet; M, mess-room, 14 by $15\frac{1}{2}$ feet; O, office, $15\frac{1}{2}$ by $15\frac{1}{2}$ feet; P, piazza, 8 feet wide; S, store-room, $15\frac{1}{2}$ by $20\frac{1}{2}$ feet. The ward is intended for twelve beds, allowing 810 cubic feet air space to each. The dispensary is dark, and the general arrangement is bad. Although there is a bath-room, water cannot be obtained for bathing.

There is a good library of about 800 volumes at the post.

The labor of supplying the post with water is great. There are no springs, wells, or cisterns, and two eight-mule teams are constantly employed in hauling water from the river, the nearest available point for this purpose being one mile distant. The hospital has been restricted to the amount absolutely required for cooking and for the laundry, with the smallest possible amount for ablution. It seems impracticable to procure water from wells, and even if thus obtained, it would be unfit for use, because of impregnation with saline matters. The cost of establishing a permanent and sufficient water supply has been officially estimated at \$13,500, not including cost of transportation of materials. The natural drainage of the post is excellent, and requires little artificial aid. The garden includes about nine acres. Owing to drought and insects, especially grasshoppers, the crop cannot be depended

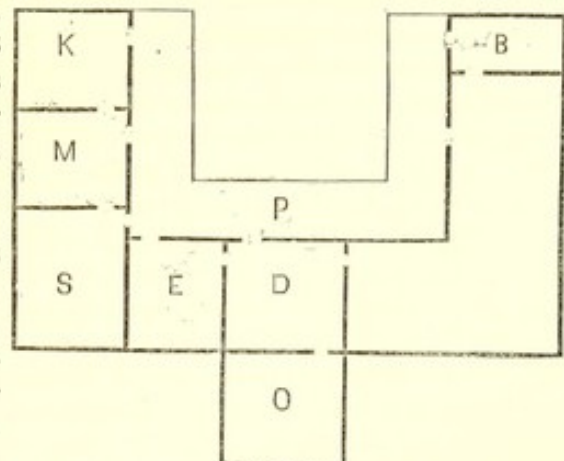


Figure 52.—Scale, $29\frac{1}{2}$ feet to 1 inch.

upon, although sometimes the yield is fair. The supply of ice is ample, being obtained from the river, and stored in blocks 18 inches thick. Officers generally keep their own cows and poultry.

Mail wagons run from Sioux City to this point during the entire year, leaving Sioux City on Friday and reaching the post the following Thursday. This means of communication is regular, but liable to interruption in winter from snow. It is almost impracticable for passenger travel, the wagons being open, and there being no stopping places at night. The river is navigable from April till October. Time from Sioux City by boat is from 8 to 16 days. There are no inhabitants in the vicinity, except Indians. Some of these have turned to cultivating the soil, and have raised good crops of corn.

The sanitary condition of the post is fair, no diseases occurring that can be fairly charged to locality.

Statement showing mean strength, number of sick, and principal diseases at Fort Sully, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	264.5	118	3	13	8	5	3	7	10	.....
1869.....	173.91	272	.....	72	8	17	.....	15	64	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT RICE, DAKOTA TERRITORY.

REPORT OF ASSISTANT SURGEON WASHINGTON MATTHEWS, UNITED STATES ARMY.

Fort Rice is located in latitude $46^{\circ} 40'$ north, longitude from Greenwich $100^{\circ} 30'$ west, on the right bank of the Missouri River. Owing to the inconstancy of the channel of the river, and other causes, the distances between different places on its banks are with difficulty estimated; hence the position of Fort Rice, with regard to other points on the river, is not well ascertained, and is laid down variously by different authorities. The distance from St. Louis, as given in the report of Colonel D. B. Sackett, in 1866, is 1,810 miles, but navigators on the river reckon it as high as 1,846 and 1,850 miles. To Sioux City, the nearest railway terminus, it is about 836 miles; to the mouth of the Cannonball, the nearest affluent of size below, it is about 10 miles; and to the Hart River, the next good-sized stream above, the distance is estimated at 50 miles. Fort Sully, the neighboring military post, down the river, is supposed to be from 250 to 275 miles distant; and Fort Stevenson, the nearest garrison above, is perhaps 150 miles. The last two mentioned places are on the opposite side of the river. The ruins of old Fort Clarke, and of the village formerly occupied by the Gros Ventres and Mandans, is 120 miles above, on this side of the river. The military reservation at Fort Rice is taken from the lands of the Onkpapas, one of the tribes of the Sioux Nation. It has not yet been declared by the President, and there is no record at the post of the amount of land held reserved. The land is generally sterile, and sparsely timbered and watered. No crops have been raised, and it is doubtful if any can be. Various attempts at gardening have been made at the post by different commands, but never with any great degree of success. Drought is one of the chief difficulties, but not the only one—for what the drought spares, the grasshoppers are apt to devour. Some years there is a pretty fair rain-fall, and a scarcity of grasshoppers, but even the best years are not encouraging. In the bottom lands of the Missouri, where they are covered with timber and underwood, the soil is rich and rendered tolerably moist by percolation from the river, and because the melted snow and rain and water of overflows are retained long on the surface in consequence of the flatness and peculiar composition of the soil; and on these

bottoms, not many miles from the post, the Indians have cultivated for many years with fair success, and without irrigation, such plants as "squaw corn" and squash, which it seems the grasshoppers cannot easily destroy.

The timber of the country consists of cottonwood, elm, ash, and oak in limited quantities.

The principal wild animals of the vicinity are the elk, buffalo, black-tailed deer, long-tailed deer, mule-deer, antelope, beaver, panther, black bear, cinnamon bear, otter, large gray wolf, coyote, red fox, gray or silver fox, crossed fox, wild cat, badger, common mink, small black mink, and white-tailed weasel.

Of birds the following are the most important: Great horned owl, great snowy owl, bald eagle, gray eagle, war eagle, prairie hen, sand-hill crane, blue heron, meadow lark, wild pigeon, jack snipe, land snipe, curlew, robin red-breast, pelican, common wild duck, swan, and wild goose.

The climate is generally dry. The summers are short and hot; thermometer, 90° to 110° F. The winters are long and intensely cold; thermometer sometimes 40° F. below zero. The average temperature for the year is about 42° F. The amount of rain-fall was 6.28 inches; of snow, 2.29 inches, during the year 1869.

Fort Rice was established in 1864. The buildings of the post were erected by the Thirtieth regiment Wisconsin infantry, and consisted of rude huts of cottonwood logs, with roofs of poles and slabs covered with earth. During the year 1868 the fort was rebuilt, the old quarters demolished, and new buildings erected on the same sites. But one building of the old fort remains; this is occupied temporarily as officers' quarters. It is 60 feet long by 24 feet wide, and one and a half stories high, containing four sets of quarters. Exclusive of the kitchens, there are four rooms in each set, two on the first floor and two on the second floor.

Fort Rice is about 300 yards from the margin of the river, and at an elevation of 35 feet above low-water mark. It has the form of a quadrangle, 544 by 868 feet, inclosed by a stockade, 10 feet high, made of two-inch oak planks secured to a strong frame. There are two sally ports, and two projecting bastions, two stories high, built of squared and dove-tailed logs. The upper story is placed in such a manner on the lower that the corners of the former correspond to, and project over, the sides of the latter. On top is a platform and an octagonal sentry-box. Each story of the bastions is 20 feet 4 inches square and 7 feet high; the lower story projects 13 feet 3 inches beyond the walls of the fort. The new buildings within the stockade are as follows, viz: Five store-houses, four company quarters, seven sets of officers' quarters, a hospital, guard-house, bakery, offices, &c. These buildings surround the parade ground; each is parallel to the contiguous wall of the fort. The barrack on the extreme north approaches within 22 feet of the north wall of the fort; the most southerly of the four is 58 feet from the south wall, the post bakery standing between the one and the other. Between the contiguous ends of each pair of the barracks is an alley of 10 feet in width, which is considered sufficient to admit light to the windows that open upon it, and to retard the progress of a fire. These barracks, one story high, have balloon frames of good pine lumber; all the rest of the wood-work, except the finishing, is of cottonwood, sawed at the post. The frames are sheeted and weather-boarded outside, and well shingled; some of the apartments are ceiled with half-inch boards; the walls are lined between the studding with adobe. The buildings are laid upon good stone foundations or piers, which are banked with clay, to prevent the wind from entering through the floors. Each barrack consists of a main building and two L's or wings, extending at right-angles toward the stockade, within 15 feet of which they terminate. The building thus incloses on three sides a yard 60 by 50 feet. The main building is 90 feet long by 30 feet wide, and is occupied by a dormitory, office, and store-room. Each wing is 20 by 60 feet, and all apartments are 10 feet from floor to ceiling. One wing is divided into kitchen and mess-room; the other wing contains four rooms occupied as laundresses' quarters, company schools, &c. The barracks are well lighted by doors and windows, and warmed, in the colder seasons, by stoves. There is no special arrangement for ventilation. Each dormitory has an area of 30 by 74 feet, and an average air space of 480 cubic feet per man. The bunks are two tiers high and sufficient in number to accommodate fifty men in each dormitory. The sinks are outside the stockade. The barrack kitchens are sufficiently commodious. The mess-rooms are each about 44 by 22 feet. There are three new buildings, containing five sets of officers' quarters, completed, and four more, containing also five sets, erected but not completed; these are good balloon frame buildings.

The first three mentioned are neatly finished, and contain two double sets of quarters with garrets, and one single set without garret; a space of ten feet separates the buildings from each other. All of these quarters stand on good foundations of hewn rock, and have cellars under the kitchens. The occupied rooms are finished inside with lath and plaster, while the company quarters are not covered inside, and the partitions and ceilings are of cottonwood; in the former the floors are of planed and matched pine flooring; in the latter, of unplaned cottonwood; in the single set of officers' quarters, burned brick, a fair quality, made at the post, is used between the studding of the outside wall instead of adobe. The same article of brick is used in the chimneys. Each set of double quarters consists of a body and rear addition or wing. The body has an area of 46 by 30 feet; each half of it contains a hall, 7 by 30 feet; a sitting room, 15 by 15 feet, and a bed-room behind the sitting-room, 12 by 15 feet, all communicating with each other. There are also three closets, one under the staircase in the hall, and two included in the walls that separate the rooms. The extension in the rear is 26 by 30 feet; each half of this is divided into a dining-room, 13 by 15 feet, and a kitchen, 15 by 15 feet, and here again another staircase, with closet under it, leads to the garret.

In the single set of officers' quarters, the main building is 30 by 27 feet on the ground floor; the rear extension or wing, 18 by 30 feet; the former contains a hall, 6 by 20 feet, two front rooms, 15 feet square, and two rooms behind, 9 by 15 feet, with four closets arranged in the walls. The latter is partitioned off into a dining-room, 14 by 18 feet, a kitchen, 10 by 16 feet, a pantry, 4 by 8 feet, and a servants' room, 8 by 11 feet. The building for the headquarters of the post is frame, finished inside with lath and plaster, and painted outside. The five store-houses mentioned are substantial frame buildings, sheathed, sided and well roofed with cottonwood shingles. They are not yet ceiled or lined inside. Four of them are 20 by 90 feet, and 10 feet from floor to eaves. One of these, used as a commissary store-house and issuing room, is built over an excellent cellar which extends the whole length of the building. This cellar has stone walls 22 inches thick, is 7 feet deep, has a graded floor, and is continued 2 feet above ground, where it is lighted by four small windows. This cellar is used for storing potatoes and other subsistence stores which would be injured by exposure to extremes of temperature. The more westerly of the store-houses is built upon stout logs, about 12 inches in diameter, set perpendicularly in the ground and rising 2 feet above the surface, leaving thus a large air space between the ground and the floor of the building; each one of these supporting logs is surmounted by an inverted iron pan, rendering the building rat-proof.

The magazine is a substantial stone building, 24 by 33 feet on the outside, and 4 feet from the ground to the eaves. The roof is covered with sods, and from its summit projects a wooden ventilator, with over-lapping boards; in the walls also are two ventilating holes, about a foot above the ground, protected by curved iron spouts. The floor is nearly 2 feet below the level of the ground outside. The walls are 2 feet thick at the bottom, tapering up to 18 inches.

In the ravine, at a distance of less than an eighth of a mile from the fort, is a small steam saw-mill. At this mill was cut almost all the lumber used in the rebuilding of the post. A shingle-machine, lath, and cord-wood saw, have been attached to steam-power. All the shingles used in the rebuilding were sawed here.

The guard-house, situated within the stockade, is a temporary frame building, 20 by 40 feet, lined inside with cottonwood planks, lighted by seven windows, and entered by two doors in the south sides, one entering the guard-room, the other the sergeant's room. It is divided into a guard-room, 18 by 20 feet; a prison-room, 14 by 18 feet; three strong cells, each 3 by 4 feet, opening into it, and inclosed in the walls that divide it from the guard-room, and a room for the sergeant. The guard-house is warmed by stoves, and ventilated by doors and windows; the cells above described are dark and small; this guard-house is considered sufficient for the need of the post.

The post hospital is constructed on a nearly similar plan to that of the company quarters, but the dimensions are somewhat different, the body of the building being 90 by 24 feet, and the L's, 20 by 40 feet. It is built on a good rock foundation, which rises 2 feet above the surface of the ground, and is banked all around with clay. It is constructed of similar materials to those used in the barracks, except that the ward, dispensary, steward's-room, office, linen-room, and bath-room are floored with dressed pine, the other apartments with cottonwood. The dispensary, ward,

kitchen, steward's room, and mess-room are ceiled with half-inch cottonwood boards; the other apartments are as yet unceiled. It is designed to finish the hospital with lath and plaster as soon as practicable. The apartments are all 10 feet from the floor to the top of the wall. The dispensary is 13 by 14 feet. The ward is 63 by 24 feet, contains thirteen beds, and an air space of nearly 1,100 cubic feet to each. The wash-room adjoining the ward is supplied with a bath-tub, mirror, towels, basin, and other necessary articles. There are no water-closets for the special use of the hospital. The hospital is warmed by stoves, well lighted and ventilated.

The post bakery is a good frame house on a solid foundation, lined with adobe and ceiled with plank. Its dimensions are 45 feet 8 inches by 20 feet 5 inches, and 10 feet from floor to ceiling. The oven has the capacity for baking 1,500 rations of bread in twenty-four hours; but 300 rations per day is about the average product.

The corral, situated outside of the fort, is a somewhat irregular inclosure, about 325 feet square, having buildings arranged around in such a manner that their exterior sides form part of the walls of the inclosure; the remainder of the walls being of long poles or logs set upright. A fine frame store-house, 18 by 130 feet, laid on a very substantial foundation, and used as a granary, is the only new building in the inclosure. Except this house, all parts of the corral building and palisades are to be torn down, and their places supplied with new structures.

There are two ice-houses built of logs; one 18 feet square, the other 28 by 30 feet. The capacity of these two houses is estimated at one hundred and fifty tons; here, throughout the entire summer, ice is kept in excellent condition.

The only drinking water used at the post is obtained from the Missouri River, and is the best to be procured in the country; it is brought around daily by the water-wagon, and allowed to stand in barrels until it settles, when it is tolerably clear and quite pleasant to drink. Many believe the water to be injurious. A large amount of foreign constituents are no doubt held in solution or suspension, as no water can possibly be more turbid, particularly in the spring; but they are nearly all mineral, and entirely, or almost entirely, innocuous. Owing to the barren character of the country through which the Missouri flows, to the rapidity of its current, to the absence of sloughs and lagoons along its course, and to the sparsity of the population upon its banks, the amount of decayed organic matter contained in its waters must be comparatively small. Much stress is laid by some upon the number of so-called "alkali springs" and "alkali creeks" that flow into the Upper Missouri; but the evil nature of these is usually overrated, and, besides, they form but an infinitesimal portion of the waters of the river, the chief source of supply being doubtless the snows and rains of the Rocky Mountains and Black Hills. The small and inconstant water-courses that rise in the plains can add but little. It may be remarked that among those Indians who have dwelt for generations in permanent villages on the Upper Missouri, drinking almost exclusively of its waters, bronchocele is very common; while among those who roam at large over the steppes, it is not noticed. We read of similar facts being observed of permanent dwellers on the Saskatchewan, whose head-waters rise near those of the Missouri.

As the fort is at a good elevation above the river, and as the soil is dry, no great amount of artificial drainage is required. From the east wall to the edge of the bluff that overhangs the river, a drain about three feet deep is cut, which carries off any excess of water from melted snow, &c.; as all the slops and other refuse of the fort are removed daily, drains or sewers for other purposes are unnecessary. Three hundred yards west of the fort, on a gently sloping hill, is the post cemetery, a quadrangular inclosure, 95 by 101 yards, with a board fence around it. It contains about one hundred and forty graves.

The nearest supply depots are at Sioux City, Iowa, about 750 miles distant. The route of supply is by the Missouri River, which is closed from the 1st of November to the 15th of April in each year. Twelve months' supply is usually kept on hand at the post.

The means of communication between the post and the nearest town, Yankton, 625 miles distant, is by steamboat on the Missouri River, and by wagon road. A sworn agent of the Post Office Department was appointed at the post in 1866, but the carrying and distributing of the mail continued, and still remains, entirely in the hands of the military. A regular weekly mail communication with the East, in winter as well as in summer, was not successfully in operation until the winter of 1867-'68. A regular semi-monthly mail between Forts Rice and Stevenson was established

the same winter. In 1866 a route was opened to Fort Wadsworth, which was the most direct way of communication with department headquarters; but owing to the numerous impediments to travel by this route in winter and spring, and to the difficulty of obtaining men able and willing to perform the journey, it was found necessary to abandon it. At present a party of mounted Indian scouts start every Monday morning (with the eastern mail) for the Indian reserve at Grand River; here they meet another party from Fort Sully, and, exchanging mail matter, return on the following Friday. Every second Monday, a mounted party (with mail for the up-river posts) start for a half-way station between this post and Fort Stevenson, and return on the following Wednesday.

The post is surrounded by lands of the Sioux nation, from which the reservation is taken. The Sioux, who more frequently visit the post, are tall, muscular, enduring, and healthy, but are becoming deteriorated. There are comparatively few of these Indians in the surrounding country at present, they having gone to the reserve at Grand River. There are no settlements in the vicinity of the post.

In summer dysentery, diarrhœa, and other diseases of the alimentary canal prevail; in winter, catarrhal affections to a slight extent. There are no diseases of a local origin to be particularly ascribed to any peculiarity of climate or position. Intermittents often recur, but probably never originate here. During the first years of occupancy, scurvy was a formidable malady, destroying many lives, and otherwise seriously reducing the efficiency of the garrison; but since the commissary has been better supplied, the disease has almost entirely disappeared.

Statement showing mean strength, number of sick, and principal diseases at Fort Rice, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	249.33	384	28	108	4	16	3	31	3	59	.....
1869.....	186.91	296	9	60	9	13	2	16	.....	83	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT STEVENSON, DAKOTA TERRITORY.

REPORT OF ASSISTANT SURGEON WASHINGTON MATTHEWS, UNITED STATES ARMY.

Fort Stevenson is situated in the northwestern part of Dakota Territory, about eighty-six miles south of the international boundary line, on the left (north) bank of the Missouri, about a quarter of a mile from the river, and half a mile west of the nearest landing place for a steamer. Latitude $47^{\circ} 34'$ north, longitude $101^{\circ} 18'$ west. It is 40 yards from the bluff which bounds the bottom lands, 36 feet above low-water mark of the river, and 12 feet above the flood mark of 1866. To Fort Rice, the nearest garrison below on the river, is 150 miles by water, 95 miles by land. To Fort Buford, the nearest post up the river, is 250 miles by water, 150 miles by land. Fort Totten, the nearest post to the east, is 130 miles distant. To Yankton, the nearest town of importance on the river, it is 800 miles by water, 560 by land. To Sioux City, Iowa, the nearest railway terminus on the Missouri, is 950 miles by water, 600 by land. To Fort Sully is 420 miles; to Fort Abercrombie, 350 miles. The two posts last named are the nearest points to which regular post roads extend, and from these to Fort Stevenson the mail is carried at the expense of the Quartermaster's department. The history of this post, including that of Fort Berthold, is as follows:

Fort Clarke, around which once lay the villages of the Ree, Gros Ventres, and Mandan Indians, stood on the right bank of the Missouri, some thirty-five miles below the present site of Fort Ste-

venson. In 1845 the Gros Ventres, and part or all of the Mandans, moved up the river, and built their village on the promontory where it now stands, and in the same year the American Fur Company commenced the building of a stockade on the extreme point of the bluff overlooking the Missouri. This was named Fort Berthold, in honor of a Mr. Berthold, of St. Louis. In 1859 an opposition trading company erected another stockade about two hundred yards south of the former building. This was called Fort Atkinson. It being found inadvisable to maintain trading establishments so close together as Forts Clark and Berthold, the former was broken up in the spring of 1860. In the winter of 1860-'61, the Rees dwelt on a timbered point about eight miles above the site of Fort Stevenson. In the winter of 1861-'62 they had temporary quarters above Fort Berthold, and in March, 1862, they commenced the erection of a permanent village whose ruins may now be seen on the prairie nearly opposite Fort Berthold. Here on the 3d of August, 1862, before their village was finished, or their first corn crop had ripened, they had a severe battle with the Sioux, and on the next day they abandoned their village and moved across the river; they then built their lodges around Fort Berthold, and joined once more with the Gros Ventres and Mandans. In the fall of 1862, the two trading companies having been consolidated, the old fort erected in 1845 was abandoned, and the stores and employes of the American Fur Company were moved into Fort Atkinson, to which the name of Fort Berthold was transferred. This fortification stands and retains the name of Berthold. On Christmas Eve of 1862, while most of the friendly Indians were absent at their winter quarters, the post was attacked by a large party of Sioux, who reduced the old fort and the greater part of the village to ashes, and nearly succeeded in capturing the inhabited stockade. The citizen garrison, however, defended itself bravely, and aided by the timely arrival of some Indians from winter quarters, succeeded in driving off the Sioux with great loss to the latter.

In the spring of 1863 the Isantee Sioux, who had been driven out of Minnesota after the massacre of the previous year, came to Berthold to form an alliance with the Berthold Indians against the whites. The two parties met at a ravine about three miles from the post, when, instead of advancing to shake hands, a Ree brave suddenly fired upon the Sioux, and a battle ensued, in which two Gros Ventres and nine Isantees were killed. Other difficulties with the enemy quickly followed, and the condition of the post becoming dangerous, an application for military assistance was made. General Alfred Sully, on the return march of his second northwestern Indian expedition, arrived at Berthold on the 29th of August, 1864, and detached from his expedition a company as garrison for the post. On the 3d of September the company moved into the stockade, and then, for the first time, troops were quartered at Fort Berthold. Owing, however, to some disagreement with the agent of the Fur Company, log buildings were erected outside of the fort, and the troops moved into them in April, 1865. The health of the command was good. It was a season of plenty while they remained, there being an abundance of buffalo constantly around the fort; and although the commissary was poorly supplied, and there were no vegetables to be obtained, they did not have a single case of scurvy.

General Sully's third northwestern Indian expedition arrived, on its return march, at Berthold, August 8, 1865, and here General Sully issued an order directing the evacuation of Fort Union at the mouth of the Yellowstone. The evacuation was completed on the 31st of August, and from this time until the establishment of Fort Buford, in 1866, Berthold was the most extreme garrison in the valley of the Upper Missouri.

The troops consequently suffered from scurvy. No death from disease is known to have ever occurred among any troops at Berthold. On the 14th of June, 1867, the troops moved from Fort Berthold to a point 17 miles further east, where a post at that time, designated as "New Fort Berthold," was about to be established. Fort Berthold was never owned by the Government, nor, as far as I am able to learn, was any rent ever paid for it. The use of it was given by the agent of the Northwest Fur Company, who erected offices, quarters, and warehouses for himself outside of the fort, which he occupied as long as the military remained.

It was considered necessary to retain a garrison somewhere in the neighborhood of Fort Berthold for the following reasons: First, as an intermediate post on the Missouri between the distant forts of Rice and Buford; second, as a link in the chain of posts along the proposed "Northern emigrant route," from Minnesota to the gold mines; third, as a base of supplies to the post then

about to be built at Devil's Lake, (now Fort Totten;) and fourth, perhaps as affording military protection to the village of friendly Indians, and whites at Fort Berthold. But it was also considered imperative that the garrison should be removed from Fort Berthold, as no suitable military reserve could be made which would not include the buildings or cornfields of the friendly Indians, and it was not considered just or politic to interfere with their improvement. As a base of supplies to Fort Totten it was deemed advisable to put the post at the point where the Missouri quits its easterly course and bends to the south, (a point some seven miles east of Stevenson;) but as there was not sufficient timber at that place, it had to be built elsewhere in the vicinity. A better steamboat landing and a closer proximity to good timber might have been found about three miles west of here, but the contiguity of two small streams and of some springs of (rather impure) water, probably influenced the selection of this particular site.

During the summer of 1867 the Sioux made three raids on the camp in force, and one attack in a small party. The troops were compelled to labor very hard after the building of the post was commenced, and as their food was deficient in variety, and being lodged in tents during the severest weather, they suffered greatly in health. Acute dysentery was the first prevailing disease. This reached its height in September, 1867, when there were some fifty-five cases on the report, besides a number of mild attacks not recorded. After this scurvy prevailed. This reached its height in April, 1868, during which month there were sixty-one cases reported among the enlisted men alone, besides some forty or fifty able to perform light or partial duty, whose names were not taken upon the sick-list. The scorbutic taint was, however, even more widespread than these numbers would seem to indicate. The men were prone to contract diseases, slow to recover, and little able to bear their hard labors and the rigors of the climate; frost-bites were common. The troops were not completely housed until January 3, 1868.

The military reservation of Fort Stevenson has not yet been surveyed or determined. It is believed, however, that it will be laid off in a rectangular form, extending about nine miles east, seven miles west, one mile north, and two miles south of the flag-staff.

The bottoms of the Missouri have in this neighborhood an average width of about a mile and a half. The most elevated parts are about fifteen feet above low-water mark, but three times within the last twenty years they have been entirely overflowed; from side to side in these bottom lands the Missouri winds cutting, at each bend, almost or entirely through the first bench, and sometimes through this to the second bench. In the latter case we find the stream bounded on one side by a high and precipitous bank. This rapid winding of the Missouri divides the bottom lands into sections, called here "points," somewhat semicircular in form, and situated alternately upon opposite sides of the river. A typical "point" on the Missouri may be described as follows: At its upper extremity, which is always at, or immediately below, the convexity of a bend, the river rushes against the bank with great force; the channel is deep, the bank steep, and the land is being constantly worn away. At the lower half of the point, which is at, or immediately below, the concavity of a bench, the river is slower and more shallow; the shore slopes down gradually to the water, and the land is increasing. The sloping shore here referred to is always a long, barren bar of sand and mud, partly covered with drift-wood. Behind this bar, as the ground becomes gradually more elevated, we find willows in all stages of growth; further up there are young forest trees; and on still higher ground we find the mature forest of cottonwood, elm, ash, and box elder. This forest is, however, usually but a narrow belt, and behind it on the older deposits of the bottom there is sparse timber or great treeless spaces, covered sometimes with good grass, but more frequently with bull-berry shrubs, and rose and coral-berry bushes. Almost the only arable land in the country is to be found on the "points," and but little timber grows beyond their limits. There are five of these points in the neighborhood of Fort Stevenson, which will be entirely or partly included in the reservation. As a result of this action of the Missouri, in tearing down the land in one place to build it up in another, we have a slow movement of the points down the stream.

The first bench or terrace rises abruptly from the bottoms to a height of from ten to twenty feet, and extends backward (becoming gradually more elevated) to the bluffs which form the edge of the second bench. It is a treeless, arid prairie. The strip of this bench upon which Fort Stevenson is built extends some nine miles up the river and about seven miles down, and it has an

average width of about one mile. The second bench is at its edge from two hundred to three hundred feet above the Missouri; it is an elevated plain, producing only stunted and scanty herbage; it stretches far to the northwest and southeast, and rises gradually into the elevated table-land known as the "Coteau du Missouri," whose eastern limit is forty miles east of Fort Stevenson. To the south, on the opposite side of the river, it is bounded by a higher plain, whose seamed and barren edge is known as the "Mauvaises Terres" or "Bad Lands."

The term "bad lands" is often of very general application. Portions of the lower plain or "second bench," when furrowed by deep ravines, and presenting a series of barren buttes and deep gullies, are frequently called bad lands, but it is a proper name when applied to the locality referred to in the last paragraph. Deep ravines in some places stretch from the Missouri up into the prairie. There are five of these in the neighborhood of Fort Stevenson; two have water-courses which run all the year except in very dry seasons.

The deposits along this portion of the Missouri Valley belong to the cretaceous, tertiary, and post-tertiary periods. The cretaceous rocks rise in some places to a considerable height, and show themselves along the river bluffs, but in the neighborhood of Fort Stevenson the tertiary rocks predominate. These rocks consist chiefly of hardened mud, (too soft to merit the name of rock except in a geological sense,) in layers of different colors. These layers are interspersed with seams of lignite, varying in width from three or four inches to as many feet. Again there are irregular and interrupted deposits of sandstone. As these resist erosion much better than the indurated mud that surrounds and underlies them, in some cases large flags of the harder rocks are supported on long slender pillars of the softer. Silicified wood is very commonly found in this neighborhood, in pieces from one to three feet in diameter, and imprints of the leaves and branches of various exogenous plants are abundant. Some of the sandstone will do well for building purposes. The lignite mined near Fort Stevenson makes good fuel, but it burns away very rapidly and disintegrates on exposure to the air.

Limonite and pumice are found in the neighborhood of the lignite seams. Above these tertiary beds is a great drift deposit containing boulders of every description, some of immense size. The foundations of all the buildings at Fort Stevenson are made of trimmed boulders, (mostly granite.) There are many good-sized fragments of marble and dolomite in the drift, and at some posts in the department these have been collected and burned into excellent lime.

As before intimated, the general surface is not fertile. The deeper ravines and bottom lands produce grass sufficiently long to be made into hay, but on the higher ground the grass is too short to be cut. Even on the better soil the second crop of hay is not as abundant as the first. At the present time a wide extent of country must be searched to obtain sufficient hay for the post, and some time hence it will probably be much scarcer. For agricultural purposes only the lower lands seem to be available, but without irrigation none but the hardier vegetables will thrive. In most seasons, and when grasshoppers are not as abundant as usual, careful husbandry may be rewarded by fair produce. At Fort Berthold, and other points in this neighborhood, the Indians have raised on the bottoms of the river, without irrigation, corn, squashes, and beans, with varying success for probably more than a century.

Among the wild animals of the vicinity may be mentioned buffalo, elk, deer, antelope, wolf, gray and red fox, coyote, wild cat, lynx, skunk, mink, beaver, otter, gopher, prairie dog, and mice. Birds: prairie chicken, duck, plover, snipe, geese, brant, snowbird, crow, gull, sage hen, crane, pelican, and magpie.

In the Missouri River may be found catfish, perch, shovelnose, and sturgeon.

The average temperature is about 43° F. Extremes 105° F. and — 30° F. The atmosphere is frequently saturated with moisture. The rainy season commences in April and ends in October.

The post is built in the form of a parallelogram, the sides of which are occupied by neat adobe buildings, one story in height, set up in cottonwood frames, on rock foundations. The parade is 220 feet square, and the general arrangement of the buildings is shown in Figure 53.

Two buildings are used as barracks, one to each company. Their walls are 11 feet from foundation to eaves; are plastered outside with a brown cement, and marked to imitate cut stone. On the inside the walls are roughly plastered, and very uneven; they will average 12 to 13 inches in thickness, but when finished they will be about 14 inches thick. The chimneys are of brick, brought

from the States; they pierce the roof about half way between eave and ridge pole, and are built upon the tie beams; the stove-pipes consequently enter the chimneys above the level of the walls

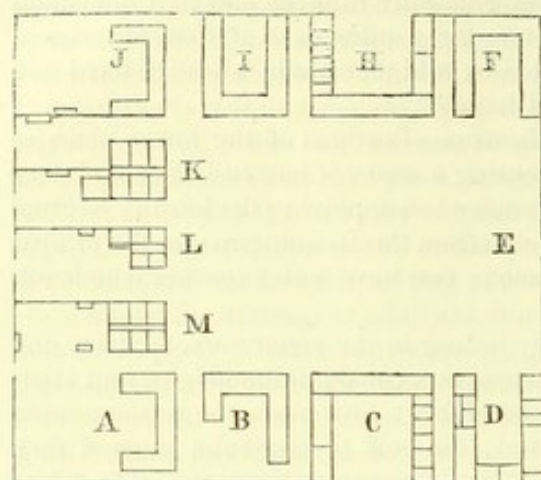


Figure 53.—Scale, 180 feet to 1 inch.

A B, temporary log houses; C, Company F barracks; D, hospital; E, sally-port; F, officers' quarters; H, Company C barracks; I, quartermaster's store-house; J, temporary log house; K, L, M, officers' quarters.

The air space is 240 cubic feet per man in each dormitory. This does not include the space contained between the roof and the horizontal joists or tie-beams which rest on the walls, for the room may yet be ceiled.

There are in each dormitory ten new, neatly finished, two-tier double bunks, capable of accommodating eight men each, or eighty in all.

The wash-room is supplied with a heating stove, a trough for the basins, a water barrel, and a slop barrel. There are also wash-tubs for those who wish to bathe themselves; beside these there are no arrangements for bathing in winter, but in summer the men go to the river.

Three buildings are now used as officers' quarters. All the floors are of tongued and grooved pine, the chimneys built from the ground, the partitions of lath and plaster, the apartments ceiled, and all the walls plastered on the inside. On the outside the adobes are uncovered, but it is intended either to plaster and mark them after the manner of the barracks, or to cover with weather-boards. The walls are fourteen inches thick.

The guard-house, situated in the center of the side opposite the commanding officer's quarters, is 60 feet long and 20 feet wide, with a passage, 10 feet wide, across the center, surmounted by a tower, 10 feet square, from which the flagstaff rises.

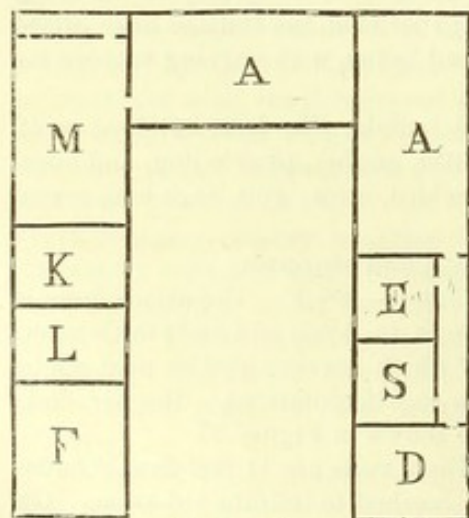


Figure 54.

The hospital, like the barracks, incloses three sides of a rectangular yard. The plan is shown in Figure 54.

A, ward, running between the main buildings, and used as bath and wash-room; A, ward, $17\frac{8}{12}$ by $44\frac{8}{12}$ feet; D, dispensary, $15\frac{1}{2}$ by $17\frac{8}{12}$ feet; E, steward's room, $12\frac{3}{12}$ by $12\frac{3}{12}$ feet; F, post bakery, $17\frac{8}{12}$ by $30\frac{9}{12}$ feet; K, kitchen, 14 by $17\frac{8}{12}$ feet; L, laundresses' quarters, 16 by $17\frac{8}{12}$ feet; M, messroom, $17\frac{8}{12}$ by $20\frac{1}{2}$ feet; S, store-room, 13 by $12\frac{3}{12}$ feet; height of rooms, 11 feet.

The yard inclosed is 70 by 38 feet. The outer walls of the hospital form the southeast corner of the fort. They are built of the same material as the barracks, adobe on rock foundation, one story high. There are as yet only cotton-wood floors, but it is designed to lay down some matched pine flooring on the ward and dispensary in the spring. All the rooms are ceiled and plastered inside, with the exception of the laundry and wash-room, and with one exception the

partitions are all about 6 inches thick, of lath and plaster. The description of the roof and windows of the barracks applies to the hospital; the walls are cemented and marked outside.

The post library occupies a room, furnished with stove, chairs, tables, and book-cases. It is designed as a reading-room for the men, as well as a library, and contains 850 well-selected volumes, including standard works on the physical sciences, travels, history, biography, and the better class of fiction and poetry.

All the water used at this post is brought from the Missouri River by water-wagon. There are streams and springs in the neighborhood, but their water is impregnated with salts, rendering it unpalatable. The Missouri water is the best in the country. It is sweet, and although very muddy, particularly in the spring time, it becomes clear when allowed to settle. There are no cisterns or reservoirs. The fort is built on sloping ground, and the subsoil consists mostly of gravel. The natural drainage is perfectly efficient, hence there are no artificial drains, and none needed. In winter there is no arrangement for bathing, except the tubs in the wash-rooms already described. In summer the men bathe in the Missouri, and in a stream named Douglas Creek, which flows close by.

On the bottoms near the mouth of Douglas Creek, about three-quarters of a mile from the post, an irregularly shaped piece of ground, containing between four and five acres, was cultivated as a post garden. Irrigation by hand was practiced during the dry season. Peas, beans, and lettuce grew well; cabbages and potatoes, being later in season, were eaten up by the grasshoppers before maturity. There are no hospital nor officers' gardens.

During six months of the year there is communication with the States for commercial purposes, by means of the Missouri River. During the remaining six months there is no communication except by mail. Heretofore St. Louis, Missouri, and Leavenworth have been the chief markets, but Sioux City, Iowa, the nearest railroad point on the river, is now taking a large share of the trade, on account of its greater proximity. Steamers from St. Louis take from twenty-five to sixty days to reach this point. We have two mail routes from here to the States. The first is via Forts Totten and Abercrombie, to St. Paul, Minnesota. It requires probably from three to six weeks for a letter to go to department headquarters. In 1868 the Indians caused considerable trouble on the road between here and Fort Totten. They captured the mail twice and killed five mail carriers, three of whom were soldiers, and two citizens, but last summer they gave no trouble. The second route is via Forts Rice, Sully, and other posts on the river below us, to Sioux City, Iowa. On this the mail is carried, when practicable, every second week.

The only inhabitants of the vicinity are the Indians and whites at Fort Berthold, some seventeen miles distant. The village contains some 2,500 Indians, of the tribes of Arickarees or Rees, Gros Ventres, and Mandans, who eke out a meager subsistence by agriculture, hunting, and the annuities received from the Government.

The present sanitary condition of the post is excellent. Venereal diseases of various forms are the most prevalent throughout the year. In summer we have many cases of acute diarrhœa, and acute dysentery of mild types. Slight scorbutic symptoms have again manifested themselves this winter, but they are readily dispelled. I do not believe that true malarial disease ever originated here, but it may recur to those who have formerly suffered. Pulmonary disease is almost unknown; we have had, since the post was established, two or three cases of phthisis, supervening on scurvy, or contracted by the patient before he came into the country. The records of this post and Fort Berthold, since June 1, 1865, (nearly five years, show but two cases of pneumonia, and these cases were so slight that the diagnosis was made with difficulty.

Statement showing mean strength, number of sick, and principal diseases at Fort Stevenson, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	245.83	382	6	66	5	45	79	8	56	3
1869.....	142.5	157	6	27	1	22	5	5	12	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BUFORD, DAKOTA TERRITORY.

REPORT OF ASSISTANT SURGEON J. P. KIMBALL, UNITED STATES ARMY.

Fort Buford, located in latitude 48° north, longitude from Greenwich 104° west, is on the north bank of the Missouri River, near the mouth of the Yellowstone.

The reservation has not been declared. Thirty miles square is held reserved, as described and announced in General Orders No. 21, Headquarters Department of Dakota, dated July 16, 1868.

The Missouri River averages in this vicinity about one-half mile in width in its usual channel. It has a flood plain which is from forty rods to several miles wide, and which is covered with water in the occasional great floods that occur once in several years. This flood plain or bottom land is generally well timbered, and covered with a dense undergrowth of willows and shrubs. Above this is a grassy plain from one to four or five miles in width, extending back to the hills or "bad lands," and abounding in sage-brush and cactus. The structure of this plain, as observed in digging wells, consists, for the first eleven feet from the surface, of a porous clay; then, for about three feet, a fine gravel; next is white sand for fifteen feet, and black sand for two feet, below which is a stratum, about twenty-two or twenty-three feet in thickness, of a very tough, grayish-blue clay. As soon as this layer of clay is perforated water in large quantity rises through the opening and affords an unfailing supply. The average depth of the three wells at the post is 52 feet. The surface of the ground in which they are located is 38 feet above the river at the ordinary stage of water. Through this plain, at distances of one-half to two or three miles apart, are ravines, or "coolies," as they are called here, running from the hills to the bottom lands of the river, constituting an excellent system of drainage. But few of them contain water, however, except in very wet seasons. The water of the few small streams that do run through them is intensely alkaline, containing sulphate of soda in large quantity. These coolies are generally of sufficient depth to conceal from observation a party of horsemen until the observer approaches to within a few yards of them, and are invaluable to the Indian for purposes of secret approach and ambuscade.

The striking feature of this vicinity lies in the "mauvaises terres," or "bad lands," which consist of a succession of barren hills, or "buttes," averaging from two to three hundred feet in height. These buttes are chiefly composed of compact clay, very tough and elastic, considered to be a tertiary deposit. They bear abundant evidences of erosion by water, some having been molded into a conical form, while others have assumed a pyramidal shape, and others again have been worn away on one or more sides until they present a perpendicular face hundreds of feet in height. At this point these lands extend back from the plain for five or six miles, beyond which is a rolling prairie. Their general course here is from west to east along the Missouri River, which approaches them closely at some points. Near the bases of these buttes there not unfrequently crops out a seam of lignite, averaging from four or five inches to as many feet in thickness. It is of fair quality for fuel, and the indications are that the deposit is sufficiently extensive to render it of great value for local uses should the population of the country ever be sufficient to require it. It is, however, so prone to crumble to a fine powder upon exposure to the air, that it would probably be impracticable to transport it a long distance to market.

The only stratified rock that has been observed in the vicinity is a calcareous sandstone tertiary, free from fossils, which crops out abundantly among the clay hills. This stone is valuable for building purposes, hardening by exposure to the weather. It contains too much carbonate of lime to be used in the construction of ovens, since it crumbles after long-continued exposure to heat. Metamorphic rock occurs only in the granite and mica schist of boulders, which have been brought to their present places in the drift.

Deserving of notice are the numerous and beautiful specimens of petrified wood, entire logs and stumps of which, supposed to be chiefly cedar, are frequently found in the hills of a pearly white color, finely tinted with various shades of red and crimson.

The country around the post is not arable. The plain just described would produce crops if it could be irrigated. The country is badly watered. Occasionally along the river strips of land are

found capable of producing corn and vegetables. Some of the more common representatives of the vegetable kingdom are the ash-leaved maple or rose elder, (*Negundo aceroides*), sparsely scattered along the river banks; the red osier dogwood (*Cornus stolonifera*) is plentiful in the same locality. The kinnikinnik, which the Indians smoke, is the inner bark of this shrub scraped off and dried. They call it "Chah-shah-shah." The green ash is found in varying quantities on the wooded river bottoms. Red cedar is sparingly found on the hills and in the rocky ravines, usually of a small stunted character. A species of the willow family finds a place in the low moist grounds. It is a shrub from 5 to 8 feet high, and is probably the low bush willow, (*Salix humilis*.) The cottonwood (*Populus monilifera*) constitutes the bulk of the forest in this vicinity, and is the only wood available in any quantity for fuel or building purposes. The low bottom lands along the Missouri and Yellowstone Rivers are for the most part covered with cottonwood forests. The wild yellow or red plum (*Prunus Americanus*) is found in the ravines and on the prairie side of points of timber located on the river lands. It is edible, and of good flavor, being the best fruit the vicinity affords. The number of trees, however, are limited, and the supply consequently scanty. The choke cherry (*Prunus Virginiana*) is found in much the same places and quantities. A variety of service berry (*Amelanchier Canadensis*) is abundant along the streams as a shrub. The smooth, wild gooseberry (*Ribes hirtellum*) is sparingly found in ravines. The Missouri currant (*Ribesia aureum*) is more common in the same locality. The buffalo, or bull berry, (*Shepherdia argentea*), an edible, acid, red fruit, ripening late in the season, occurs abundantly, usually in the bottom lands. It is very valuable to the Indians, who often subsist on it almost entirely for several weeks during the fall, at times when there happens to be great scarcity of game. The pomme blanche, or Indian turnip, (*Psoralea esculenta*), is abundant in the high grounds and sandy soil. It is much used as food by the aborigines. The prickly pear (*Opuntia Missouriensis*) is extremely abundant in the prairie, and by its sharp, stiff spines is rendered a very annoying obstacle to the traveler, whether mounted or on foot. Lambs' quarters (*Chenopodium album*) grows plentifully in the low moist bottoms, and is highly prized and much used during the spring and early summer for greens. The wild onion (*Allium stellatum*) is common upon the hill-sides and steep banks. A species of wild mint finds a place on the moist banks of streams in the vicinity.

Some of the more important animals are the American bison or buffalo, mountain sheep, white and black-tailed deer, elk, antelope, Canada lynx, wild cat, American gray wolf, coyote, common red fox, swift fox, prairie fox, silver gray fox, Indian dog, grizzly bear, black bear, long-tailed ermine, mink, badger, common skunk, American otter, fisher, American sable, Canada porcupine, jack hare, gray rabbit, beaver, gopher, and muskrat.

The climate is one of extremes, being excessively hot in summer and extremely cold in winter. The extreme heat of summer is of short duration, and the nights are always cool. Winter sets in early in December, and lasts until near the 1st of April. The cold is continuous and severe. Wind and snow storms are of common occurrence. Snow sometimes falls to a depth of two feet, which is the greatest depth ever known here. The atmosphere is dry, and the variations in temperature are not as observed as in more humid climates. The fall of rain is very small, the annual average for two years being about nine and a quarter inches.

Fort Buford was first established as a one-company post in 1866, and increased to five companies in 1867, since which time the work of building the fort has been in progress. It is built upon a rectangular plot of ground, 333 yards in length by 200 in breadth. This plot is inclosed on three sides by a wooden stockade, 12 feet in height. The south side, facing toward the river, is not stockaded. The parade ground, 460 by 350 feet, is bounded on the north side by the officers' quarters, on the east by the commissary store-room and office, quartermaster's store-room and office, and one company barrack; on the south by four company barracks, and on the west by the hospital, post library, adjutant's office, and guard-house. East of the buildings forming the eastern boundary of the parade ground, and separated from them by a street twenty feet in width, are the granaries, stables, corral, butcher shop, blacksmith shop, bakery, and magazine.

The barracks, five in number, are rectangular adobe buildings, each 124 feet in length, by 24 feet wide, and 10 feet high to the eaves, not ceiled. Walls 17 inches thick. Roofs of boards and slabs, covered with dirt. Each barrack is divided into a first sergeant's room, 12 by 24 feet; men's quarters, 70 by 24 feet; mess-room, 30 by 24 feet, and kitchen, 12 by 24 feet. The natural illumina-

tion of the quarters is insufficient. In the dormitory there are but three windows, each 2 feet 6 inches wide, by 4 feet 8 inches high, not affording sufficient light to read by except in their immediate vicinity. The quarters are at all times dark and gloomy, the exact reverse of what they should be were the health and comfort of the occupants considered. The ventilation of the quarters by means of flues immediately beneath the eaves, and the large open fireplaces, is sufficient in this climate, if the rooms are not overcrowded. The air space in the men's quarters is 18,480 cubic feet, and the average occupancy sixty men, allowing, therefore, but 308 cubic feet of air to each man. The quarters are well warmed by fireplaces and stoves. A serious fault in these buildings is the entire absence of a room for bathing purposes; the only facilities the men now have for washing being a basin of water out of doors, and the Missouri River, which last is so rapid and dangerous at this point that but few avail themselves of the opportunity it gives during a few months in the summer. The bunks are badly arranged in three tiers one above the other, each bunk holding two men. The company sinks, two in number, are situated 110 feet distant from the fort, each consisting of a ditch, 30 feet in length by 8 feet wide and 12 feet in depth, with a building erected over it.

The kitchens are of ample size, but their location is objectionable, as, being in the same building and in close proximity to the men's quarters and communicating with them, much of the steam and effluvia pass in, frequently rendering the quarters very disagreeable. The same objection of locality might be raised against the mess-rooms. The fact that there is no store or lumber-room connected with the barracks is made evident by the accumulation of sundry articles in the kitchens, mess-rooms, and sleeping-rooms, to the great detriment of the good order and neatness of the quarters.

The laundresses occupy an adobe building, 20 by 100 feet, which is divided into five rooms, each 20 feet square. On a line with this building are the quarters of the citizen employés, an adobe building, 20 by 50 feet, divided into three rooms, each 16 by 20 feet. In rear of the laundresses' quarters is an adobe building, 12 by 20 feet, now occupied by the interpreter.

The officers' quarters consist of three adobe buildings and two wooden ones. The adobe buildings are each 45 by 48 feet, and 10 feet high to the eaves, and divided by a hall through the center into two sets of quarters of three rooms each, each room 14 by 13½ feet. The wooden buildings were built in 1866, when the fort was first established. One building is 45 by 22 feet, the other 36 by 20 feet. Each one is divided into three rooms and a hall. The officers' quarters are all well warmed, lighted, and ventilated.

The adjutant's office and the post library are in an adobe building formerly used as a hospital, 54 by 22 feet, divided into three rooms of equal size, one of which is vacant.

The commissary store-rooms and office are contained in one adobe building, 24 feet wide by 200 feet long, and 10 feet high to the eaves. These rooms are well warmed and ventilated, and are kept in admirable order and police. Extending in a line with the commissary building is the quartermaster's store-room and office, contained in an adobe building, 24 by 124 feet, and 10 feet high to the eaves.

The guard-house, 40 by 22 feet, and 10 feet high, consists of two rooms, each 20 by 22 feet; one built of adobe used as the guard-room, and one built of logs for the prisoner's quarters. The building is well warmed by stoves. The illumination, both natural and artificial, is bad. Ventilation very bad. The present guard-house is intended to be used only temporarily until a good one can be built.

The hospital was originally erected in the summer of 1867, for a company barrack, and was used as such until June, 1868. Its dimensions and structure are similar to those of the barracks already described. It is divided into a dispensary, 12 by 24 feet, store-room, 16 by 12 feet, ward, 68 by 24 feet, bath-room, 10 by 8 feet, mess-room, 16 by 24 feet, and kitchen, 12 by 24 feet. The ward is furnished with twelve beds, giving to each 136 square feet of superficial area, and 1,496 cubic feet air space. The ventilation of the ward is excellent. It is effected by numerous small openings in the walls immediately beneath the eaves, and by two large open fireplaces. The room is well warmed by these fireplaces and two wood-stoves. The natural illumination of the ward by means of four windows, each 2 feet 6 inches wide, 4 feet 8 inches high, is insufficient. The kitchen, of sufficient size and accommodations, is badly located in too close proximity to the ward. The hospital sink is built twenty feet from the hospital.

The post bakery is an adobe building, 30 by 45 feet, with walls $2\frac{1}{2}$ feet thick. It contains two ovens, each 13 by 12 feet, well constructed.

The stables are two wooden buildings, one 32 by 250 feet, and one 17 by 218 feet. They are well constructed and adapted to the purpose for which they were built. The corral is 250 feet square, including a shed, 16 by 250 feet, built for the cattle. At the east side of the corral, and near the center of the east side of the fort, is the butcher's shop, a wooden building, 20 by 24 feet. Near the corral and stables are three temporary wooden buildings, two of them roofed with tarpaulins. One is 30 by 85 feet, and used as an additional commissary store-room; one 30 by 80 feet, and one 30 by 260 feet, both filled with grain.

The library consists of 73 volumes.

The post is chiefly supplied with water from the Missouri River. There are, however, three wells within the fort, one of which was dug in the winter of 1866 and 1867, at a time when the garrison was surrounded and besieged by hostile Indians. The other two were sunk in the fall of 1867, near the corral, for the supply of the cattle and horses, and to serve in case of emergency. The water from these wells is hard, clear, and transparent, and has a slightly saline taste. It contains a small amount of lime and chlorine. A small amount of organic matter is present. The water from these wells is now used only for the cattle and horses, the entire supply for the command being daily brought in carts from the river, 750 yards distant. The river water contains a large amount of suspended matter, principally clay and sand. A careful measurement in the month of September, at a season when the water of the river is comparatively clear, gave eighty-four grains of suspended matter in one gallon of the water. In the spring and during the early part of the summer, when the river is high, the amount of suspended matter is at least doubled. The addition of six grains of alum to the gallon of water renders it perfectly clear and transparent after standing twelve hours. Cleared of the suspended matter, it is excellent water, much superior to that of the wells. During the winter of 1866-'67, when the well water was used exclusively by the garrison, the records show that diarrhœa was the prevalent disease. In the fall of 1867 a sudden increase in the number of cases of diarrhœa was charged to the use of the water from the well, which was used on account of being colder than the river water. The well was closed, and the epidemic immediately abated. During the summer and fall of 1868 the river water was used exclusively. The daily amount of water furnished the troops averages about eight gallons per head.

The natural drainage of the post is excellent. In front the ground slopes gently to the river, and on both the east and west ends it descends gradually to shallow ravines running parallel with, and emptying into, the river. Gardens are cultivated, producing lettuce, radishes, cucumbers, and green corn in sufficient amount to furnish a fair supply to the entire garrison during the season; also a limited amount of green peas, cabbages, turnips, and beets. Tomatoes have not done well, the season being too short. Potatoes have proved a failure during the last two years, producing nothing but tops. The corn raised is a variety cultivated by the Ree Indians, which comes quickly to maturity.

Rations, procurable from the commissary, are of good quality and sufficient in quantity. During the fall of 1868 and the winter of 1868-'69, after the supply of vegetables from the garden was exhausted, the following articles of food, in addition to the regular ration issued from the commissary department, in the quantities stated, were found effectual in preventing scurvy and maintaining the command in excellent health, viz: Per 100 rations, ten pounds of dried fruit and five gallons of kroust or curried cabbage twice a week; one gallon of molasses, twenty-five pounds of corn meal, and two and one-half gallons of pickles once a week.

The nearest supply depots are at St. Louis, Missouri, 2,233 miles distant. The route of supply is by the river, which closes for navigation early in the fall. Supplies should be sent early in the spring, as many articles spoil later in the season. Fresh vegetables are always needed, and some means should be devised to supply potatoes at least. Communication between the post and nearest town is by the Missouri River. There is no public land conveyance. Mail communication is very irregular and uncertain. The post has twice been nearly three months without receiving a mail. During the past year a mail has been received about once a month. It is carried on horseback, via Forts Stevenson and Totten, Dakota Territory, 490 miles, to Fort Abercrombie, Dakota Territory,

the nearest mail station. The length of time required for a letter to go to department headquarters is about thirty days.

The territory on the north side of the Missouri River is claimed by the Assiniboiné Indians, from White Earth River, 65 miles east of the post, to Milk River, about 170 miles west of it. The Assiniboinés were originally a part of the Yancton tribe of the great Dakota or Sioux Nation, and, according to tradition, split off from that tribe and became a separate people through some difficulty that arose about a woman. They call themselves Hokes, and claim to be Dakotas. The name "Assiniboiné," meaning stone-boilers, was given to them by the Crees, their neighbors on the north, on account of a singular method practiced by them of boiling meat by holding in the water heated stones. Catlin states that in 1832 the Assiniboinés numbered 7,000. At present they do not exceed 2,000. Small-pox and war have been their destroyers. The Assiniboinés are athletic, well-formed, fine-looking Indians, and since the establishment of this post have been uniformly friendly to the whites, and have frequently rendered valuable services to the Government. During the winters of 1866-'67 and 1867-'68, they kept the command apprised of the movements of the hostile Sioux, and during the past season, (1868,) after the capture of the Government herd of beef cattle from this post by the Sioux, they sent a courier between 60 and 70 miles to give information of the direction in which some of the cattle had strayed, and afterward drove in to the fort several head which they had found upon the prairie nearly one hundred miles distant. The Assiniboinés are very anxious to have an agency established among them, similar to those among the Indians lower down the river. They are poor in horses and few in number, and consequently unable to pursue the buffalo, their chief source of subsistence, to any great distance from home, and their hunting grounds are constantly encroached upon by other tribes, the Crows on the west, the Crees and British half-breeds on the north, the Yanctonais, Gros Ventres, Rees, and Mandans on the east, and the Tetons (Sioux) on the south. Owing to the inroads of these tribes on the lands of the Assiniboinés, game is becoming scarce, and they are at times almost in a state of starvation. During the spring of 1868, a camp of 30 or 40 lodges near the fort chiefly subsisted themselves for several weeks upon the offal from the butcher's shop and corn picked out of dung heaps. They are keenly alive to the fact of the increasing scarcity of game, and are anxious to learn to cultivate the soil before they shall be overtaken by starvation. Their poverty in horses arises principally from their traffic with the British half-breeds from the Red River of the North, who make frequent trading expeditions into their country with powder and whisky. The Assiniboinés are now mostly encamped on the Missouri River, from 60 to 100 miles west of the post. In the immediate vicinity are the Gros Ventres, Mandans, and Yanctonais on their winter hunt. All these Indians are friendly.

On the opposite or south side of the Missouri is the country of the Teton Sioux, who, since the establishment of the post, have proved as uniformly hostile as the Assiniboinés have friendly. The band of the Sioux that most infest this vicinity is the Onkpapas, although in some of their raids other bands have been recognized. Since the establishment of this fort in 1866, they have killed at the post, or in its immediate vicinity, eleven men—five soldiers and six citizens. Six of these men have been killed since May, 1868. On the 20th of August, 1868, they made an attack in force upon the Government herd of beef cattle at this post, and captured over 200 of them. In this fight two men were killed and four wounded, one mortally. In addition to their relentless war upon the whites, the Sioux are constantly harassing the Assiniboinés, killing men, women, and children because of their friendship for the whites.

The health of the locality is excellent, and there are no prevailing diseases. The most common diseases are venereal and acute rheumatism. The fatigue duty performed by the troops has been hitherto extremely onerous, but with the exception of the exposure of the workmen in the adobe yard during a few excessively hot days in the summer of 1868, from which several cases of disease resulted, and once or twice the moral depression produced by being hard driven, I have seen no injurious effect produced upon the men of the command, but on the contrary I consider a reasonable amount of fatigue duty performed in the open air during pleasant weather as beneficial to them. Especially is this the case during the winter, when the labor of getting fuel in good weather not only gives needed and healthful exercise, but furnishes an agreeable relief to the monotony of sitting and standing around a fire in crowded quarters, and, by occupying the mind and attention, does much to prevent that ennui and nostalgia which frontier garrison life is apt to generate. Amuse-

ments of the soldier consist of base ball, cricket playing, and hunting. A theatrical performance is given once a week by a troupe composed of men in the command. Situated on the west side of the parade ground is a wooden building, 75 by 30 feet, originally erected for a store-room, now used as a theater.

Statement showing mean strength, number of sick, and principal diseases at Fort Buford, Dakota Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	401.58	444	1	13	57	1	80	33	25	1	80	1
1869	195	322	.....	7	40	18	34	.....	30	1	61	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BENTON, MONTANA TERRITORY.

REPORT OF ASSISTANT SURGEON A. B. CAMPBELL, UNITED STATES ARMY, DATED JULY 13, 1870.

Fort Benton, Montana Territory, is located on the Missouri River, at the head of navigation, in latitude 48° north, longitude 110° 40' west; altitude about 6,500 feet above sea-level. It is about 5,000 miles from the Gulf of Mexico; 64 miles east, by water, of Fort Shaw; nearly due north of Fort Ellis, distant about 245 miles by circuitous road, and 144 miles east of Helena. The post adjoins the town called Benton City on the east. It is about 25 miles east of the Bell range of the Rocky Mountains, and 45 miles south of the Bear Paw Mountains. It was originally built for an Indian trading post by the American Fur Company, in 1846; was sold in 1864 to the Northwest Fur Company, and was occupied by United States troops in October, 1869, to receive and forward the freight for Forts Shaw and Ellis. The reservation is one mile wide and three miles long. Except the depression through which the river runs, it is a prairie. There are no springs or ponds on the reservation. There is a small alkaline pond 28 miles on the road to Fort Shaw, and a small spring 8 miles from there on the same road. The wells in town differ; some have cold and delightful water; others adjoining are warmer, alkaline, and offensive to the taste. The highest temperature observed in the shade was 104° F.; in the sun, 139° F.; the lowest, —30° F., and the mean about 47° F., which I think below the truth; it is nearer to 50°. The rain-fall is 4.24 inches, and the snow, melted, 2.25 inches. Snow seldom lies deeper than 8 to 10 inches. There was quite a snow-storm on the 31st of May and 1st of June, 1870, the minimum thermometer on the 1st of June showing 29°, and on June 3 going, in the sun, above 130°. Winds prevail from the east and south, frequently blow with great violence, and change in a short time. The winter, in the main, is mild and genial, but interspersed with sudden falls of temperature, the cold lasting but a few days at a time, but being then excessively severe.

The fort, built of adobe, is located 40 yards from the river, 12 feet above low water. Its capacity is sufficient for one superintendent and about 20 employés, but not for a company of soldiers. One adobe building, two stories high, is used as barracks, the first story containing orderly room, kitchen, and mess-room; the second the dormitory. The building is 85 by 18 feet inside, and 14 feet to the eaves, being 7 feet for each story. The quarters are warmed by stoves, and lighted and ventilated by the door and small windows. The air space per man, with the present force, is 252 cubic feet. When the company is filled up there will be 91 cubic feet per man. The bunks are double, and two-storied. The wash-room is in a tent; there is no bath-room. The water-closets are ordinary privies outside the inclosure.

The laundresses occupy tents outside the walls.

Parts of three buildings are used as officers' quarters; they are built of adobe, finished with whitewash over the bricks and canvas over the beds to keep dirt and dust from falling; heated by stoves, and lighted and ventilated by windows and doors. There are no water-closets or bath-rooms.

The quartermaster's store-house and commanding officer's office is a building of hewn logs with shingle roof.

The guard-house, formerly the stable, is 31 by 18 feet inside, warmed by a stove and ventilated by a door and window; its capacity is sufficient, but it is insecure.

There is no hospital; one hospital tent, containing four beds, is used as a ward; it is warmed by a stove.

The general water supply is from the Missouri River; it is brought in buckets as needed, and is impure from the offal from the town.

The natural drainage is sufficient; one wooden-box drain leads from the middle of the yard to the river.

There are no gardens at the post. Abundant food, good and of sufficient variety, is procurable from the post commissary. There is also plenty in the town, but very high-priced. Milk is 60 cents per gallon, butter \$1 per pound, eggs \$1 50 to \$2 per dozen, chickens \$2 each.

Medical supplies are obtained once a year from St. Louis, by steamboat; the amount on hand is large, and is stored in a loft over the magazine, not well protected from the weather.

The means of communication are by telegraph and stage; the latter is regular, but sometimes interrupted by snow. Mail is received three times a week. The length of time required for a letter to reach department headquarters is from fourteen to sixteen days.

There are four Indian trading or outfitting houses in the vicinity of the post; one brewery, one bakery, two blacksmiths, one carpenter, one tailor, one butcher, and one shoemaker shops, and about a dozen drinking and gambling shops. It has also a court-house, a school, and a small jail. It is said to have 180 inhabitants.

No malarial or pulmonary diseases occur here unless imported. Rheumatism is rare, but very severe when it is encountered. Bowel diseases are at present prevailing, probably owing to the combined influences of impure water and excessive heat.

FORT ELLIS, MONTANA TERRITORY.

INFORMATION FURNISHED BY SURGEON P. C. DAVIS AND ASSISTANT SURGEON CLARENCE EWEN,
UNITED STATES ARMY.

The post of Fort Ellis is situated in the southern portion of Montana Territory, in latitude 46° 30' north, longitude 112° west, 30 miles from Gallatin City, on the headwaters of the Missouri, and three miles from Bozeman City. Elevation above the level of the sea about 6,000 feet. The post is on the south bank of the Gallatin River, and at the upper end of the Gallatin Valley, situated on the north side of an elevated prairie, which is surrounded on the north, east, and south by high mountains. The post was established August 27, 1867, by order of Brevet Major General Terry, commanding the Department of Dakota. In November, 1867, the commissary and quartermaster store-houses and stables were completed. The company quarters, three buildings for officers' quarters, and the post bakery, were completed in December of the same year, and in January, 1868, the hospital, headquarter building, guard-house, and blacksmith shop. In February, 1868, an ice-house was built, and in October and November of the same year two more sets of officers' quarters were finished, and the stockade completed at the same time.

The climate at the post is dry and pure, but snow-storms and severe frosts are not unfrequent, even in summer. The ground upon which the post stands, owing to its greater elevation, and being somewhat sheltered from the sun's rays by the adjacent mountains, is colder than the neighboring valley.

Cultivation is confined to the river bottoms, as the small amount of rain renders irrigation

necessary. The soil is very fertile, and large crops of wheat, rye, oats, and barley are raised, and all the more hardy vegetables, such as potatoes, turnips, beets, carrots, &c. The river bottoms are covered with groves of cottonwood and aspen, and thickets of willow. The passes to the Yellowstone River and the country to the south of it open into the valley a few miles from the fort. The valley of the Yellowstone is described as being as fertile as the Gallatin Valley, but is unsettled.

The neighboring mountains are very broken and precipitous, with huge cliffs of sandstone and limestone, clothed to their summits with vast forests of white pine, red fir, and cedar, and contain immense beds of bituminous coal of good quality. Gold is found in the immediate vicinity of the post, and at Emigrant Gulch, about thirty miles distant, gold mining is carried on extensively. The rivers and mountain streams are well stocked with trout, and the forests and plains abound in game—elk, black-tailed deer, antelope, mountain sheep, grizzly and black bear, wolf, mink, ermine, and beaver.

There has been but little communication with the Indian tribes of the vicinity. The Crows occupy the country south of the Yellowstone. They number about 250 lodges. Although small-pox and syphilis have made great ravages among them, they are said to be increasing in number.

The ground upon which the fort is built slopes gently from the south to the river. The soil is argillaceous, with a subsoil of gravel. The buildings of the post are of unhewn pine logs, the interstices are plastered with mortar, and the floors are of pine. The buildings inclose the parade ground, and are surrounded by a stockade, 390 by 458 feet, and 10 feet high. The plan of the post is shown in Figure 55.

A, headquarters building; B E K, barracks; C, hospital; D, carpenter shop and bakery; F H, commissary store-houses; I, officers' quarters; J, quartermaster's store-house; L, post library; M, parade ground; O, bastion; P, guard-house.

There are three sets of company quarters at the post, of the following dimensions each: 123 feet long, 22 feet wide, 10 feet high on the sides, and 13 feet in the center, with two wings at the rear 22 feet long and 20 feet wide. They contain each a kitchen and mess-room, 40 feet long and 20 feet wide, and a dormitory, 102 feet long and 22 feet wide. These rooms are not ceiled. The dormitories contain a double tier of bunks, are lighted by five small windows, and are occupied, each by one company. They are warmed by stoves.

The only means of ventilation are the windows and the holes cut for the stove-pipes. The mess-rooms and kitchens of these barracks are provided with large cellars. The allotment of air space to each man is about 600 cubic feet. The sinks for the men are placed outside of the stockade, about 150 feet distant.

There are four buildings used for officers' quarters, containing two sets of quarters each; four rooms to each set in three of the buildings, and three to each set in the other. The rooms are not ceiled. The building containing the headquarter offices is 42 feet long and 30 feet wide. It contains the post commander's, adjutant's, quartermaster's, and commissary's offices, and the sergeant major's quarters.

The commissary's and quartermaster's store-houses are each 62 feet long and 22 feet wide, with two wings at the rear 22 feet long by 20 feet wide.

The guard-house at the fort is in one of the bastions; the lower story used as a guard-room, the upper story as quarters for the prisoners; it is 20 feet square; ceiling, 10 feet high; lighted by two small windows, warmed by an open fireplace, and ventilated by a ventilator in the ceiling.

The hospital, located on the northeast corner of the post, is built of rough pine logs, and roofed with boards. It is 42 by 30 feet, and contains a ward, 28 by 18 by 8½ feet, which occupies the

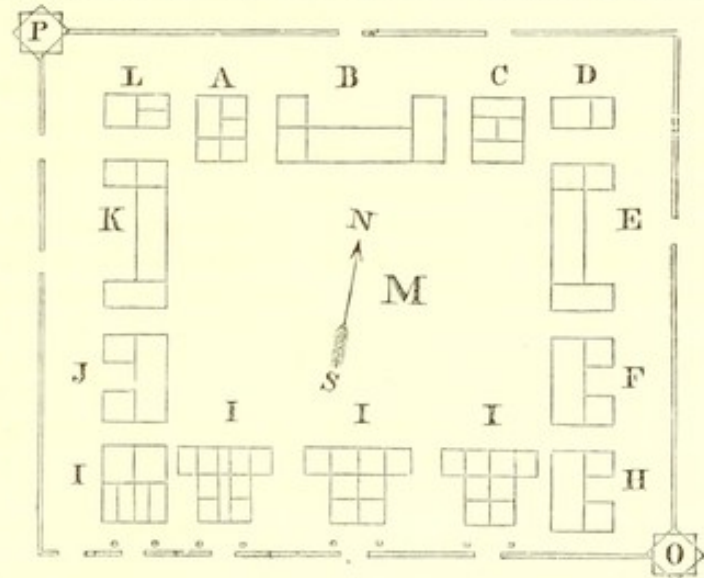


Figure 55.—Scale, 151½ feet to 1 inch.

central portion of the building, the dispensary and steward's room communicating on the one side, the kitchen and store-room on the other. The ward contains seven beds, with 612 cubic feet of air space to each. It is warmed by a stove, and lighted by two windows, one at each end. Ventilation is secured by ventilators in the ceiling. There is no bath or wash room. The sink is located outside of the stockade. The hospital building is small and ill adapted to its present use. A new hospital is in course of erection, consisting of a main building with L attached. The main portion has an attic. The ground floor is divided into six rooms, each 15 by 16 by 9 feet, designed for dispensary, office, steward's room, kitchen, and laundry. The office and dispensary are in front, being divided by a partition, and communicate with a hall, 6 by 32 feet, which extends across the building to the L containing the ward. At the other end of the hall, and attached to the main building, is the dead-house, 12 by 12 feet. A stairway ascends to the attic, which is designed for a store-room. The ward is 40 by 24 feet, and 12 feet high; two small rooms are partitioned off at the further end for wash-room and water-closet. The ward is well lighted by eight windows placed in opposite sides, and two at the free end; the latter looking out from the small rooms before mentioned. No special provision is made for ventilation.

The quartermaster's stables are located 100 yards west of the post. They are built of logs, and roofed and floored with earth. Their lighting and ventilation are deficient. At a distance of 100 yards southwest of the post are the cavalry stables, consisting of four log buildings, each 150 by 30 feet, with board roofs.

The library contains 210 volumes, principally histories and standard works of fiction.

The East Gallatin River, about 200 yards from, and above the post, supplies the command with water, which is brought to the post in tanks. The quality of the water is excellent, and the quantity sufficient for the necessities of the garrison.

The natural drainage of the post is good, the ground sloping to the river.

There are no arrangements for bathing in winter; in summer the men frequently bathe in the river.

The farmers in the vicinity bring in a plentiful supply of potatoes and other vegetables. Game, such as deer, elk, mountain sheep, and antelopes, is procured by hunters, and sells at ten cents per pound.

The mail is received regularly once a week. A letter requires fourteen days to reach department headquarters or Washington.

The prevailing diseases during the past year were, bronchitis, rheumatism, neuralgia, tonsillitis, and diarrhœa. The diseases of the respiratory organs are doubtless owing to the overheated and ill ventilated quarters in cold weather.

The population of Gallatin County is 1,200.

Statement showing mean strength, number of sick, and principal diseases at Fort Ellis, Montana Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	204.08	522	2	126	25	42	4	1	55	.....	27	.....
1869	191.66	322	4	61	19	42	36	.....	11	1	42	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP BAKER, MONTANA TERRITORY.

REPORT OF ASSISTANT SURGEON CLARENCE EWEN, UNITED STATES ARMY, JULY 18, 1870.

Camp Baker, Montana Territory, is situated in latitude 47° north, longitude 111° west, at an elevation above the sea of about 7,000 feet. It is on Smith's River, or Deep Creek, which empties into the Missouri about fifty miles below. The nearest post is Fort Shaw, situated about seventy miles northwest in a direct line, and 200 miles by the road. Fort Ellis is 120 miles south. The nearest town is Diamond City, 25 miles southwest.

The post was established in November, 1869, to protect Diamond City and other mining camps of the vicinity from Indian depredations, this being considered one of the most dangerous localities in the Territory.

A reservation has been selected about twelve miles south of here, and a new post will be built.

The rocks of the vicinity are granite, syenite, and limestone. The trees are red and yellow pine and cedar, growing on the hills, and cottonwood, aspen, and willow, on the river bottom.

Game is abundant; deer, elk, antelope, mountain sheep, and black and cinnamon bears, are the principal wild animals. The streams contain trout and grayling.

The post is on the west bank of Smith's River, about 150 yards from and 80 feet above it. The buildings are of pine logs, and consist of seven small huts, each 16 by 25 feet, roofed with pine slabs covered with earth, lighted by a small window in the door, and warmed by open fireplaces; three are used for officers' quarters, and have board floors; the one used for headquarter offices, and the three remaining, occupied by the enlisted men, have dirt floors; the other buildings are the stables, 116 by 26 feet, the post bakery, 16 by 15 feet, and the commissary store-house and company cook-house in the same building, 42 by 15 feet.

The hospital and guard-house are in tents.

The water is obtained from Smith's River, and brought to the quarters in barrels. It is warm and muddy, some of its tributaries being used for mining purposes. There is no post garden. Fresh beef of good quality, potatoes, and a good variety of canned fruits and vegetables, can be procured from the post commissary. Game of all kinds can be procured in the vicinity, and milk and butter from the neighboring ranchmen.

The medical supplies have been limited to a pannier, and a few articles procured from Fort Ellis. A portion of the stores of the post have been received, and when all arrive the supply will be ample. They are procured from St. Louis, Missouri, and are either shipped up the Missouri to Benton, Montana Territory, by steamer, or by the Union Pacific railroad to Corinne, and from thence by wagons to this post.

A mail is received twice a week. It takes about fourteen days for a letter to reach Washington, and about the same time to reach department headquarters.

The inhabitants of the vicinity are engaged in gold mining or grazing.

The general sanitary condition of the post has been very good. All offal is carted away some distance and burned. The prevalent diseases are neuralgia and rheumatism.

FORT SHAW, MONTANA TERRITORY.

REPORT OF SURGEON F. L. TOWN, UNITED STATES ARMY.

Fort Shaw, Montana Territory, is located on Sun River, about twenty miles above its mouth, in latitude $47^{\circ} 30'$ north, longitude $111^{\circ} 4'$ west. The elevation above the sea-level is probably not less than 5,000 feet. The valley of Sun River is about fifty miles in length, with a variable width of two to five miles, and its general direction is nearly due east and west. Fort Shaw, as a military post, may be said to date from June 30, 1867, when four companies, under command of Major William Clinton, Thirteenth Infantry, moved on to the selected site and went into camp. The new

post was named Camp Reynolds. The object of a military post on Sun River is to protect and keep open the route from Helena to Fort Benton, on the Missouri, and prevent as far as possible the incursions of Indians into the settlements to the south. The Thirteenth Infantry had moved up the Missouri River during the summer of 1866, and the first battalion, under Major Clinton, took post that fall and built Camp Cooke, Montana Territory, (since abandoned,) near the mouth of the Judith River. August 1, 1867, the name of the new post was changed to Fort Shaw, pursuant to department orders, dated July 4, 1867, in remembrance of the services of the late Colonel Robert G. Shaw, Fifty-fourth Massachusetts volunteers, (colored,) who lost his life at the assault on Fort Wagner, July 18, 1863. In August, 1867, all were in tents and very little had been accomplished towards building a post or sheltering the troops during the ensuing winter. By hard labor the command erected that fall (1867) one-half of each set of company quarters, a small part of the post hospital, a temporary wooden store-house, and three sets of officers' quarters. The troops did not get into barracks until late in the fall and after the weather became quite cold. The officers were somewhat later in getting into their quarters. None of the buildings occupied were completed further than to afford habitable shelter. The winter of 1867-'68 was not of great severity, and though officers and men were necessarily greatly crowded, no one suffered. Early in the spring of 1868 the building of the post was resumed, and during the season the walls of the remaining buildings at the post were put up and roofed. The following season (1869) was occupied exclusively in finishing the quarters already erected and rendering them comfortable. At present all labor is suspended.

The military reservation of Fort Shaw occupies the whole valley for ten miles at least. The valley basin is simply an extensive depression in the elevated plains of the country, and presents in the main a prairie bottom from two to three miles wide, with a higher prairie surface of moderate width extending along the foot-hills on either side. The bluffs are therefore merely the steep ascents to higher levels beyond. Their elevation on the north is abrupt and in the vicinity of 250 to 300 feet; on the south the elevation is generally less. All the steeper slopes are covered with a thin soil, hence the valley has not that exposure of the bare sandstone strata and desolate aspect so universal in the valley of the Upper Missouri.

In the vicinity of the post and on the south are three isolated buttes of considerable height, the central and longer of which encroaches somewhat upon the valley. From the base of this butte a nearly level plateau of some extent slopes with a gentle incline to the river, and ends in an abrupt bank. This plateau is two or three miles in width, and considerably higher than the prairie bottom, which it trenches upon very considerably. At the extremity of this bench, immediately on the southern bank of Sun River, is the site of the post. The elevation above the river is some forty feet. The post commands an extended view of the valley toward the west, and of the Rocky Mountains in the background.

Sun River is a stream of moderate size during the greater part of the year, and runs in a succession of short curves in a shallow channel. It is a clear stream, gliding over a bed of rounded stones and gravel; the descent is considerable and current strong. It is scarcely more than twenty yards wide, and is fordable anywhere except toward its mouth. The river forks several times near the head of the valley. These forks are said to be of considerable length, and drain the eastern slopes of the extensive belt of mountainous country to the west and north. During the spring and early summer the snow melting in the mountains, and the rains which prevail at this season, swell the river to many times its usual volume. At this time it is an exceedingly rapid and somewhat dangerous stream. The river is only moderately well supplied with fish, and usually affords but indifferent sport to the angler. Trout are found, but other and less desirable varieties are more common.

The valley is almost destitute of wood for fuel. A growth of bushes, and a few scattering trees, fringe the river along the reservation, and afford in summer a ribbon of green foliage. Elsewhere upon the grassy country there is not even a shrub visible. The tree is a species of willow, with a very thick rough bark, resembling cottonwood. Extensive sparsely wooded tracts of clumpy pines cling to the steep slopes of the mountain sides, degenerating into the scrubbiest of saplings toward the summits. Pine wood is delivered at the post by contract at about \$10 per cord, and is now obtained not less than eighteen or twenty miles distant. In a few years the cost

of wood at the post will probably be much increased. Lignite beds of considerable extent are found on the Dearborn River, not more than thirty miles distant. A small quantity of this coal was delivered at the post for trial. It appears to burn freely, with the strong odor incident to lignite, and left unconsumed only a small percentage of earthy residuum. It is scarcely probable that lignite deposits will be found in the valley. These lignite beds, if properly worked, should afford an abundance of fuel at reasonable rates. Below the reservation a few ranches have been taken up in the valley by settlers. Several other ranches are located in the hills to the south. These settlers raise quite a supply of vegetables, which they bring to the post and retail to officers and men at high prices. The larger valleys of the Territory, viz., those of the Gallatin, Deer Lodge, Bitter Root, and other rivers, have extensive areas under cultivation. All of them contain much more arable land than Sun River Valley. These valleys produce already large quantities of oats, barley, and wheat, as well as vegetables of nearly all kinds. Grain for the use of public animals is therefore obtained exclusively in the Territory. Vegetables are likewise purchased each fall by the commissary department in reasonable amounts. The wheat grown in the Territory looks bright and plump enough, but for some cause the flour is altogether of inferior quality compared with that brought from the States, and the bread made of it has a dark color and is generally heavy. Even the best brand of Montana flour is entirely unreliable. The variety known as spring wheat is alone raised, because the winters are open and withal windy. Ranchmen say that the winds in winter are liable not only to blow away the surface soil of their winter wheat fields, but the sown grain also with it. The lack of winter wheat, and perhaps of first-class mills, may account for the comparatively poor grade of mountain flour. Corn will not ripen well in the valley, neither will tomatoes mature. Frosts are liable to occur late in the spring and early in the fall.

The valley as a whole is not very well adapted to agricultural purposes. The nature of the subsoil is extremely unfavorable, since whatever moisture the soil absorbs is almost immediately drained off into the underlying beds of coarse gravel and pebbles. A constant supply of water is necessary, as the soil is unable to retain its moisture. The natural result of this condition is, that as soon as the spring rains cease the soil and country rapidly become almost as dry as an ash heap. Wherever a different subsoil of fine sand or sand and clay is found above the gravel beds, the settler can plant with a reasonable assurance of a crop. Irrigation is always resorted to, and for vegetables especially is probably indispensably necessary. Owing to the absence of springs along the foot-hills, water for irrigation must be obtained from the river. This entails great labor in digging and maintaining a long ditch to convey the water. Hence, only selected portions of the prairie bottom are eligible for cultivation, although it is not altogether impracticable to convey water for irrigation on the higher levels. The valley bottom is well carpeted each spring with a fine expanse of grass, but as the season advances and the moisture fails a partial arrest of growth takes place, and the mature grass is rarely sufficiently abundant for mowing. The hay used at the post is therefore furnished by contract from the valley of the Missouri.

The country is well adapted to grazing. The short and dry upland grass is even more nutritious than the more succulent herbage of the prairie bottom, and animals, if left to their own choice will seek the higher prairies. Cattle will live and thrive on this dried grass throughout the entire winter, hence ranchmen usually allow their animals to graze on the prairie without shelter the year round. There are thousands of working cattle employed in freighting across the country, and always on the approach of winter they also are driven into the valleys, or localities where no great depth of snow falls, and required to forage for themselves. Some of these cattle are annually wintered in this way in Sun River Valley, although in latitude $47^{\circ} 30'$ north; they are reduced by hard usage and constant labor, yet are driven up recruited and active in the spring.

The ordinary surface rock of the country is sandstone. Occasionally the high plateau to the north terminates abruptly in a vertical escarpment of 50 to 100 feet elevation facing the valley, and giving a view of the successive layers. Superiorly the sandstone is friable and of a light color; lower down the rock is somewhat harder, and darker shades prevail. A broad band of a noticeable dark color is suggestive of lignite beds. Exceptionally and from local causes, though not in this immediate vicinity, the beds are more or less tilted. The strata on both sides of the valley yet maintain a very nearly horizontal position. Hence the valley is unquestionably the result of extensive denudation and excavation, and not of upheaval. Generally along the course

of the valley the whole thickness of the sandstone deposit has been cut through and removed, exposing an underlying strata of shale or shaly limestone, where it is not buried beneath the drift or other later post-tertiary deposits. The question as to the mechanical means by which such vast excavations of rock strata have been effected might find an ample solution solely in the wonderful but well-recognized erosive power of running streams in the formation of valleys or river courses. In this case the eroding and degrading action of the water would be much facilitated by the comparatively soft nature of the rock, and the very considerable slope of the land. The present pitch of the valley is some 10 feet or 15 feet to the mile. During the earlier post-tertiary period, however, glaciers, fed from the adjacent mountain range, very likely crept down the elevated plateaux spread at their base, and effectually wrought with the streams, grooving out the valleys, planing down the surface, and molding it into something of its present conformation of high rolling prairie and valley interval. The sandstone found in the valley is probably a conglomerate. In it are seen abundant concretions of a spheroidal shape, as well as flattened concretionary layers. These concretions are apparently developed only after exposure to atmospheric agencies, and are, therefore, not seen in the unaltered rock. As decomposition progresses they often become very numerous; so much so that the whole exposed ledge appears as if made up of rounded, or, more commonly, flattened concretions, with crumbling rock between. The concretions are frequently more or less calcareous, especially those of an ovoidal shape, and in some localities contain fossil remains. Along the slope of the sandstone strata on the north side of the valley, opposite the post, numerous concretions are seen in the rock, which are filled with fossil shells. They are of considerable size, fissured and shaly, and readily break to pieces with a slight blow, leaving the casts of shells exposed. These casts themselves are generally fragile and quite imperfect. Higher up the valley, on the south side, round boulder-like concretions, of various sizes, are freely met with. Being much harder than those containing rock, they are gradually set free by its slow wear and disintegration. After their release they lie on the crumbling surface or roll down the incline and repose along the foot-hills. In places these rounded, boulder-like developments must have progressed in the sandstone with unusual energy, for they are exceedingly abundant over the slopes and foot-hills. About eight miles above the post are several acres so thickly strewn with them as almost to cover the ground. These boulders are regularly oval in shape, some of them weighing several tons each, and are themselves apparently very slowly acted on by the frost and atmosphere. They are undoubtedly calcareous. The disintegration of the sandstone formation has produced other curious results in some localities. The rock has crumbled away, leaving a small, spherical concretion supported on a short column; or a flattened concretion rests on a low pedestal not unlike a table. Sometimes these capped columns stand in a row, and at a distance appear much like a file of men marching up the bluffs. The shaly limestone, as seen undisturbed in the beds, has a moderately compact laminated structure, apparently easily worked and an excellent stone for buildings. It comes out truly without difficulty in fine rectangular slabs, some of which are of a blue color, hard, and almost crystalline; others, however, are softer, and have a black slaty look calculated to awaken suspicion. In fact, the stone is almost worthless for any use whatever. Soon after being quarried it begins to fissure, and, readily separating into thin lamina, crumbles rapidly. An exposure of a few months only will reduce any but fragments of the harder layers to a shapeless mass. The harder layers are decidedly calcareous and react freely with any acid. It was inferred by some, therefore, that portions of the rock might be successfully burned into lime. The experiment with the stone in this direction likewise signally failed. After driving off the carbonic acid gas a very little lime, much sand, and some clay remained.

In the vicinity of the post and standing just on the borders of the valley are three distinct bluffs or buttes, separated by an interval of a mile or more, and rising even to a greater height than the opposing country to the north. These buttes present a somewhat novel and interesting feature; they are topped out with a layer of dark igneous rock overlying the sandstone. The more easterly of these is widely known throughout the country as the "Crown Butte." It is a large oval-shaped hill, entirely isolated, and rising abruptly to a height, I should judge, of 500 or 600 feet above the valley bottom. The overlying stratum of trap exhibits a perpendicular ledge, of from 50 to 100 feet in thickness, encircling the top of the mountain. This vertical ledge of dark igneous rock gives the butte a very bold aspect, and appears not unlike a crown resting on its summit.

The butte to the west is also a "crown butte;" and though of lesser circumference is strikingly similar in form and appearance. The intervening butte is longer and more irregular in outline, with dark ridges of igneous origin breaking the uniformity of its slopes.

The summit of the "Crown Butte," which is somewhat higher than the others, is a comparatively level, oval-shaped area, about one and one-half miles across on its longer by one mile on its shorter, or conjugate diameter. The peculiar formation of the "Crown Butte" is such that except for two or three partial breaks in the trap ledge it would be nearly impossible to climb to its summit. As it is the ascent is somewhat difficult. Standing on the buttes their outspread prairie summits look to be, as they undoubtedly once were, simply a continuation of the high prairie level to the north, the continuity of surface having been evidently only severed by the valley excavation. The ledges which surmount the buttes are evidently, as before stated, true igneous rocks, which have been ejected in a molten state up through fissures in the earth's crust. It is a coarse rock, and in the ledges very compact; in other situations it is not so compact, and consists of feldspar and hornblende or augite, the latter in small elongated prisms. The rock belongs, therefore, to the augitic series, and is properly a variety of dolerite. It has a high specific gravity and a dark color, ordinarily a dark gray or greenish black. Wherever found it is more or less jointed or basaltic, and in the ledges presents often a beautiful compact columnar appearance. A dike-wall intersects Sun River Valley about one and one-half miles above the post. In the river bottom it has, however, been mostly swept away and buried beneath the alluvium. It comes out of the sandstone strata on the north side of the valley as a well jointed wall, and looks not unlike the remains of an ancient race. To the south, on the opposite side of the butte, one can see this same dike-wall cutting across the adjacent valley into the mountains beyond. Isolated comb-like ledges are sometimes unexpectedly met with. The most interesting illustrations of these is the bird-tail rock, fifteen miles to the south. This is a thin fan-shaped ledge projecting straight up in air 100 feet or more, through a sandstone hill on which it is perched. The apex of the ledge is probably 200 and 300 feet above the surface level below. Among the fossil remains found in the valley the mollusks are apparently in the ascendant. So far as I am able to form an opinion they seem to bear a closer resemblance to the species of the cretaceous period than to those of tertiary beds. One specimen especially, jointed and of some length, and which is probably the *Baculites compressus* (Say) of the Upper Missouri, is very abundant. Ammonites (probably) of a very large size are also seen, as well as members of the oyster family, and many other species. On the other hand, the strata would seem to be of the same formation in which lignite beds occur, and which are generally considered brackish water deposits of the early tertiary period. A lignite bed is found in the valley of the Dearborn River, thirty miles distant, and the strata occupying the intervening country appear on the whole to be very little disturbed, though in places the surface is broken by ridges and hills of igneous rock. The lignite deposit itself, however, is considerably tilted to the west. Hence the bed might possibly be an earlier formation than the strata of Sun River Valley, especially as the latter are possibly tertiary also, and not deposits in cretaceous seas.

Various kinds of large game abound in the country, though not so plentiful in the immediate vicinity of the post. The white-tail deer frequents the brush along the river; black-tail deer are found on the higher prairies, and antelopes are quite numerous everywhere. Bands of elk graze along the mountain slopes, and the mountain sheep ("big-horns") inhabit the bolder inclines. Hunting these animals affords plenty of sport for those who have much patience and scorn fatigue. The buffalo seldom advances west of the Marias River; beyond they are in great numbers. The smaller kinds of game are not very abundant. A few wild duck of various species frequent the rivers and sloughs; likewise wild geese, brant, &c. A few sage hens and prairie chickens are found; the latter are on the increase. Beaver make their home in the streams, and the otter and muskrat are met with. Wolves, coyotes, foxes, hares, rabbits, pole-cats, prairie dogs, and gophers inhabit the prairies, while grizzly and cinnamon bears, the panther, and lynx are less numerous, and generally confine themselves to the vicinity of mountains.

The valley is almost destitute of water, aside from the river. A few small springs flow out of the foot-hills along the valley, but generally their feeble rills scarcely more than moisten a few yards or rods of the prairie bottom, in which they are speedily lost. A large spring or springs comes up in the prairie bottom opposite to and about one and a half miles distant from the post,

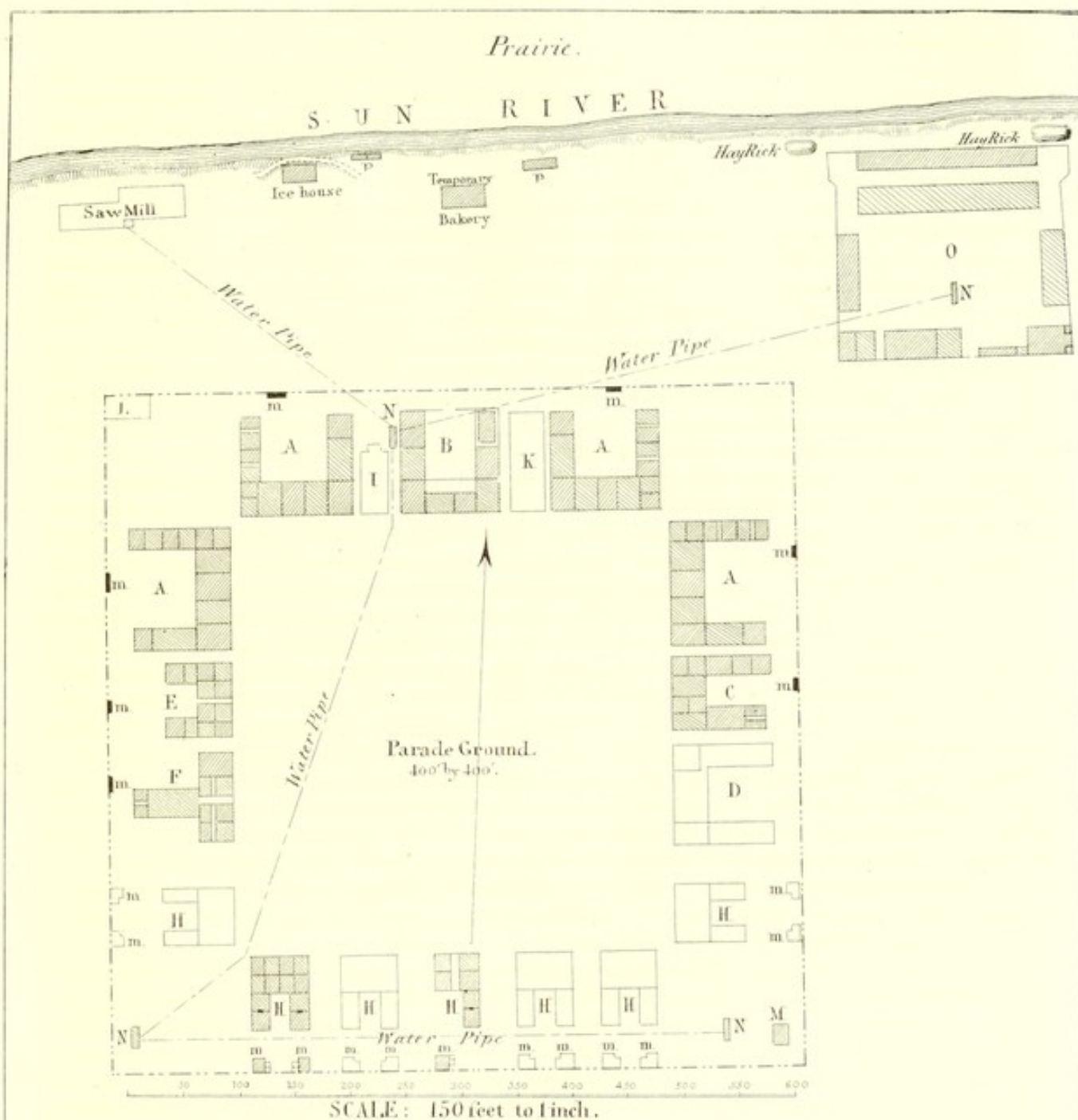
and forms an extensive slough. This slough remains the year round, and is a favorite resort of various species of wild ducks.

The climate of the Territory is exceedingly dry all the year round. The aggregate fall of rain and snow (melted) for the year 1868 was 10.14 inches, and for 1869, 7.46 inches. At other seasons than the spring and early summer, the showers seem scarcely at all to moisten the exsiccated soil beneath the surface. Snow rarely lies on the ground long after a storm. High westerly winds prevail and drive much of it into drifts; at the same time the current of dry atmosphere moving over the surface melts the snow, and bears away the moisture quite as fast as melted. It is interesting to watch the snow banks thus mysteriously dwindle away and disappear, perhaps altogether, without leaving the customary puddles of mud and water behind. Snow on the mountains is usually abundant and of great depth. The roads in winter are, as a rule, in fine condition, and the wheeling good. The want of humidity in the atmosphere is to be ascribed partially, perhaps, to the altitude, but is also largely due, probably, to the obstructions of high mountain chains to the west. The Cascade Range is a formidable obstacle to the passing inland of clouds gathered over the areas of the Pacific. The intervening mountains receive contributions in rains, as the vapors climb to the higher plains and cooler atmosphere beyond, and the main divide of the Rocky Mountains offers the final barrier to the arrival of moisture to the great plains on their eastern slopes. The extremes of mean temperature, although considerable, are not so great, perhaps, between the summer and winter months as one might anticipate, considering the high latitude. The mean temperature for the year 1868 was 45.25° F., and that of 1869, 47.35° F. In 1868, total increase of mean temperature from January to July is 59.41° F., and the corresponding decrease from July to December, 44.51° F. The diurnal oscillations of temperature, however, are usually quite marked at all seasons of the year. The variations in the daily observations, which are registered at 7 o'clock a. m. and 2 o'clock and 9 o'clock p. m., respectively, are frequently from 20° to 30° F. Hence it follows that the nights are generally cool in summer, although the temperature may be high at mid-day. The heat of summer is quite inconstant; a high temperature rarely obtains for more than three or four days in succession. In winter, likewise, the periods of intense cold are infrequent, and scarcely continue for more than a week at a time. Winds are exceedingly prevalent at all seasons of the year, though they relax somewhat during the summer months. The fact that they attain a monthly mean force of three and four, (which is the equivalent of a constant and uniform velocity of 10 to 20 miles an hour,) through three-fourths of the months in a year sufficiently indicates this. Their usual direction is down the valley from the west. The location of the post is, however, very favorable to catch the full force of winds. The valley is narrowed slightly here by an encroachment of the bluffs on the south. The air currents are consequently driven by the post at a somewhat higher velocity than elsewhere.

The post is built around a square of 400 feet side, and very nearly in accordance with plans designed by General Reeve in 1867. The adobe brick was used exclusively in constructing the walls of the buildings. The dimensions of the brick used are 6 inches by 12 inches, with a thickness of 4 inches. All outside walls of buildings are 18 inches in thickness, and the inside walls, likewise of adobes, are one foot in thickness. The officers' quarters, especially, are well finished inside throughout; the walls are plastered, the doors and windows cased and painted white. The arrangement of the post is shown in Plate No. 9.

The company quarters are four barracks, each 102 feet front, and built alike. Each contains orderly sergeant's quarters, 15 by 15 feet; company store-room, 15 by 14 feet; four dormitories, each 20 by 30 feet, and 9 feet high—5,400 cubic feet air space, or together, 21,600 cubic feet of air space; mess-room, 18 by 40 feet; kitchen, 18 by 18 feet; laundresses' quarters, each room, 15 by 15 feet. The 21,600 cubic feet air space to a company gives 313 cubic feet per man, when the company is at the minimum organization of 69 men, or about 190 cubic feet to a man when the company has a maximum of 119. Each dormitory is well lighted by four windows, 12 square feet of glass to a window, or 48 square feet of glass to a dormitory.

Commissary of subsistence and quartermaster's store-houses, 90 feet front; office of commissary of subsistence, 16 by 14 feet; clerk's room, 13 by 14 feet; issuing room, 30 by 15 feet; store-rooms, each 27 by 30 feet; cellar for subsistence stores, full size of back store-room; quartermaster's issuing room, 27 by 30 feet; store-rooms, each 27 by 30 feet. Yard 30 by 60 feet, inclosed at



PLAN OF
FORT SHAW
Montana Territory.

NOTES.

- | | |
|--|--------------------------------|
| A. Men's Quarters | L. Bakery |
| B. Q.M.'s & Co's Storehouse | M. Magazine |
| C. Band quarters & Guardhouse | N. Water Tanks |
| D. Q.M.'s & Co's Storehouse | O. Corral, temporary, of Slabs |
| E. Offices, District & H.Q.'s | m. Sinks & Outhouses |
| F. Post Hospital | p. temporary sinks. |
| H. Officers' Quarters | |
| I. Chapel, Library & Courtmartial Room | |
| K. Ordnance Room, School & Billiard Room | |

D. French, Langran & Ogilvie, Lith. Wash^o.

the rear by a high wall and gate. Band quarters and guard-house, 68 feet front; all rooms 9 feet high in the clear. Band dormitory, 19 by 30 feet—5,130 cubic feet air space. An occupancy of 16 gives 320 cubic feet air space per man. Sergeant and drum-major's rooms, front room, 15 by 15; back room, 15 by 14 feet. Band mess-room, 15 by 15 feet; band kitchen, 15 by 15 feet. Laundresses' quarters, 15 by 15 feet; guard-room, 17 by 30 feet; officer of guard's room, 10 by 15 feet; sergeant of guard's room, 10 by 14 feet; general prison, 18 by 18 feet, and 9 feet high—2,916 cubic feet air space. Separate cells, each $3\frac{1}{2}$ by $6\frac{1}{2}$ feet, and without windows. These are of stone, and partially built. One could scarcely credit the construction of windowless stone dens only 3 feet 6 inches wide, and 6 feet 6 inches long, to the end of imprisoning men in them.

The building temporarily occupied by the quartermaster and commissary as a store-house is a wooden structure, designed to be replaced by one of adobe, and of the same model as the store-house marked B.

District and post headquarters, 68 feet front. Offices, district headquarters, front rooms, 14 by 15 feet; rear rooms, 14 by 14 feet; offices, post headquarters, front rooms, 13 by 15 feet; rear rooms, 13 by 14 feet; non-commissioned staff quarters, each 15 by 15 feet; hall, 7 feet wide, with stairway.

The hospital is 82 feet front. Its arrangement is shown in Figure 56.

A, ward, 24 by 44 feet; B, bath-room, $8\frac{1}{2}$ by 11 feet; G, dead-room, $8\frac{1}{2}$ by 11 feet; C, office, 12 by 18 feet; D, dispensary, 12 by 16 feet; H, main hall; K, kitchen, 12 by 16 feet; L, steward's room, 12 by 15 feet; M, small ward or dining-room, 18 by 30 feet; N, attendants' room, 12 by 18 feet; V, matron's room, 12 by 15 feet. All rooms except the wards are 9 feet high in the clear. The small ward is designed for six beds; mean height, 12 feet; 6,480 cubic feet air space, or 1,080 cubic feet per bed; habitually used as a dining-room. Main ward, capacity sixteen beds, 24 by 44 feet; mean height, 14 feet; 14,784 cubic feet air space, or 924 cubic feet air space per bed. The main hall is 8 feet wide, with stairway side halls, each 4 feet wide; rear hall, 6 feet wide. Shaft ventilation alone is used in the wards, because of winds and the high latitude. A commodious store-room is finished off under the roof over the surgery, dispensary, &c. The hospital grounds are limited and without shade trees, as the soil is a bed of coarse gravel and pebbles.

The commanding officer's quarters contain a hall, 7 feet wide, with stairway; rooms, each 15 by 15 feet; kitchen, 15 by 12 feet, with pantry and small cellar underneath; servants' room, 15 by 10 feet, and two garret-rooms. The officers' quarters are a double set, under the same roof; hall, 7 feet wide, with stairway; front-room, 15 by 15 feet; back-room, 13 by 15 feet; small mess-room cut off from hall, 9 by 15 feet; kitchen, 15 by 12 feet, with a pantry and small cellar underneath; servants' room, 15 by 10 feet. Each set of quarters has also a garret-room. All the officers' quarters, the store-house, the offices, and hospital have permanent shingled roofs; other buildings have roofs similarly constructed, but boarded temporarily. Chapel and library not erected; ordnance-room and post school not erected; post bakery, a temporary wooden building; magazine, a temporary excavation covered with earth. Water tanks, with wooden pipes, (not serviceable;) out-houses and sinks, built of adobes, except those used by the men toward the bank of the river, which are wood, and temporary.

The supply of water is obtained at present exclusively from the river, and is distributed to the post by means of a water-cart. The water is comparatively wholesome, except perhaps during rains or the melting of snow, when water which has percolated through the alkaline soil of the valley finds its way into the river. This gives the water a saline taste, and renders it liable to disturb the bowels somewhat. Water may be reached in wells by digging a little below the level of the bed of the river, but it is not suitable for use, for the reason above indicated. The com-

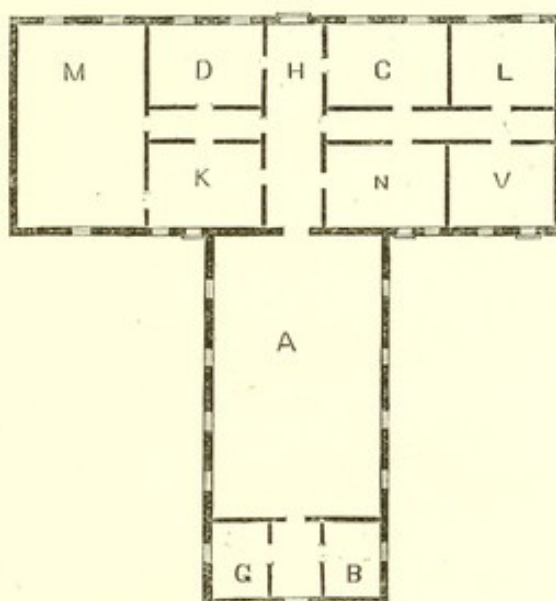


Figure 56.—Scale, 30 feet to 1 inch.

manding officer has undertaken to bring a running stream of water on the parade ground from the river. A ditch receives the water about six miles above the post, and its entire length is some eight miles. The river at that point is sixty feet or more above the level of the parade. This is an enterprise of great labor and not a little difficulty. The stream has yet to be brought about one-third of the distance. Surface drainage only is employed; the slope towards the river is very gentle; water, however, seldom stands on the surface in this dry climate.

The cemetery is located about half a mile west of the post.

The post and company gardens are at present of limited size. They are situated in the prairie bottom, about a mile below the post. A suitable irrigating ditch, upon which considerable labor has been expended, conveys water out of the river, just below the post, on to the ground. Either because the gardeners were scarcely adepts at irrigating, (as is most probable,) or from other causes, the gardens have afforded as yet no adequate supply of any vegetables, except perhaps lettuce and radishes. It is in contemplation, however, to add largely to the gardens with a view to raising an abundance of vegetables at the post. The grasshoppers which annually swarm in myriads in many localities, and are so destructive to vegetation, seldom invade the valley in numbers sufficient to inflict great injury. In 1867 they were quite numerous, and where they prevailed the crops of the settlers suffered.

The prevailing diseases of the post and vicinity are epidemic catarrhs during the fall and winter, and catarrhal inflammations of all mucous membranes; acute diarrhœa, frequently dysenteric, has been especially prevalent at the post; at the same time many cases of febricula occur. Attacks of acute rheumatism are very common notwithstanding the dryness of the climate; probably the sudden transition from a dry to a moist atmosphere, when storms occur, which are often attended with considerable fluctuations of temperature, favors the development of this disease. Remittent and typho-malarial, and probably enteric fevers are not infrequent in the spring and fall, especially among miners and hunters, or persons who are generally without shelter; these in the parlance of the country are termed "mountain fevers" indiscriminately. Three cases of typho-malarial fever have occurred at the post, two of citizens and one a soldier, and with a fatal termination in each instance. I have known of no cases of intermittent fever that have with certainty originated in the country; neither is phthisis pulmonalis incident to the climate, so far as I have observed; incipient phthisis is frequently apparently arrested in this climate, though but imperfectly if tuberculous exudation has taken place to any extent. Small-pox, when it occurs, makes dreadful ravages among the Indian tribes. A Catholic father, who is laboring with the Blackfeet Indians, gave me the following statement of deaths from small-pox in the Blackfeet nation alone, from December 2, 1869, to May 1, 1870: Men, 681; women, 378; and of children, 341; this gives a total of 1,400 deaths from small-pox in a population of perhaps 7,000 or 8,000 souls. The younger members of the tribes suffered most, since many of the older members had previously had the disease. A famine fever (relapsing fever probably) also prevailed in connection with small-pox, and increased the mortality. The white population has also suffered from small-pox to some extent the past year.

There is a post office at Fort Shaw, and a mail route from Corinne, on the Central Pacific railroad, via Helena, to Fort Benton, Montana Territory. Coaches pass regularly over the road, and bring the mail three times a week. The distance from the post to Corinne is about 500 miles. A telegraph wire extends along the same route, with an office at Fort Shaw.

Statement showing mean strength, number of sick, and principal diseases at Fort Shaw, Montana Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	258.58	365	1	25	78	12	3	32	3	113	.....
1869	185.83	215	.....	30	21	16	5	14	.....	76	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF THE COLUMBIA.

POSTS DESCRIBED.

Fort Colville, Washington Territory.	Camp Three Forks Owyhee, Idaho Territory.
Fort Cape Disappointment, Washington Territory.	Fort Stevens, Oregon.
Fort Vancouver, Washington Territory.	Fort Klamath, Oregon.
Fort Lapwai, Idaho Territory.	Camp Warner, Oregon.
Fort Boise, Idaho Territory.	Camp Harney, Oregon.

FORT COLVILLE, WASHINGTON TERRITORY.

REPORT OF ACTING ASSISTANT SURGEON E. Y. CHASE, UNITED STATES ARMY.

Fort Colville is situated in Washington Territory, in latitude $48^{\circ} 41'$ north, longitude $117^{\circ} 55'$ west; altitude above the sea, 2,800 feet. It is about 35 miles south of the dividing line between the United States and British Columbia, and 14 miles east of the Columbia River. The Cascade Range of mountains is about 150 miles west. Old Fort Colville, a Hudson Bay trading post, is located on the Columbia River, 14 miles west. Forty miles north of Colville, also on the Columbia River, is another Hudson Bay post, Fort Shepard, which has but one employé, and is not of much importance. Fort Lapwai is the nearest United States military post. The Jesuits have a mission in the immediate vicinity of the post, and a church on the Columbia River, at the Kettle Falls, 16 miles distant.

The post was established June 30, 1859, to guard against the Indians who were very hostile, having defeated Colonel Steptoe near the Spokane River the previous year, in June. The Government reserve consists of about one square mile of land of a very irregular form. On the north side it is bounded by a small stream of water, which runs the Government saw-mill; on the east and west sides by hills ranging in height from 200 feet on the east side to 800 or 900 feet on the west. On the south side the reserve is an open valley. The town of Colville is north of the post about one-half mile. It contains a post office, three stores, one saloon, one blacksmith shop, and one carpenter shop, a boarding-house, about twenty buildings, and 50 inhabitants.

The soil of the valley is very fertile, producing in abundance all the cereals, except Indian corn, for which the nights of the summer are too cold. Much of the land in the vicinity is too dry for any farming purposes, except where it can be irrigated, when any of it will produce fine crops of wheat and oats.

The geological formation is limestone, interspersed with granite, quartz, and slate. Of mineral productions, gold in minute quantities is found in the sands of all the mountain streams. Galena is also occasionally found in small quantities. Iron is generally diffused. But a small portion of the soil upon the reservation is tillable. It is mostly an elevated terrace, composed of gravel, but on the north side, near the creek, the soil is a rich loam, containing considerable alkali; and this is the location of the post garden. Clay of good quality for making brick is found in abundance in the vicinity. Pine and fir grow in great abundance, suitable for rough building and agricultural purposes, especially valuable for fire-wood; also white cedar, tamarack, cottonwood, wild cherry, vine maple, thorn, hazel, and willow.

White and black-tailed deer are seldom seen in this vicinity; black and brown bears are in abundance; cougar, lynx, coyote, red fox, wolverine, beaver, otter, marten, mink, fisher, and badger are found. Of birds, there are ruffed grouse, wood or blue grouse, caper kelzie or cock of the mountain, prairie grouse, curlew, pigeon, dove, ducks and geese, and other varieties of water-fowl in great abundance. Of fishes, there are the salmon and salmon trout, in the Columbia River and all its large tributaries not too much obstructed by falls. Trout are in great abundance in all streams.

The mean annual temperature for ten years was 48.54° F.; hygrometer, 44.30° . The coldest days were the 16th, 17th, and 18th of January, 1862, being -32° ; greatest heat, August 11, 1860, and July 29, 1870, being 96° F. in the shade. Average yearly fall of rain 25.75 inches. Snow sometimes falls during the first week in November, and in rare instances as early as the middle of October, but in these instances melts soon, and begins to fall steadily about Christmas, when it lies on the ground until the 1st of March. The cold is extreme, the atmosphere dry, crisp, and bracing.

The fort is located very near the center of the reservation upon an elevated and level gravelly plain, containing about 150 acres of ground. It is distant from the creek, bounding the reserve on the north side, about 500 yards, and elevated above it about 60 feet. The post is built of hewn logs, the buildings being arranged on four sides of a parallelogram. At the post are four buildings originally intended and once occupied as barracks for soldiers, 88 by $28\frac{1}{2}$ feet and $10\frac{1}{2}$ feet high to the ceiling; they are built of logs, not hewn, but filled between with mortar. Only one of these buildings is used as quarters at present. It is well ceiled with rough boards, and against its north end is built a frame building, 15 by 16 feet, and 9 feet high, used as first sergeant's room. Each of the barrack buildings is intended to accommodate a full company. Of the other three buildings, the middle one is used as a theater, with a room, 20 feet wide, partitioned off for ablution room; one as a drill-room during wet or inclement weather; the fourth has never been finished, and at present is the quartermaster's store-house. The barracks are warmed by two immense fireplaces, one at each end of the room, and lighted by two windows in front and four in the rear, and ventilated by a large opening in the ceiling, in the middle of the room, communicating with openings at the ridge of the roof, protected by boxes perforated for exit of the air. The fireplaces also are very efficient ventilators. When the quarters are full the air space per man is 572 cubic feet, but as it is never completely full the real space per man is much greater. The room contains 25 wooden bunks, $3\frac{1}{2}$ feet wide, each occupied by two men. The only wash and bath-room for the soldiers is the room before mentioned, as a portion of the middle barrack building; it has a large fireplace, and sinks, but no bath-tub. Each barrack building has its kitchen and mess-room in a long building with one large room, situated 60 feet back, with its long diameter perpendicular to the barrack; it is 60 by 26 feet, and $10\frac{1}{2}$ feet high. The one now in use has two windows on each long side; one door in front and two in the rear. Three small rooms are partitioned off the rear end of the room for a pantry, wash-room, and wood storage; it has a large fireplace and fine range. There are eleven sets of laundresses' quarters, built of logs. Four buildings are used as officers' quarters; three more were built for that purpose, one now used as adjutant's office and post library rooms; two have never been finished. All are built of hewn logs, and well finished in a plain, substantial manner; are lathed and plastered, and well painted inside. Two of them have been hung with paper, at the expense of officers living in them. They are one and a half stories high, the rooms above having never been finished. Each set contains four rooms with hall between, in the building proper, and kitchen and pantries in the rear. In the set of quarters occupied by the commanding officer, (middle set in the row,) the main building contains four rooms, with a hall, 7 feet wide, running between from front to rear; the rooms are 16 by 16 by 9 feet, the upper half-story not having been finished. In the rear are the pantry, 9 by $9\frac{1}{2}$ by 8 feet, and the kitchen, 14 by $14\frac{1}{2}$ by 8 feet; then a porch, 6 feet wide, running back 51 feet, and in front of the wood-shed and kitchen; the wood-shed is next to the kitchen, and is 25 feet long; in the rear of the wood-shed is the privy. The two sets of quarters, which are on the east and west sides of the commanding officers' quarters, were originally intended as double quarters, but in dividing the rooms for that purpose they were made entirely too small for comfort, the largest room in the building having been only 12 by $13\frac{1}{2}$ feet in size; the fault was remedied by removing the partition between one of the halls, closing one front door, thus giving a large parlor, 12 by 21 feet in size; the height of the ceilings in both buildings is 9 feet; they have a porch, 6 feet wide and 47 feet long; a hall, 7 feet wide, runs from front to rear, the depth of the front rooms. At the end of the hall is a small room, 9 by 12 feet; on the left of this room is a bed-room, 9 by 12 feet, and in front, left side, is a room, 12 by $13\frac{1}{2}$ feet. All the buildings are heated by open fireplaces; supplied with water by an iron pipe which runs through the kitchens from the reservoir, and have no bath-rooms.

The commissary store-house is a building, 101 by 30 by 13 feet; it has a cellar, 7 feet deep, under

its whole length. The quartermaster's store-house is an old set of barracks, the old kitchen in its rear being used as a granary for oats.

The guard-house is a building of hewn logs, $40\frac{1}{2}$ by $30\frac{1}{2}$ feet; it has two large rooms front, $16\frac{1}{2}$ by $15\frac{1}{2}$ feet, divided by a hall, 6 feet wide, and four rooms back, of various dimensions, for cells. It is warmed by two large fireplaces, and has no special arrangement for ventilation. It is abundantly large, and sufficiently secure and gloomy; it has but one window, and that is in the guard-room.

The hospital is built of hewn logs, well lathed and plastered, and is whitewashed within and without; it is 42 by 30 feet, the part forming the kitchen, mess-room, and linen-room joining the main building at right angles; this portion is 45 by 18 feet, and has an uncovered porch, 6 feet wide, running its whole length. The plan is similar to that of the quartermaster's office; four rooms, with hall, 7 feet wide, between; the room on the left of the front door is 14 by 16 feet; the surgery, in the rear of this room, 14 by 16 feet. The room on the right of the front door is 13 by 15 feet; the room back of that, 15 by $16\frac{1}{2}$ feet. A porch, 6 feet wide, runs the whole length of the building on the west side or front. Behind the surgery, and in the addition, is the linen-room, 10 by 12 feet, with shelving all around, and a small room, 7 by 12 feet, used as a sleeping-room for the steward. Back of these rooms is the mess-room, 16 by 16 feet, and back of that the kitchen, 16 by 18 feet. A small addition, back of the kitchen, made of rough boards, is used as a wood-shed. The height of the ceilings, in the main buildings, is 9 feet; of the mess-room and kitchen, 8 feet. The main building is lighted by six windows. There is no arrangement for ventilation, except by letting down the top sash a few inches. Three rooms are used as wards; each has three beds; the air space per man is from 585 to 720 cubic feet. No bath nor wash-room; patients wash out of doors when able, otherwise in the wards. The privy is a small building, 75 feet to the rear of the hospital.

The Government stable is 117 by $31\frac{1}{2}$ feet; it is built of unhewn logs; is 9 feet high from floor to loft, and divided in the middle into two portions, by a passage, 13 feet 4 inches wide, running from side to side. On each side of each division are rows of stalls against the walls. The whole building has but one window, and that in the east end; is rough, dark, and poorly ventilated.

The library contains about 50 volumes.

The post is supplied with water from the creek; it is raised about 50 feet, by means of a water-ram, furnishing 1,080 gallons per day. The water is received in a reservoir of 50 barrels capacity, and is distributed throughout the garrison by means of iron pipes; the supply being insufficient, daily use of the water-cart is necessary. The water contains a small quantity of lime, and is of excellent quality. The natural drainage is excellent. There is no bath-house. For bathing the men go to the creek.

The post garden is situated in a bend of the creek, and contains about eight acres of ground. All the ordinary vegetables do well here, excepting melons, tomatoes, cucumbers, corn, beans, and squashes, for which the nights are too cold in summer, and the frosts too early and hard for them to mature. There are no hospital nor officers' gardens.

The mail is received once a week, is regular in summer, but not in winter. It requires ten days for a letter to reach department headquarters at Portland, and one month to Washington.

Attached to the Colville agency are about 3,600 Indians, in various localities, and of the following tribes, viz.: Colvilles, Spokanes, Pend d'Oriettes, Okanagans, Cœur d'Alenes, Sanpoils, Lakes, Isle de Pierres, and Melhows.

The general health of this post and vicinity is unusually good; there was no prevailing disease during the past year. Malarial diseases are entirely unknown in the country. Not one case of phthisis originated at this place; but two or three cases, which were imported, rapidly improved under treatment; phthisis, however, is very prevalent and very fatal among the Indians. But two deaths of adult whites have occurred in this vicinity during the past two years. One died of old age, and the other, a soldier, shot himself. Two or three children among the white settlers died during the same period; one from croup, the other from infantile diarrhœa.

Statement showing mean strength, number of sick, and principal diseases at Fort Colville, Washington Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	57.91	32	3	6	1	2	2	.....	2	.....
1869.....	69.25	69	5	8	8	6	8	1	8	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT CAPE DISAPPOINTMENT, WASHINGTON TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEONS W. E. WHITEHEAD AND RICHARD POWELL, UNITED STATES ARMY.

Fort Cape Disappointment is situated on the north side of the mouth of the Columbia River, latitude 40° 16' 32" north, longitude 124° 3' 13" west. The reservation contains about one square mile. The surface is rocky and in part densely wooded.

The barrack for enlisted men is a two-story frame building, 80 by 30 feet, by 28 feet high. It is situated about 30 feet from, and 4 feet above, high-water mark. The dormitories afford about 650 cubic feet air space per man. They have ridge ventilation, and are well lighted. They are fitted up with bunks in two tiers. The officers' quarters consist of three small frame cottages, each containing three rooms, a kitchen and two attic rooms. They are on a narrow sand-bank between Baker's Bay and the Pacific Ocean, and are about 50 feet above tide-water. Each has a small cellar and cistern.

The guard-house is built on piles over the water. The lower story is built of hewn logs, and is divided into fourteen cells, four of which are dark. The upper story is of plank, and is occupied by the guard.

The hospital is a one-story building, frame, plastered inside. It contains two wards, 15 by 18 by 14½ feet each, and intended for eight beds. The wards are well lighted and ventilated. There is an office and dispensary in one room, a bath-room, and a store-room.

The water supply is derived from a spring, the water being conveyed by wooden pipes through a filter box, and thence to the barrack and hospital. The drainage of the post is good.

The post is a healthy one, and there are no endemic or local diseases.

Statement showing mean strength, number of sick, and principal diseases at Fort Cape Disappointment, Washington Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	66.41	186	2	32	9	52	14	7	5	.....
1869.....	76.18	142	6	18	11	38	8	11	3	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT VANCOUVER, WASHINGTON TERRITORY.

INFORMATION FURNISHED BY SURGEON GENERAL J. K. BARNES AND SURGEON J. H. BILL, UNITED STATES ARMY.

Fort Vancouver is situated on the north bank of the Columbia River, 120 miles from its mouth and five miles west of the confluence of the Willamette River, latitude $45^{\circ} 40'$ north, longitude $125^{\circ} 30'$ west. Although the military reservation extends from the river bank, the garrison proper is located upon high ground which rises gradually from a delta varying in width from a half to two miles, and which is subject to overflow. The selection of this site in 1849 was doubtless owing to its being the extreme western point of a high plateau which extends northeastwardly to the foot-hills of the Cascade range of mountains. North of the garrison proper, and directly between it and the river, are the extensive stockade and trading houses of the Hudson Bay Company, near to which was a village of half-breeds, Kanakas, and other employés. The town of Vancouver has sprung up along the line of the western boundary of the reservation. The bottom lands between the garrison and river, as well as those east and west, are subject to overflow, and it has been not unusual to have all communication with the Hudson Bay fort cut off except by bateaux and rafts. Immediately in rear (north) of the line of officers' quarters, the red fir forest commences, which continues (with several intervals of prairie, varying in size from one to four or six miles across) to the foot-hills. These prairies, called by the settlers plains, were cultivated by the Hudson Bay Company, and since the extinguishment of their claim, have been occupied by small farmers. The strip of land lying between the Columbia and Willamette Rivers, south of Fort Vancouver, and through which the road to Portland, Oregon, passes, is thickly timbered bottom land with occasional swale, and many streams, and is not infrequently overflowed from river to river. The average temperature is 55° F.; the extremes being 25° F., in January, and 70° F., in July. Yearly rainfall 45 inches; little snow falls here. The east and west winds are the most prevalent, and of about equal frequency, the former bringing rain. Roses bloom in December, and frost may occur in June. The summers are dry, but little rain falling between April and October. The winters are mild and wet, the usual rule in the rainy season being seven rainy days in a week. The first fall rains restore vegetation, and the first winter snows fall upon a most beautiful and luxuriant herbage. Colored snow, blue and red, was observed twice during the past winter. In the last instance patches of deep red or purple snow twenty yards square were seen, and on close examination this was found to contain immense numbers of the *Podura nivalis*. These insects collected in the water barrels, and are considered to have been a cause of diarrhœa in some instances.

The post was intended for six companies, and occupies about 1,100 yards square. The general arrangement of the post is shown in Plate No. 10.

The barracks now occupied are two frame buildings, on the east and west sides of the parade. The east barrack, 80 by 30 feet, is two stories high, has windows on opposite sides, and is intended to accommodate 140 men. It is furnished with double bunks. The other building, 75 by 30 feet by 10 feet high, is one story, and intended for 70 men, each having a separate bed. In neither building is there any provision for ventilation. Average air space per man, 700 cubic feet. A kitchen and mess-room are in the basement of the larger and rear of the smaller barracks. Sheds in rear of the barracks are used as lavatories; the latrines are simple earth pits. The quarters for married soldiers are much decayed, damp, and leaky. Six buildings are used as officers' quarters, three log huts, and three frame cottages. The log huts were built of carefully selected logs of red fir, well underpinned, and are of the pattern known as "four pens and a passage," giving four rooms and two attics, with kitchen and servants' room in rear, with the crevices chinked and plastered, and the walls and ceilings lined with dressed lumber. They are well suited to the locality and climate.

The hospital is a large building on the eastern line of the parade ground facing west. It has three capacious wards, a surgery, store-room, and steward's room, and two large attic rooms, with high ceilings and large windows for convalescents in the main building.

The arrangement is shown in Figure 57.

A, wards, 25 feet 6 inches by 18 feet 6 inches; B, wash-room, 6 feet 6 inches by 12 feet; D,

dispensary, 14 feet 3 inches by 18 feet 6 inches; E, steward's room, 10 feet 11 inches by 11 feet 3 inches; G, dead-house, 10 feet 6 inches by 8 feet; H, hall; K, kitchen, 17 by 14 feet; M, mess-room, 17 by 14 feet; P, piazza in front of hospital, 61 feet 10 inches by 9 feet 3 inches; P, piazza running by kitchen and mess-room, 34 by 7 feet 10 inches; P, piazza running in rear of ward, 32 feet 10 inches by 8 feet 4 inches; S, store-room, 10 feet 11 inches by 6 feet 10 inches; height of rooms, 13 feet. The foundations are of brick, the frame of red fir, weather-boarding and shingles of cedar, and the entire interior lathed and plastered throughout. As wood is the only fuel obtainable, the wards were each provided with roomy fireplaces. Before the erection of this hospital in 1858, the sick of the command had been very poorly provided for in one of the outbuildings of the Hudson Bay Company, or in a set of one-story quarters, which the reduction of force made available. Earth-closets have been sent to this hospital.

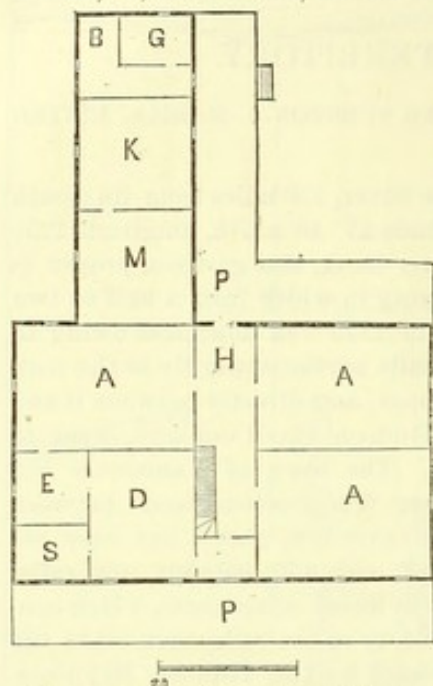


Figure 57.—Scale, 30 feet to 1 inch.

plans have been proposed as remedies. For a long time the water was hauled in water-wagons from the river, and stored in casks and barrels in the rear of the quarters. A company has brought water from a brook six miles off to the town of Vancouver, by pipes which run across the reserve. The supply is sufficient for 10,000 people, and the water is pure, cool, and well aerated. Since January 1, 1870, the use of water from this main has been allowed as a favor. It is distributed by a water-wagon as before. For the officers' quarters and hospital, the water barrels are placed over the sink just behind the latrines. The arrangement is very objectionable; the supply for the men is often scanty; the contents of the casks freeze in winter and are very apt to become offensive in summer. The quarters of the ordnance officer, not being under the control of the quartermaster's department, are supplied, as all the rest should be, by pipes communicating with the main. Cisterns holding 1,000 gallons are attached to each set of quarters and to the hospital.

The natural drainage at the post is excellent. Water is soaked by the gravel or runs off down the steep declivity, rendering artificial drainage unnecessary.

There is plenty of good ground that could be used as a post garden. The hospital garden was most excellent and productive when properly cultivated, though for the want of efficient gardeners the result now hardly pays for the trouble. All the most esteemed vegetables of the middle States can be raised. Potatoes, beets, turnips, &c., are a certain crop. Corn, tomatoes, egg-plant, melons, &c., sometimes fail in maturing, owing to the coolness of the season.

Portland, Oregon, the nearest city, can be reached by a row-boat and by wagon in about two hours; by the Columbia and Willamette Rivers on steamboat in 2½ hours. The latter course is not liable to interruption, unless the rivers freeze. It takes from 10 days to 4 weeks for a letter to go to Washington.

There have been no prevailing diseases at the post. A few men in the summer of 1869 had diarrhœa, the result of drinking the bad water; but this was the only disease directly traceable to bad sanitary provisions. Observation does not show that the climate is particularly prejudicial to pulmonary complaints, unless they are tubercular. Rheumatism is rare. Myalgia is common enough, but the climate has nothing to do with it.

Statement showing mean strength, number of sick, and principal diseases at Fort Vancouver, Washington Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	188.66	307	39	55	18	27	22	1	42	.....
1869.....	164.75	313	24	56	21	19	15	1	56	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT LAPWAI, IDAHO TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEON C. R. GREENLEAF, AND ACTING ASSISTANT SURGEON EDWARD STORROR, UNITED STATES ARMY.

The post of Fort Lapwai is situated on the left bank of a stream of the same name, 3 miles from its mouth; latitude $46^{\circ} 32'$ north, longitude 40° west from Washington. The Lapwai is a small tributary of the Clearwater, itself a tributary of the Snake River. The Blue Mountain range, about twenty-five miles to the west of the post, are the nearest mountains. Lewiston, a city of about three hundred inhabitants, is 12 miles northwest of the post, and located on a sand spit at the junction of the Clearwater and Snake Rivers. The nearest occupied post is Fort Colville, some three hundred miles north of this post, and near the line of British America.

The post was first established in November, 1863, and its construction completed in the fall of 1864. It was intended to accommodate one company of cavalry and one of infantry, and quarters for the men and stabling for the horses were erected. In July, 1867, the post was abandoned, and remained unoccupied until the following November. The reason for stationing troops at this point was to protect the settlers from the Indians. The military reserve embraces a square mile, within which is an inclosed space of 10 acres occupied by the post.

The country is of volcanic formation, with terraces of basaltic trap cropping out. Patches of land in the neighborhood are impregnated with orthoclase.

The soil in the Lapwai Valley is admirably fitted for the growth of vegetation. The cereals and tubers of the temperate zone yield abundantly and mature well.

The trees and plants indigenous to the soil are the cottonwood, willow, birch, cedar, and pine trees; the sumach, elder, wild cherry, with strawberry and huckleberry in the mountains. A bulbous root, called by the Indians "camas," and a favorite article of food with them, grows quite luxuriantly on the prairies south of us. It resembles somewhat the common onion, and is gathered in the month of August, at which time nearly the whole tribe (Nez Percés) move to the camas prairie, dig and prepare the root for winter use, by first drying and then powdering it between stones.

Of wild animals there are the grizzly, cinnamon, and black bears, cougar, gray and black wolf, coyote, red and gray fox, moose, common red and black-tailed deer.

Of birds there are bald and gray eagles, falcons, owls, prairie chickens, grouse, and ducks, (teal and mallard.)

Of fish there are the brook and salmon trout, and the salmon.

The nearest river, Clearwater, is a mountain stream, navigable for steamboats about four months in the year, when raised by the melting of the snow in the spring of the year. Its waters are beautifully clear, and of great purity. The Lapwai has a pebbly bottom, with cottonwood trees and willows fringing its banks. The tributaries of this stream rise in Craig's Mountains, 14 miles southeast of the post.

The climate of this region is pleasant, and while there are wide ranges in the temperature they do not appear to have any detrimental effect upon the health of the inhabitants. In a period embracing 20 months the mean temperature was 56.95° ; the extreme heat was 103° in the shade in August; extreme cold -4° in January. The rain-fall averages 1.11 inches per month; of snow, but 15 days in 20 months. The prevailing winds are from the north, and are mild in the winter and spring, but in the summer and fall blow occasionally with great violence. A wind, called by the natives "chinook," is prevalent in this region at all times of the year. It comes suddenly with great violence, and is always attended with a very great rise in the temperature. In winter one of these winds has been known to commence blowing in the evening at a time when there were three or four inches of snow on the ground, and by morning not a trace of snow could be seen. In summer the heat attending them is like that from a furnace, and vegetation wilts and withers before the hot blast.

The buildings of the post occupy the several sides of a square, inclosing a parade ground. The barracks are two frame buildings, battened upon the outside and board lined within, each 91 by 30 by 10 feet, and erected upon stone foundations raised about two and a half feet from the ground. A porch, 8 feet wide, runs along the western face of the buildings. The ceiling is of boards, not tightly laid. Between the roof and ceiling is an unoccupied garret, lighted by two windows at each end. The quarters are warmed by air-tight stoves, wood being the fuel used. Each building has four windows, 2 feet 10 inches by 4 feet, upon its western face, and three upon its eastern. Three doors open upon its western face and two upon its eastern. In the center of each building, dividing it into two equal portions, is the orderly room. This, therefore, gives two rooms for dormitories in each barrack, measuring 40 feet 6 inches by 30 by 10 feet. These rooms are amply ventilated by windows and cracks, and each contain seven bunks for the accommodation of 28 men. The air space per man is 212 cubic feet. There are neither wash nor bath rooms, the men performing their ablutions at the well and creek. Latrines have been built some distance in rear of the company quarters and on the edge of the Lapwai. They are filled with earth, and the sheds over them moved as occasion requires.

The laundresses' quarters are rooms measuring 16 by 14 feet, and 10 feet to the eaves. The buildings are framed, constructed of slabs, the interstices filled with mortar, and board-lined within. Each room has an open fireplace, and a well-constructed shed attached.

The quarters devoted to the use of officers are two double frame buildings one story and a half high, lathed and plastered throughout, each 46 by 54 feet, and containing eight rooms upon the ground floor, with two garret rooms. The front rooms measure 14 by 14 feet 9 inches by 12 feet; rear rooms, 11 by 14 feet 9 inches; the mess-room, 13 by 11 by 9 feet, and the kitchens, 18 by 12 feet. A hall, 7 feet wide, extends from front to rear, dividing the buildings into two sets of quarters each.

The commissary store building and adjutant's office are situated on the south side of the parade.

The guard-house is built of squared logs, one story high, with a front of 40 feet, and 30 feet deep, 8 feet to the eaves, without ceiling, but open to the ridge, and situated upon the north side of the parade ground. The guard-room, occupying the whole front of the building, with a porch is 17 feet deep, heated by an open fireplace and lighted by two windows. In rear of this room are the double and single cells, the former 11 by 11 feet, the latter 8 by 5 feet, which are ventilated by grated openings in the doors and sides of the building.

The hospital is located upon a natural slope, which terminates in the Lapwai. The building, is a frame one, one story and a half high, with porch in front, facing east, and erected upon a stone foundation which has 3 feet elevation in front, decreasing in the rear to a level with the ground, and is in good repair. The general plan of the hospital is objectionable. It is 41 feet front, with an L extending in rear, is lathed and plastered throughout, and contains four rooms upon the ground floor, with bath-room and wood-shed adjoining. A hall, 6 by 15 feet, divides the main building into two rooms, used as ward and dispensary, with a small store-room in rear of the latter. The ward, 20 by 15 by 12 feet, contains six beds, giving to each a cubic air space of 600 feet. The dispensary is 15 by 15 feet. The mess-room and kitchen, both in rear of the ward, are each 12 by 12 by 10 feet. The bath-room is 12 feet long and 6 feet wide. Above the ward and dispensary are

two garret rooms, lathed and plastered, with two windows to each, and occupied by the attachés of the hospital. Beneath the dispensary is a cellar, 8 feet square, with neither artificial walls nor floor, nor natural light. The hospital is warmed by stoves, and ventilated only by doors and windows. The privy is located 30 feet distant from the building. The library consists of 150 bound books, besides a large number of unbound volumes of a miscellaneous character, novels predominating. A number of periodicals and newspapers are also taken.

An abundant supply of excellent water is obtained from two wells, one midway between the company quarters, and the other between the officers' quarters. Water for washing and police purposes is procured from the Lapwai. Buckets are kept constantly filled for use in case of fire, and in addition there is a hand force-pump at the post, with sufficient hose to throw water upon the hospital.

There is no artificial drainage at the post. The natural drainage is good.

The post garden contains about twenty acres. A great variety of vegetables and fruits are cultivated, and yield abundantly. Potatoes, cabbage, squash, onions, egg-plant, corn, beans, peas, oyster-plant, cauliflower, tomatoes, beets, turnips, okra, lettuce, radishes, watermelon and muskmelon, cucumbers, parsnips, carrots, raspberries, and strawberries comprise the list, and are furnished with great regularity to the men in their season.

The nearest large city is Portland, Oregon, which is reached by steamboat in the summer months from Lewiston, and during the fall and spring by stage to Wallula, 32 miles from Walla-Walla, on the Columbia River, where a steamer starts for Portland; and in the winter by stage to the Dalles on the Columbia River, where steamer is taken. The only serious interruption to travel occurs during the winter from snow on the Blue Mountains, but the weekly mails are seldom detained. A letter going to department headquarters requires seven days.

There is no prevailing disease at this post. Among the citizens this past summer typhoid fever prevailed to some extent, and, so far as can be learned, this was the first time this disease had appeared in this region of country. The disease may be attributed to the high temperature and the filthy habitations of the persons affected.

Statement showing mean strength, number of sick, and principal diseases at Fort Lapwai, Idaho Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	74.41	62	3	3	1	6	1	11	.....
1869.....	46.5	46	1	12	1	6	1	5	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT BOISÉ, IDAHO TERRITORY.

REPORTS OF ASSISTANT SURGEONS GEORGE B. JAQUETT AND PETER MOFFATT, UNITED STATES ARMY.

Fort Boisé is located in the Boisé Valley, about half a mile from Boisé City; latitude 43° 37' north, longitude 116° 28' west from Greenwich, with an elevation above the sea-level of 2,880 feet. The Boisé Range of mountains bound the post on the north and east, while on the south and west flows the Boisé River. The nearest military posts are Camp Three Forks, Owyhee, about 95 miles to the southwest, Camp Harney, 255 miles to the west, and Fort Lapwai, 352 miles to the north. Old Fort Boisé, the site of an old Hudson Bay station, is situated about 50 miles to the west,

on Snake River. Boisé City, the territorial capital, with a population of about 2,000, adjoins the military reservation on the west.

Fort Boisé was first occupied in July, 1863, for the protection of emigrant trains, *en route* to Oregon and Washington Territories, from the Shoshone Indians of Snake River. The increasing interest excited by the reputed discovery of the precious metals in this region in 1862 also indicated the necessity of establishing a military post at some favorable point intermediate between Walla-Walla and the settlements in the vicinity of Salt Lake and Fort Hall. Boisé Valley, being the rendezvous of great numbers of Indians, and in the line of the emigrant roads passing down Snake River, and being moreover a locality that promised to become an agricultural settlement, and at the same time centrally situated in relation to the recently discovered mines, was fixed upon as the most suitable point to effect the desired object. The first houses in Boisé City were erected, subsequent to the location of the military reservation, by camp followers.

The reservation, rectangular in shape, is one mile in width by two in length. In rear of the garrison the ground is of a rugged, broken surface, while the ground occupied by the post and the space extending between it and the Boisé River is level. The valley from a few miles above this place, to the confluence of the Boisé with the Snake River, 50 miles below, is of irregular width and varied surface, and bounded on each side by arid table-lands of sage brush, or broken and barren mountains. The soil for some miles above and below the fort is arable, and by aid of irrigation produces in perfection all the cereals and vegetables appropriate to this latitude. Wheat to the amount of 40,000 bushels, and of superior quality, was raised in this section last season. The most formidable foes of the agriculturist in this region is the cricket or grasshopper, or both, in countless numbers, during the months of May or June. Their track, when in full force, is marked by the utter destruction of all verdure. The soil is a sandy loam, inclining more to a mixture of clay and decayed organic matter in the lower portions, which are on the margins of the streams. The stone used for building material in the construction of the post is procured in the neighborhood. It is a very soft, coarse, and rather light sandstone, doubtless of aqueous origin. Gold and silver are found; the former, on most of the streams in this section, in the form of placer diggings; the latter chiefly in the surrounding mountainous regions, and in the form of ledges. Silver City, about 60 miles to the south and west of this point, is surrounded by mountains containing immense deposits of silver ore. The number of trees indigenous to this region is not large. Among them are several species of the coniferæ, *e. g.*, pine, fir, and mountain juniper, generally occupying the mountain summits. The only species of hard wood to be found is a stunted tree, which grows in isolated mountain spots, and known as mountain mahogany. The cottonwood and willow grow on the margin of the rivers. The abundance of the cottonwood and its large size first suggested to the French Canadian agents of the Hudson Bay Company, who penetrated the country in early years, the name of Boisé wood, by which that river is known.

Bears, wolves, coyotes, foxes, beaver, otter, mink, and martens are found; also mountain sheep, antelope, deer, rabbits, and smaller game. Wild geese, ducks, sage hens, prairie chickens, pigeons, and many species of smaller and less known birds are met with. Salmon, salmon-trout, mountain trout, and other fish of less importance exist in the streams. Very excellent salmon are taken from those tributaries of the Snake River which have not been rendered turbid by mining.

There are two seasons, the wet and the dry; the former beginning in November, and continuing until May, and the latter during the intervening period. The extreme temperature in summer is 109° F., and in winter 4° F.

The present post buildings for the most part were erected in 1864. The post is of rectangular form; the quarters, guard-house, and store-houses forming its respective sides. The buildings are principally of stone.

The company quarters are two stone buildings, each 90 by 30 feet, with side walls 10 feet high; only one is at present occupied. There is a fireplace at each end of the building; windows on either side, and one tier of double bunks. Ventilation is secured by the windows and doors. The dormitory consists of one large room, and is occupied by one company, giving an air space of about 800 cubic feet to each man. There are no bath or wash rooms; ablutions are performed in the barrack-room. A stone building, 22 by 50 feet, and about 20 feet to the rear of the company quarters, contains the kitchen and dining-room.

Quarters for married soldiers are seven log houses, containing one room each.

The quarters for officers are three stone buildings, one story high, with attic rooms above. They are finished with lath and plaster, have each three rooms and a kitchen on the ground floor, with a hall running from front to rear, and opening into a yard surrounding the house. The one occupied by the commanding officer has an extension in rear, of 45 by 15 feet, which is separated into dining-room, kitchen, wood-shed, and water-closet. The main building contains four rooms, each about 15 by 15 by 9½ feet, with fireplaces looking into each. The remaining buildings have a dining-room, kitchen, wood-shed, and water-closet appended in rear of each lateral half, thus completing two separate and independent sets of quarters under one roof. These quarters contain no bath-rooms.

The quartermaster's and commissary store-houses are also of stone, 100 by 30 feet each, and divided into offices and store-rooms, ample for the storage of all supplies. The commissary building has a cellar for vegetables and other articles.

The guard-house, situated on the north side of the parade ground, is a stone structure, 40 by 30 feet, and open to the roof. The front room, extending the entire length of the building, is used for the guard, and has a fireplace and two windows. One large room in rear of this is used for general prisoners, and is lighted and ventilated by small openings along the top of the wall. The cell is without light, except that which is admitted through the ventilator. The average occupancy of the guard-house is about four men.

The hospital is a stone building, 56 by 32 feet, with a wing in rear, 40 by 18 feet. The front half of the building, containing three wards, a dispensary, and store-room, is the only part of the hospital finished. Only one ward is used as such, containing six beds, with an air space of about 800 cubic feet to each. It is warmed by open fireplaces, and ventilated by doors, windows, and fireplaces. An unfinished ward is used as wash and bath room. The office and dispensary are in one room. The wing contains a dining-room, kitchen, and steward's room.

The stables are two large frame buildings situated at the southwest corner of the garrison, and amply isolated.

The library, comprising about 1,000 volumes, has recently been purchased by the company stationed here, at an expense of \$1,200. The selection embraces the standard literary works in the English language, histories, biographies, romances, and miscellaneous works.

The supply of water for the use of the post is taken from the mountain stream which flows through the reservation. No reservoir, cistern, or system of water-works are in use, with the exception of a well, sunk upon the margin of the creek, from which the supply may be obtained when the stream is low, or the water turbid. A water-wagon delivers a supply to each quarters daily. The quality of the water is good, and the quantity abundant.

Communication is had by a daily stage and mail to and from the Pacific railroad at Kelton, Utah. The time occupied is from two to three days, according to the season; thence to Washington, from five to seven days. Occasional delays are experienced during the winter from heavy falls of snow, both on the railroad and stage route. Communication with department headquarters at Portland, Oregon, is by stage to Umatilla, on the Columbia River, and thence by water and railway to Portland. Considerable delay in mail communication is frequently experienced on this route, owing to the closing of the Columbia by ice, or to snow or mud on the stage road, particularly in crossing the Blue Mountains in Oregon.

Immediately around for a few miles, Boisé Valley is occupied by agriculturists; while the sources of Boisé River and its tributaries, and the neighboring streams, afford employment to gold and silver miners. Here and there throughout the country a solitary ranch-man has located in some of the more promising spots, and is occupied in stock-raising and the cultivation of a small domain where water is available.

The post is generally very healthy, there being no diseases of a specific or contagious character; only a few cases of the common varieties of disease occur, such as acute diarrhoea and rheumatism, with an occasional case of fever, either remittent or intermittent, commonly called in this country mountain or typho-malarial fever. This prevails more especially among the citizens who are occupied in mining or on the farms in the valley along the river.

Statement showing mean strength, number of sick, and principal diseases at Fort Boise, Idaho Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	89.41	35	3	3	1	9	1	5	.....
1869.....	73.91	47	6	5	1	10	9	3	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP THREE FORKS, OWYHEE, IDAHO TERRITORY.

REPORT OF ACTING ASSISTANT SURGEON E. COLMACHE, UNITED STATES ARMY.

Camp Three Forks, Owyhee, was established in its present location September 26, 1866, in latitude 42° 51' north, longitude 116° 54' west, on the southwestern boundary line of Idaho Territory, and at the south base of a range of mountains known as the Owyhee Mountains. It is distant 35 miles south from Silver City, Idaho Territory, the nearest post office, and 16 miles north from the Three Forks of the Owyhee River. Its elevation is about five thousand feet. From Silver City to Elko, Nevada, on the Central Pacific railroad, distant 225 miles, there is communication by stage daily; time 48 hours. It requires about six days to send a letter to department headquarters, via Boise City. The nearest settler lives in Jordan Valley, 16 miles distant.

The camp is built on a small piece of table-land, gradually declining toward the south, and is closed on the east and south sides by a ravine through which flows a creek, which supplies the water used by the camp, and which carries off the drainage. The camp, built to furnish accommodations for two companies of infantry, consists of seven buildings arranged in the form of a hollow square, the parade ground inclosed by them measuring 400 feet each way. These buildings are all one story high, built of rough unhewn logs. The walls are chinked and daubed with mud. The roofs are covered with shingles, insufficient in number and badly put on, allowing rain and snow to penetrate into the interior of the buildings. The floors are of undressed lumber, and are barely raised from the ground, the sleepers lying directly on the surface. The warming of every room in each building is by large open fireplaces, built of granite. The windows are of the "dormer-window" pattern, and, with the doors, all open toward the square. Being thus all placed on one side of the buildings, they allow of no cross draughts; and were it not for the chance openings found in the roofs and walls, and the wide chimneys, the buildings would be uninhabitable for the want of proper ventilation. Each room has one window and one door opening directly on the parade ground.

The north side of the camp is formed by a building, 65 by 20 feet, divided into three rooms, one at each end of the building, 16 by 18 feet, and one in the middle, 28 by 18 feet. Each room is assigned as separate quarters for officers. A lean-to, 10 feet wide and half the length of the building, affords room for one kitchen, one officers' mess-room, and one room used as a sleeping-room by the servants; a small two-roomed house, 32 by 16 feet, having no conveniences, forms the only quarters suitable, in any way, to married officers. A small lean-to at the back forms a kitchen, and 15 yards in the rear is the sink belonging to the building. The west side of the square is formed by a building, 65 by 20 feet, which is divided into one room, 20 by 18 feet, used as quartermaster's harness-room and saddler-shop; one room, 10 by 18 feet, used as quarters for post surgeon; one room, 10 by 18 feet, used as an office by the post adjutant, and one room, 20 by 18 feet, used as a guard-room. A building, 65 by 18 feet, is used as quartermaster's and commissary's store-house. There are no windows nor fireplaces in this building.

The south side is formed by a building 260 by 20 feet, divided in the center by a strong log partition, and furnishing in each half one room, 88 by 18 feet, used as day room and dormitory for one company; and in the wing one room, 40 by 18 feet, serving as company-kitchen and mess-room. Each of the company rooms is warmed by two very large open fireplaces, and has, let in at equal distances along the ridge of the roof, three common square box ventilators, each having a superficial opening of 144 square inches. These rooms were originally lighted only by two windows, and the inlet and outlet to them were gained through two single doors, all facing toward the parade; but the quarters were found to be so dark that panes of glass were let in among the shingles of the roof. Two windows and a door have been cut through the rear wall of the west quarters, making them comparatively light and cheerful. The same improvement has been carried out in all the buildings. The wash and bath-house has a fireplace for heating water, and a supply of bathing tubs. A well, giving an abundant supply of water, is close to the wash-house. (In the summer parties of the officers and men often repair for a day or two at a time to some very large warm springs, situated in the cañon of the Owyhee River, 17 miles distant.) A large sink, 20 feet long, is situated 15 yards in the rear of the center of this building. The east side is formed by a building, 65 by 18 feet, equally divided into six rooms, 10 by 18 feet, which are used as laundresses' quarters; and a building, 65 by 20 feet, divided as follows: In the northern end, a room 10 by 18 feet, used as dispensary; a room, 27 by 18 feet, used as a ward, to contain eight beds. Between these two rooms a space 3 feet wide is partitioned off. It is divided into two equal parts by the stone chimney, and forms a store-room, 3 by 7 feet, and a hall of the same dimensions. The ward is lighted by two windows facing the parade ground. Next to the ward is the hospital kitchen and mess-room in one, 10 by 18 feet, having no fireplace, but using a cooking stove. These three rooms constitute the post hospital. The hospital has no quarters for a hospital steward, no dead-house, bath-room, or lavatory; all of which are needed. In the south end of the same building is situated the post bakery, 10 by 18 feet.

In the ravine southeast of the post are situated the post trader's store and dwelling-house, post blacksmith and carpenter shop, and a house serving as quarters for the Indian scouts attached to the command.

Further west, and lower down on the creek, are the Government stables, granary, and hayshed. These are built of logs, split in half and planted upright in the ground, and roofed over with rough boards and battens. Behind are the corrals.

The water used by the camp is entirely supplied by the creek above mentioned, which has its source among granite rocks in the mountains about eight miles north. The stream, from its source down, is well protected from the sun by an abundant growth of willow bushes and some cottonwood trees. Great care has been taken to preserve these uninjured. The water is remarkably pure, always cool, and very pleasant to the taste. It flows in sufficient quantity for the use of the camp during every season of the year. It is brought to the camp by hand, and stored in barrels, which are refilled every day.

The soil on which the camp is built consisting principally of broken-down quartz rock and crushed lava, is very dry, and does not allow water to percolate through it. There is no stagnant water to be found near the camp.

There are no Indians resident in the immediate vicinity of the post. A few scattered Pi-Utes roam between the south side of the Owyhee River and the Humboldt chain of mountains.

The climate is very variable, and sudden changes of temperature are of frequent occurrence. The thermometer ranged during the year 1868 from 9° below zero to 101° F. Yearly mean of thermometer 45.53° F. The amount of rain and snow that fell during the year measured 10.65 inches. The yearly mean of the hygrometer was 42.04.

The situation, as far as the records show, is very healthy. Since the camp was established there have been only three cases of serious sickness; all of the typho-malarial type, no doubt contracted by the patients while away from the camp on scouts through flat and marshy districts, and resulting in one death.

Statement showing mean strength, number of sick, and principal diseases at Camp Three Forks, Owyhee, Idaho Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Epidemic catarrh.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868	131.58	121	9	12	3	12	9	25	.....
1869	101.58	130	8	12	.....	10	11	24	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT STEVENS, OREGON.

INFORMATION FURNISHED BY ASSISTANT SURGEONS J. E. SEMPLE AND A. W. WIGGIN, UNITED STATES ARMY.

Fort Stevens is located in latitude $46^{\circ} 30'$ north, longitude $124^{\circ} 1'$ west from Greenwich; altitude, twelve feet above high water. It is near the extremity of Point Adams, a low sandy spit of land which forms the south side of the mouth of the Columbia, and guards the south channel of that river; Fort Cape Disappointment, distant about ten miles from this post, guarding the north channel. The two channels are separated by a sandy island, nearly covered at high water. East of Fort Stevens, and on the same side of the river, eight miles distant by water, but accessible by land, is the town of Astoria. This is the oldest American settlement on this coast, a trading post having been established there by John Jacob Astor in 1811, and now numbers some six or seven hundred inhabitants. A creek and swamp nearly divide the strip of sea-coast land, at the northern extremity of which are Point Adams and Fort Stevens, from Astoria and the main portion of the State of Oregon. This strip of land, called Clatsop Plains, is low, sandy, with poor soil, in most parts densely covered with spruce and hemlock trees, and sparsely inhabited by farmers and fishermen, some of whom have occupied their lands for thirty or forty years, raising extensive families of half-breeds, and waiting to get rich by a rise in the value of their real estate. Some ten or twelve families living near Skipanon Landing, on a creek of the same name, constitute the town of Lexington, distant six miles from the post.

This post was first occupied April 25, 1865, the fort having been built under the supervision of the engineers during the two years preceding.

The military reservation contains one square mile. The land is undulating and sandy, having evidently been formed by the action of the waves on the one side, and by alluvium brought down by the Columbia River on the other. A shallow soil exists, capable of supporting evergreen trees, ferns, grasses, &c., but, as its bottom is sand, crops are very uncertain, except in a wet summer.

The following animals exist in this part of the country, viz.: Elk, deer, wolf, black bear, cougar, rabbit, otter, mink, squirrel, and beaver. The birds are chiefly the wild goose, woodpecker, bluejay, swan, duck, pelican, crow, eagle, gull, swallow, crane, robin, and pigeon. The fish are the salmon, which is abundant and an important article of export, salmon-trout, smelt, sole, sturgeon, flounder, perch, sucker, porgy, craw-fish, clams of an immense size, and oysters, which are small and inferior in quality.

The climate is equable, much cooler in summer and warmer in winter than on the same isothermal line of the Atlantic coast. The total annual rain-fall is excessive, amounting during the year 1869 to 6 feet 8.16 inches, which, judging by the meteorological register kept since January, 1867, is not more than an average; 20.66 inches of rain fell during the month of November, 1869. At the same time there is usually so little rain during the months of July, August, and September as to necessitate irrigation for many crops. The records do not show that any snow

has fallen here since the occupation of the post. The mean temperature for the year 1869 was 53.51° ; the average hygrometrical indications, 51.38° ; highest temperature, 80° , lowest, 32° ; highest indication of hygrometer, 70° , lowest, 32° . The prevailing winds are southeast and southwest during the rainy season; northwest during the dry season.

The fort itself is an earthwork; it has been rebuilt and is surrounded by a moat. The buildings composing the garrison quarters are placed on a bluff some distance from the river, with a low beach between it and the water. At present the beach below the post buildings is increasing by the fresh daily deposit of sand from the river; but the changes at this point being so uncertain and various, at some future time the waters may encroach upon and remove the whole of it. A fine wharf has been constructed on this beach, at which small steamers land the supplies for the post.

For the first year of its occupation the only houses for officers or men were the temporary shanties of rough boards which had been erected for the engineer workmen while constructing the fort. None of these structures now remain. All the buildings now at the post are substantially built of wood. The soldiers' barrack, erected in 1866, is a one-story building, 98 feet 5 inches by 30 feet 4 inches, with porch in front. It contains two dormitories, one at each end, with offices between them. Each dormitory measures 37 feet 11 inches by 29 feet; height, 13 feet 10 inches. They are lighted and ventilated by four windows of ordinary size. Box stoves are used for heating. The number of bunks occupying the dormitories is kept down to those actually in use; and the air space per man, of the number now occupying each dormitory, is, respectively 1,057 and 841 cubic feet. The bunks are wooden, in two tiers. A building 70 yards northwest of the soldiers' quarters contains the company mess-room and kitchen. Quarters for married soldiers and laundresses consist of two buildings, one and a half stories high, accommodating two families each. Four houses are used as quarters for officers, three of them constructed on the same plan, the fourth slightly but not materially different. They are built of wood, and consist of a main building one and a half stories high, and an L, one story high. Each house has four large rooms on the ground floor, with a cellar underneath the kitchen; a hall, and ample room for closets, pantries, &c. In the upper story are two large bed-rooms, two small rooms, and two lofts. The rooms on the ground floor in the main house are $10\frac{1}{2}$ feet high, plastered with hard finish, and well painted. There is a privy in the L, connected with the main building by a covered porch. Fireplaces are in two rooms of each house, the other rooms having openings for stove-pipes. A cistern affords rain-water for washing purposes; drinking water is supplied by a well, and brought around daily in carts. Good gardens are attached to these quarters.

There are three store-houses at this post, one ordnance store-house, one commissary and quartermaster's store-house, and one engineer store-house. The first is a one-story building, 81 feet 2 inches by 22 feet 3 inches, and contains two store-rooms. The quartermaster and commissary's stores occupy a building one and a half stories high, having a porch along the entire front. The building is 112 feet 4 inches by 30 feet 4 inches in dimensions. The commissary stores are kept down stairs, and the upper story occupied by quartermaster's property. Two offices and a sleeping-room are also on the first floor. The engineer store-house is an old, rough building, filled with engineer tools, and kept closed up. One end of it is used as a carriage room.

The guard-house is located on the edge of the parade ground, and constructed of solid plank-ing throughout. The foundation is of brick; the floors are double, the intervening space being inlaid with cement. The building is T-shaped; the extreme length of the cross part is 67 feet 8 inches; the width 32 feet 10 inches. The length of the other portion is 28 feet, and its width 24 feet 3 inches. Its height is 10 feet in the clear. The transverse section of the building contains the cells, ranged on either side of a hall 12 feet 2 inches wide. The cells are 7 by 12 feet, and open by a door into cell halls, 9 by 12 feet, which communicate by grated doors with the transverse hall. The cells are 9 feet 5 inches high. The apertures for ventilation are near the ceiling; four are 12 by 16 inches, the rest 8 by 12 inches each. The guard-room, in the main portion of the building, is 15 by 24 feet. The main building has a stove in each end, the pipes going into chimneys built from the attic. The window at the extreme end of the transverse hall is two feet square, glazed and grated. The main hall has a window at each end, 3 feet 11 inches by 2 feet, also glazed and grated. A sky-light, 2 feet square, opening through the roof, is placed directly over the point

of crossing of the halls. The cell doors are all solid, without any opening in them, while those shutting off the cell halls from the main hall have grated openings 5 feet by 8 inches. Arrangements exist for putting up six bunks in each cell, in tiers of three each, but in point of fact seldom more than two prisoners occupy the same cell—never more than three, and then only while a part of the building is being scrubbed, the custom being to wet-scrub one-half the guard-house once a week, leaving the other half dry for occupancy. If the cells were occupied to their fullest capacity there would be but 140 cubic feet of air space to each occupant—obviously insufficient, even with the ventilators open and communication with the hall afforded by means of the grated doors. The average number of prisoners for the past two years has been 6.14—less than one man to each cell.

The hospital building stands on a knoll of sand fronting toward the river, and has a porch along the whole front. The main portion of the building, by outside measurement, is 25 feet 6 inches by 46 feet 10 inches; the back building is 22 feet 5 inches by 24 feet 2 inches. The rear door of the dispensary opens on a hall leading to the wards, one on the right hand and one on the left. Between the two wards in the rear portion is the steward's room. In rear of this main building, and connected with it, is the kitchen, and partitioned off from the back end of the kitchen are a bath-room and pantry. The wards, of which there are two, one on each outside end of the main building, with dispensary and steward's room between them, are each 24 feet 11 inches by 15 feet 8 inches, with a ridge opening, 9 feet long by 12 inches wide, for ventilation. The air space in each ward is 1,234 cubic feet per bed. There are five windows in each ward, and a movable transom over each door. Capacity of hospital, ten beds. Stoves are used for warming the rooms. The bath-room is 7 feet 10 inches by 7 feet 6 inches, and contains a bath-tub and water-sink. The water-closet contains movable sinks and a urinal.

The post bakery is 35 by 12 feet, containing a sleeping room, kneading room, and an oven capable of baking bread daily for 200 men.

The stable for public animals contains stalls for 15 animals, is well lighted, and has an opening into the external air in each stall in front of each animal's face. The building is 40 by 30 feet.

The post being garrisoned by a single company there is no post library. The library of the company now stationed here consists of 232 volumes, principally history and novels. They are kept in the office of the company, and are well read.

The water supply of the post is dependent upon that furnished by the wells which have been dug. Of these there is one in each cellar of three of the officers' houses, one near the stables, one at the mess-room, one inside of the fort, one in the parade ground, and one near the hospital. During the winter season the supply of water seems to be sufficient and of good quality. The water supplied to the different portions of the garrison is hauled on carts in water-barrels and distributed fresh daily. Although apparently sufficient for ordinary purposes during the winter when the rains are abundant, the supply of water becomes very small in summer, while its quality deteriorates to such a degree as to make its use, to say the least, unpleasant. During the later months of the summer of 1868 this was painfully apparent, the water from the different wells in use having a peculiarly disagreeable taste and odor, as well as an uninviting appearance. It was also very limited in quantity, at a time, too, when the forests in this vicinity were constantly burning, the material of the quarters and other public buildings very dry and liable to catch fire from the falling sparks carried about by wind through the dense, smoky atmosphere. In view of these facts, cisterns calculated to hold a sufficient quantity of water, caught and stored during the rainy season, are called for, both in view of the health and comfort of this command, as well as the preservation of public property at the post.

The drainage of the post, from its natural location, is in general good, and water is either absorbed quickly or carried to the beach below. The present drainage from the officers' quarters, hospital, kitchen, and laundresses' quarters is rather defective, and might be improved.

Ample facilities for bathing are afforded in the summer time by the river, but in the cooler weather, which, in this climate may be considered as three-fourths of the year, no facilities are provided except in the hospital.

A small garden at the post produces potatoes and cabbages, but not nearly enough for the winter's use. A few potatoes are raised in the vicinity of the hospital, but a hospital garden, properly speaking, does not exist. There is ample room about the quarters of each officer for gar-

dening purposes, but such is the uncertainty of rain in the summer months and the difficulty of watering, that it seems to be generally preferred to rely upon the neighboring country, vegetables being readily procured at reasonable rates.

A small steamboat chartered by the government plies between this post, Fort Cape Disappointment, and Astoria three times a week for Portland, connecting with stages for the East by way of Kelton, on the Central Pacific railroad. A steamship leaves Astoria three times a month for San Francisco. A letter requires from one to three days to go to department headquarters, and from eleven to eighteen days to go to Washington.

The inhabitants of this vicinity are generally emigrants from Missouri and other western States, who hold large tracts of land. The Indians consist of the remains of the Clatsop tribe, now numbering about 15 individuals, and are fast disappearing.

There seem to be no prevailing diseases whose cause is due to the location of the post. Malarial diseases exist along the Columbia and Willamette Rivers, but this particular locality is apparently exempt from them. The moisture of the atmosphere predisposes somewhat to rheumatism, but not to pulmonary or bowel affections.

Statement showing mean strength, number of sick, and principal diseases at Fort Stevens, Oregon, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	65.08	105	5	12	5	4	3	1	34	.....
1869.....	67	231	12	19	5	9	27	.....	62	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT KLAMATH, OREGON.

REPORTS OF ACTING ASSISTANT SURGEONS L. E. HOLMES AND C. B. BRIERLY, UNITED STATES ARMY.

Fort Klamath occupies a site on the margin of a low prairie or meadow, extending south and west to the Klamath lakes, a distance of eight or ten miles. Its latitude is $42^{\circ} 41' 34''$ north, longitude $44^{\circ} 40'$ west; altitude 4,200 feet above the level of the sea. The fort was built in 1863, and designed for a two-company post. The land occupied and immediately surrounding rises slightly from the prairie, and is naturally well drained. The pine forests on the north and east approaching to the buildings of the post, and partly surrounding them, are heavy and have but a slight undergrowth. A large creek runs within five or six rods of the buildings on the north and east.

The principal buildings of the post are twelve in number, constructed of hard pine lumber. The parade is fenced. Its south side is clear, and opens on the prairie.

The barracks, 120 by 30 by 10 feet, are divided into large square or oblong rooms, and warmed by means of fireplaces and stoves. Air space per man, 500 cubic feet. Twelve windows are placed opposite each other, affording ample ventilation, with the doors and fireplaces. Double wooden bunks in two tiers are used. Quarters for married soldiers are four in number, each 30 by 15 by 10 feet, with two windows and one door. The officers' quarters are five separate buildings, each 40 feet square and 10 feet high. The store-houses, one story high, built of hewn timber, are ample and well policed.

The guard-house, also made of hewn timber, is 30 feet square by 10 feet high. The prison-room is 14 by 12 feet.

The hospital building is of the same size and construction as the quarters for officers, 40 by 40 by 10 feet. Though small and not specially designed for the purpose, it answers very well for a one-company post, where sickness of a grave nature is almost unknown. The building is warmed by stoves. The windows and doors are the only means of ventilation. The office and dispensary are adjoining rooms, each 12 feet square and 10 feet high. The ward, 30 by 15 by 10 feet, has four windows and two doors, contains four beds, giving to each 1,125 cubic feet. There are no lavatories or bath-rooms.

The stables, at a little distance from the men's quarters and near the border of the creek, are large, well ventilated, and made with a view to warmth, dryness, and durability.

The Indian camp lies to the southeast on William's River, a distance of 12 miles. Nine hundred are of the Klamath, 500 of the Modock, and 200 Snake Indians.

The prevailing diseases are venereal. Diseases of the respiratory organs appear to be the only diseases having local origin.

Statement showing mean strength, number of sick, and principal diseases at Fort Klamath, Oregon, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (11 months).....	72.63	115	9	10	3	5	11	25	.....
1869.....	60	155	8	46	2	16	23	23	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP WARNER, OREGON.

REPORT OF ASSISTANT SURGEON RICHARD POWELL, UNITED STATES ARMY.

Camp Warner, Oregon, was located in 1866, about twenty miles east of Warner Lake. In September, 1867, it was changed to its present situation, which is about 42° 50' north latitude, 120° west longitude, 15 miles west of Warner Lake, and 35 miles from the California and Oregon line. Its altitude is presumed to be between 6,000 and 7,000 feet. It is almost surrounded by hills, and to the south and west is a forest, principally of pines, which extends four or five miles.

There is fine trout fishing within ten miles of the post.

Grizzly and black bears are found in the vicinity; also antelope, deer, grouse, prairie chicken, and ducks.

The soil is not fertile, being sandy and alkaline.

The mean temperature is 50° F.; hottest, 19th of August at 2 o'clock p. m., 89° F. in the shade; coldest, the 6th of December at 7 o'clock a. m., 10° F. There is not much rain, but the fall of snow is very heavy, lying on the ground from December until May or June.

The post is located on the slope of a hill, the incline facing the north. The buildings form three sides of a square of 200 feet side. The company quarters are three log buildings, each 103 by 25 feet, with board gables, shingle roofs, and porches in front. Each contains two dormitories, measuring 34 by 30 by 10 feet, occupied by one company, warmed by fireplaces, lighted by ten windows which, with five doors and the chimney flues, afford ample ventilation. Air space per man, 324 cubic feet. The bunks are double, in two tiers. The latrines for the men are about two hundred yards in rear of their quarters.

Temporary buildings are occupied as kitchens and mess-rooms. The kitchens measure 18 by 28 feet, the mess-rooms 37 by 28 feet.

Married soldiers' quarters are three houses recently erected, and four others which were previously devoted to other uses. The houses are built of logs, and contain two rooms each, with a chimney in the center.

The officers' quarters are six log buildings, each 30 by 40 by 10½ feet, with an addition, 16 by 21 by 10½ feet, for kitchen and dining-room. One house is occupied by the commanding officer. Each of the others is designed for one captain and one lieutenant. Their construction is similar to the barracks. The partitions are of boards, and the walls and ceilings of nearly all the rooms are covered with cloth and wall paper. They are heated by means of fireplaces and stoves.

The commissary's building measures 30 by 100 feet. The quartermaster's buildings, two in number, are each 60 by 30 feet.

The guard-house, a temporary building, is 30 by 40 by 10½ feet, divided into a guard-room, 24 by 30 feet; a prison-room, 16 by 15 feet, and four cells, each 4 by 8 feet. It is warmed by stoves, lighted by windows, two in front and rear, which, by aid of one door in the center of the building, afford the only means of ventilation. The average occupancy is five.

The hospital is built of logs, with board gables and shingled roof, and when completed will be well adapted to the wants of the post. The ground plan is essentially the same as recommended in Circular No. 4, Surgeon General's Office. The main building is 33 by 34 feet, contains four rooms, surgery, steward's room, and bath-room, each 15 by 14 feet, and dining-room, 19 by 14 feet. These rooms open into a common hall, which is also connected with the ward, a wing, 44 by 24 feet. The kitchen, 16 by 21 feet, is attached to the rear end of the main building. The second floor of the main building is an attic with four windows, and is used for attendants' quarters and store-rooms. Warming is effected by means of stoves, though it is proposed to have the ward warmed by a fireplace. Lighting and ventilation are secured by windows and doors, aided by the cracks unavoidably existing in a building so rudely constructed. It is proposed also to have the walls more carefully lined, and, if deemed necessary, more suitable means of ventilation provided. The ward contains 968 cubic feet of air space per bed, with a capacity for twelve patients. The bath-room is provided with basins and bath-tubs. The sink is 60 yards distant in rear of the hospital.

The bakery recently erected contains an oven measuring 9 by 10 feet, and is well adapted.

About one hundred yards in rear of the men's barracks are the cavalry stables, blacksmith and wheelwright shops; and on the same line, but across a creek, are the quartermaster's corral and stable. The dimensions of the cavalry stable are 30 by 200 feet; quartermaster's stable, 96 by 30 feet. The two corrals are each 180 by 300 feet.

Two little streams come down from the mountain south of the post; one runs between the officers' quarters and the adjutant's office; the other runs to the left of the hospital, the officers' and men's quarters, and separates the quartermaster stables and corrals from the stables and workshops. There has been a deep drain dug about one hundred yards in rear of the officers' quarters between those streams, so that the drainage of the post is very good. The water is excellent in quality and the supply is plentiful, being obtained from springs which have their source in the mountain.

The gardens, one for each company and one for the hospital, are located 16 miles north from the post, in the valley of Lake Warner, and cultivated by enlisted men. Potatoes, cabbage, turnips, onions, &c., are raised.

Camp Warner commands a large section of country which, until very recently, was held by the most hostile Indians in the department, and its position will be important for some years to come. Some two miles north from the post, 150 Indians of the Pi-Ute tribe make their winter resort.

As might be presumed from the altitude of the post, we are singularly free from malarial or any other form of zymotic disease. I have yet to see the first case of malarial disease originating here. There have been some cases of intermittents, but it has been among those who suffered from malarial or typho-malarial disease in Virginia. In the winter months sore throats, catarrhs, and diarrhœas from exposure to cold and wet feet, yield to the simplest medicines, or, what is

much preferable, to the warmth of a hospital ward and proper dietetic measures, in a few days. In summer constipation is common, which is ascribed to the altitude of the post.

Statement showing mean strength, number of sick, and principal diseases at Camp Warner, Oregon, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	231.91	541	65	113	20	2	11	25	96*
1869.....	167.25	324	13	73	6	10	.....	18	42	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP HARNEY, OREGON.

INFORMATION FURNISHED BY ASSISTANT SURGEONS CHARLES STYER AND C. B. BYRNE, UNITED STATES ARMY.

Camp Harney is situated at the mouth of Rattlesnake Creek, in a cañon of the same name opening into Harney Lake Valley, in Grant County, Oregon. Latitude $43^{\circ} 30'$ north; longitude $118^{\circ} 30'$ west, and about 4,200 feet above the level of the sea.

The cañon is about a mile long, with precipitous walls of dark volcanic rock from four to six hundred feet in height. Its breadth at the post is about three hundred yards. The reservation is 6 miles square, and, extending into Harney Valley, includes about 15 square miles of level and serviceable land.

Harney Lake Valley, formerly known as "Big Meadows," is about 50 miles long by 30 wide, and contains two lakes of considerable size, known as Malheur and Harney Lakes, which have no outlets, the water of each being somewhat brackish.

Rattlesnake Creek, from which the post derives its supply of water, rises about ten miles north of this place in the mountains. The water is of good quality, clear, sparkling, and perennial. In summer the stream is maintained by springs, and the water remains cold throughout, except during the heat of the day.

The character of the country to the north, east, and west of this place is broken, rugged, and mountainous. Just at this point, where the mountains lower down and give place to the valley or flat, all vestige of timber disappears; and to the south, southeast, and southwest nothing but sage and a few stunted junipers are to be found. In the opposite direction, however, as the mountains recede from this point, they become wooded with juniper, fir, and pine. The geological formation of this section of country is singular. The flat already alluded to, adjacent to us on the south, is composed of alluvium, and in places the soil is impregnated with saline matter. The hills immediately bounding the valley present in many places bold, continuous cliffs, of probably five hundred feet in height, resembling a line of coast rocks. The face of the rocks near the creek, where not crumbled away or concealed by debris, has well-defined marks of having at some time formed the limit to a body of water, being washed and worn as is usual in such situations. The face of the rock furthermore presents evidence of its aqueous origin, exhibiting well-marked strata. These remarks apply only to the comparatively low range of hills immediately circumscribing the valley. The "rim rock," as it is termed, from which, as the hills recede, they become irregular and more and more elevated till high altitudes are obtained, and the character of the formation changes apparently to igneous and volcanic, the surface at the same time becoming wooded. At the

oot-hills below the cliffs are large detached rocks of volcanic origin, in many of which are imbedded specimens of petrified pine. No mineral products of value have been discovered in the vicinity.

Elk, deer, and bear are found in the vicinity, and immense flocks of wild geese and ducks remain in the low marshy lands of the valley during the spring and summer. On the side-hills are found the sage hen and prairie chicken.

During the year 1869 the mean temperature at the post was 45.9° F.; extremes 5° F. and 86° F. Rain fell 32 days, and snow 16, the combined fall being 7.51 inches. The dryness of the air renders the heat of summer very tolerable, and the nights are always cool. Frost sufficient to injure vegetation occurred in every month during the summer of 1868, greatly to the prejudice of the post garden. All winds at the post are either north or south, owing to its location in the cañon.

The post was first located in August, 1867, as a base of operations against the Indians occupying the Malheur and Stein's Mountain section of country in the south and east of Oregon. It was first known as Camp on Rattlesnake Creek, then as Camp Steele, then Camp Crook.

The buildings at this post are all constructed of logs, chinked and plastered with mud, and well roofed with shingles. There are three sets of barracks, each 30 by 100 feet, intended for one company. They are not lined or ceiled. They are warmed by fireplaces and stoves, lighted by large windows, eight to each set of quarters, and have no special means of ventilation. The air space per man as now occupied is 804 cubic feet; when companies are filled to maximum strength, 511 feet. There is as yet but one bath and wash-house, a scarcity of lumber preventing the building of others. The privies are situated 150 yards in rear of the camp and beyond the stream. The mess-rooms and kitchens are 40 feet in rear of the barracks.

Laundresses and married soldiers occupy quarters at the south extremity of the camp. Four sets originally intended for such occupancy, built of logs, are comfortable and of ample size, 16 by 24 feet. The light and ventilation are sufficient. Below these, and on the same line, are two buildings, originally intended as shelter for packers and other civilian employés. These have been converted into double sets of quarters, and are occupied by two families each. They are built of the same material as the others, though larger, their dimensions being 20 by 29 feet.

The officers' quarters, except the one occupied by the commanding officer, are built for two families each, making one single and three double sets. They are built of logs, cabin style, with piazza extending along the whole front. Each set is divided into two rooms on the ground floor; size of front rooms, 14 by 15 feet; back rooms, 9 by 15 feet. These rooms are neatly finished, and in most instances are papered. The buildings are one story high, with unfinished attics. Water is furnished by teams from a perpetual spring of excellent water. Adjoining the quarters are kitchens, one to each set, 18 by 30 feet.

The headquarters and quartermaster's office are under one roof, the building being a double one, with two halls running across it. A piazza extends along the southern front. Size of building 32 by 43 feet.

The commissary store-house, notwithstanding that it is a large building, viz., 40 by 80 feet, is entirely inadequate to meet the demands for storage made upon it. It is built of logs, and in the same manner as the other buildings.

The guard-house is 32 by 42 feet. Inside, 29 by 40 feet. Large cells, 14 by 29 feet. Small cells, each 7 feet 10 inches by 3 feet 6 inches. Height of ceiling 11 feet. It is warmed by a stove placed in the center of the guard-room, and is ventilated by doors and windows. The average occupancy during the past year has been five.

All timber used in the building of the post was procured from the timbered hills to the north, a distance of three miles. In a cañon beyond is situated the saw-mill. All the buildings were built of green lumber, and the consequent contraction, owing to its drying out, gives ample ventilation, without exposing the health of the inmates.

On a gentle rise to the northwest extremity of the camp is situated the hospital building, built of the same material as the others. It is warmed by stoves and fireplaces, one to each room. Large windows and doors give the requisite light and ventilation. One large ward, containing

eight beds, gives to each man 682 cubic feet of air. The wash-room adjoins the rear of the large ward. It contains a trough running the width of it, with a waste pipe leading to a subterranean drain. It is used also as a bath-room, and contains two bath-tubs. The privy is 50 feet in rear of the hospital. There is no dead-house. The baggage of patients is stored in a closet underneath the stairs leading to the attic.

There is no post bakery, laundry, chapel, nor school-house.

The stables are two in number, 150 feet apart, built of boards and divided into single stalls, with a capacity for 75 horses each.

Water is obtained from Rattlesnake Creek, a small stream running through camp from a spring half a mile above camp, and from wells in rear of each set of barracks. The quantity is unlimited, and by proper police being enforced the quality is excellent.

The soil being very porous, moderate amounts of rain and snow are rapidly absorbed. This, during the greater part of the year, is all that is needed for proper drainage.

There are as yet no general arrangements made for bathing.

Owing to the occurrence of severe frosts during each month of the year, together with immense swarms of crickets and grasshoppers, it has been found impossible to cultivate a garden with any surety of success. For two seasons the attempt was made, and the result proved but a total loss.

The price of butter is \$1 per pound; milk 20 cents per quart; eggs \$1 per dozen, and fresh vegetables ranging according to variety from 5 to 25 cents per pound. The above prices are in coin.

Medical supplies are obtained from Fort Vancouver by annual requisition.

Private conveyance is the only means of communication with the nearest railroad station, Winnemucca, Nevada, distant 280 miles. Portland, Oregon, the nearest city of any magnitude, is reached from Cañon City by a weekly line of stages to the Dalles, thence by steamboat and railroad down the Columbia River. The only obstacle to travel during the year is occasioned by snow, which usually falls to such a depth in winter as to preclude the possibility of passage from camp except on snow shoes. This causes in the season mentioned great irregularity in the transmission of mail matter. When there is no interruption the usual time occupied in the transit of mails to department headquarters is from ten to fourteen days, and to Washington one month.

The only inhabitants at the post or in its vicinity are roving bands of Pi-Utes or Snake Indians.

Since the establishment of the post the general sanitary condition of the garrison has been remarkable as regards the general good health and the small number of deaths. Of adults but two have died, one from phthisis pulmonalis, appearing before the patient arrived here, and one from suicide. There have been occasionally cases of intermittent fever, though of a mild type.

Statement showing mean strength, number of sick, and principal diseases at Camp Harney, Oregon, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Epidemic catarrh.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	197.16	493	1	6	87	35	11	19	33	77	.....
1869.....	143.75	211	.....	6	27	6	1	1	20	36	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF CALIFORNIA.

POSTS DESCRIBED.

Alcatraz Island, California.
Camp Reynolds, Angel Island, California.
Point San José, California.
The Presidio of San Francisco, California.
Yerba Buena Island, California.
Camp Bidwell, California.

Camp Gaston, California.
Camp Independence, California.
Camp Wright, California.
Camp Halleck, Nevada.
Camp McDermitt, Nevada.
Camp Winfield Scott, Nevada.

ALCATRAZ ISLAND, CALIFORNIA.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEON LORENZO HUBBARD, UNITED STATES ARMY.

Alcatraz Island, in latitude $37^{\circ} 49' 27''$ north, and $122^{\circ} 24' 19''$ west longitude, is situated in the Bay of San Francisco, three and a half miles distant from Fort and Lime Points, which guard the harbor mouth, and one and a half from Point San José and the water front of the city. It is rocky and precipitous on all sides, and rises to a height of 135 feet above tide-water. Its shape is an irregular oblong, and its area about twelve acres. A Government steamer calls twice daily from San Francisco. There is no water supply on the island. The island is composed of a fine-grained sandstone, and is almost destitute of vegetation. The temperature is mild and equable. Mean annual temperature 58.20° , with the wet-bulb indicating 55.56° F. From the conformation of the island and its rocky character the drainage is naturally perfect.

The buildings consist of a citadel, two barrack buildings for troops, and three prison buildings on the summit of the island, and laundresses' quarters, blacksmith and carpenter's workshop, two boat-houses, coal and wood house, and bowling alley and theater for the men, most of which are situated on the eastern face of the cliff.

The citadel, of brick, is 200 by 100 feet, and is two stories high above the basement, with bastion fronts facing to the northwest and southeast. It is well ventilated by the main hall passages and windows. It is used as officers' quarters, hospital, and quartermaster and subsistence offices and store-rooms. The set for each officer consists of two large and comfortable rooms, with kitchen and dining-room attached, and water-closets and bath-rooms. The rooms set apart for hospital use comprise a dispensary, and two wards, a kitchen, and adjoining mess-room, a store-room, bath-room, and water-closet. The wards are each 35 by 26 by 17 feet, well floored and ceiled, and are furnished each with ten beds and bedside tables, chairs, dumb-waiter, closet, and washstand. They are warmed by coal grates, lighted and ventilated by side windows. Air space per bed, 1,547 cubic feet; area, 91 feet.

The other buildings at the post are of wood, well floored, ceiled, plastered, and whitewashed. The dormitories occupied by the men are, one 82 by 39 by $12\frac{1}{2}$ feet, giving 740 cubic feet per man to its average occupation; having the beds disposed in four rows, with two passage-ways between; and a second, 50 by $20\frac{1}{2}$ by $13\frac{1}{4}$ feet, which has twenty single iron bedsteads in two rows, with an aisle between, and overhead a gallery with twelve beds, giving 507 cubic feet per bed.

The prison-rooms are three buildings, ventilated by sky-lights and warmed by stoves in the main hall. They have the cells arranged in two tiers, (in one three,) with galleries for the upper tiers. Ventilators are placed over the door of each cell, and air tubes in the walls. One building contains fourteen single and two double cells; the second has forty-five cells, and the third forty-eight single and four double cells. The average size is $8\frac{1}{4}$ by 6 by $3\frac{1}{4}$ feet, giving an air space to

each of 161 cubic feet. Adjoining these buildings are the kitchens and mess-rooms for the troops and prisoners, and the bakery for the post.

There are five double cottages, of which four are on the eastern, the other on the western declivity. They are occupied by married soldiers and their families. Each is 30 by 22½ feet. The sewers all discharge into the bay, into which, also, all refuse collected by the police parties is cast.

A bowling alley, gymnasium, and theater are at the disposal of the men for recreation and amusement.

A garden of twelve acres is cultivated on Angel Island by a detail of four men. Communication is kept up daily by steamer. This furnishes a good supply of fresh vegetables in their season.

The prevailing diseases are rheumatic and bronchial affections, owing to climatic influences.

Statement showing mean strength, number of sick, and principal diseases at Alcatraz Island, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	243.25	414	2	78	69	12	1	25	32	3	63	2
1869.....	222.25	254	1	56	12	6	.....	32	13	.....	32	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP REYNOLDS, ANGEL ISLAND, CALIFORNIA.

INFORMATION FURNISHED BY ASSISTANT SURGEON ALEXANDER H. HOFF, UNITED STATES ARMY.

The post known as Camp Reynolds is situated in latitude 37° 48' north, and 122° 26' west longitude, on Angel Island, 5 miles north of the City of San Francisco, California. The island is one mile square, and consists of a series of hills rising from a height of 300 feet near the shore to 820 feet at its central part. The only level ground is a small portion of the eastern extremity near Point Blunt. At this point there is a quarry of soft sandstone, used for building purposes. The soil is in parts fertile; the climate mild and pleasant. Mean annual temperature 61°, with extremes of 46° and 82° F. The prevailing winds are westerly, but the Seacoast Range of mountains, which run north and about five miles westward, protect the island in a degree from their violence, as well as from the fogs which are of such frequent occurrence on this coast. A Government steamer calls every alternate day for communication with San Francisco and the transportation of supplies. The drainage is naturally good from the irregularity of surface. The water is supplied from springs on the hillsides, conducted by pipes to the post, is of good quality, but insufficient in quantity. The camp is situated on the western extremity of the island, in a triangular depression between three hills, which leaves it exposed to the westward fronting the entrance of the harbor, the base being a pretty sand beach of about 1,000 feet in length.

The barracks for the men are two sets of wooden quarters, built in 1864, well ventilated, and well warmed by large stoves, but imperfectly lighted. They are not lathed and plastered nor ceiled, a very great mistake in this windy climate, and detrimental to the health of the men. They are furnished with double bunks, two tiers high, and give about 500 cubic feet air space per man of average occupancy. The sinks connect with sewers, which open into the bay.

The officers' quarters consist of one set for the commanding officer, and six sets of two rooms, with kitchen to each, in three houses.

The married soldiers' quarters are two double cottages with two rooms and attic in each set. They are comfortable, but insufficient for the number frequently at the post.

The guard-house is of wood, 18 by 26 feet. It has four cells cut off from the main building, and is well ventilated.

The quartermaster's store-houses, 25 by 60 feet, built of wood, one story, are located near the wharf.

The stables, built of wood, are situated on the eastern slope of the triangle, opposite the hospital, some distance above, and in the rear of the officers' quarters.

The hospital is situated on the western slope of the triangle, 100 feet above the level of the sea, in a fine, airy position. It has been recently erected in accordance with the plan in Circular No. 4. It has one ward for twelve beds, with bath-room and water-closets attached. The grounds around it are at present being graded, and, when completed, will make one of the most beautiful spots on the island.

The old hospital is at present used as a chapel, and the surgeon's quarters are assigned to the chaplain. It is about three-quarters of a mile from the post, and should be moved over to the camp to be used for school, library, chapel, &c., there being no suitable buildings at the post for such purposes. The grounds near it are cultivated as a hospital garden.

The post is a depot for recruits, the average number of which is about 250.

There are three gardens cultivated, one for the detachment, one for the recruits, and one for the hospital. The supply of vegetables is abundant.

There is no prevailing disease.

Angel Island is the largest of the group of islands in the harbor of San Francisco. It is the first one approached after entering the Golden Gate, and from its secluded position and nearness to the entrance to the harbor, it was a great resort for smugglers, and to prevent this was granted in 1839, by Governor Michael Torino, to Antonio Osio, by order of the supreme government of Mexico, and used as a sheep and cattle ranch. The United States troops took possession of it on the 12th day of September, 1863, and established the present post. The climate is much milder than that of San Francisco, and from its position the post enjoys an immunity from the disagreeable summer winds which prevail in the city. There are two or three mounds on the island, the soil covering them being mixed with shells, supposed to have been sites selected by the Indians for their camps. The one near the new hospital, in making the necessary grades, is being leveled. Several skeletons have been exhumed, together with stone mortars and some trinkets, showing that they were burial places for the Indians, and that the island was originally inhabited by them. Some mining has been done on the island; silver ore taken out yielding about fourteen dollars to the ton, and gold is said to have been discovered.

Statement showing mean strength, number of sick, and principal diseases at Camp Reynolds, Angel Island, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	246.83	379	.....	63	63	1	53	20	2	45	2
1869	265	291	1	62	43	1	70	5	.....	30	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

POINT SAN JOSÉ, SAN FRANCISCO HARBOR, CALIFORNIA.

INFORMATION FURNISHED BY ASSISTANT SURGEONS W. A. BRADLEY, E. J. MARSH, AND EDWIN BENTLEY, UNITED STATES ARMY.

This post is built upon the point of that name, or, as it is more commonly called, "Black Point." It is in latitude $37^{\circ} 48'$ north, longitude $122^{\circ} 23' 20''$ west. It is on the southern margin of the Bay of San Francisco, and lies on the outside, and distant to the northwest half a mile from the city wharves. To the westward, about a mile, along the curvature of the shore, is the Presidio of San Francisco, and beyond that, at the harbor mouth, the fortification of Fort Point; over against it, in the center of the harbor channel, is the island of Alcatraz. The post is three-quarters of a mile distant from the terminus of the nearest street cars.

San José is a rocky point which, with an elevation of 80 feet, projects into the bay northward. It is steep and bare on its western face, less so on its eastern or sheltered face; and on both sides it falls away into low sand mounds. Back from the bay it is continuous with the sand-hills, on which the western portion of the city is built.

The climate is similar to that of the Presidio; but on account of the sand-hills which lie between the point and that post, and the prevailing direction of the wind, it is much more exposed to sand storms during the summer and autumn. Its elevation is insufficient to prevent it from being wrapped up in the fog-banks that creep in from the ocean.

There is very little vegetation in the neighborhood, as all the ledges that otherwise would afford a footing to vegetable growth are buried in the shifting sands. On the brow of the less exposed eastern face a small space around the officers' quarters, under cultivation, yields a large show of flowers during the greater portion of the year. Immediately on the landward side of the post buildings is a deep excavation in the rock which is sheltered from sand-drift, and always contains more or less stagnant water, but no evil effects on the health of the post can be traced to its presence. With this exception the ground requires no artificial drainage.

In the small cove on the sheltered side of the point a wharf has been built, at which a Government steamer calls twice daily for communication with the city; but the post supplies are generally brought out by wagons, as, with the exception of a quarter of a mile of sand-hill, the road to the paved streets of the city is good.

The battery is placed on the western face of the point, and well on the brow of the hill; above it are built two sets of company quarters, of which one only at the present time is occupied. They are each of wood, 90 by $30\frac{1}{2}$ by 13 feet. Thirteen feet of this length is partitioned off at one end, and divided into two rooms—one an office, the other a company store-room. The barrack is furnished with a double row of bunks, two tiers high, and affords 470 cubic feet per man of its average occupancy. It is heated by one stove in the center of the building, lighted by seven windows, and ventilated by the ridge. Two tables and four benches complete its furniture. The kitchens and mess-rooms of both barrack buildings are in rear, 60 by 20 feet, as is also the bakery, 38 by 16 feet. The married soldiers' quarters are in rear, or on the landward side of the company barracks, and consist of two frame buildings, 32 by 24 feet, each divided into two sets of quarters, and a third building, 25 by 16 feet, forming another set. Three families are at present at the post. Near these are the stables for the few quartermaster's horses and mules and officers' stock at the post.

Between these buildings on the western brow and the officers' quarters on the east, the crown of the point is occupied by a small parade ground facing the bay, and backed by certain of the other buildings of the post. The guard-house is a frame building, 34 feet 9 inches by 18 by 6 feet, divided into a guard-room, 17 by 16 feet, with a stove and three windows, a prison-room, 17 by 14 feet, with two windows and 4 cells, each 7 by 4 feet, with a small window or ventilator. Average number of guard, five; of prisoners, six. The hospital is a small frame building, $36\frac{1}{2}$ by $32\frac{1}{2}$ feet, divided into a dispensary and two wards. The former is well fitted up with desk, shelving, drawers, &c., and has a closet by way of store-room. The latter are furnished with five iron bedsteads for patients and attendant, and give an area per bed of 75 feet, and an air space of 900 cubic

feet; average occupation, four. There is no kitchen, mess-room, or other out-houses. Serious cases of sickness are not treated here. When such occur at the post they are sent for treatment to the hospital at the Presidio. There is a large building for quartermaster and subsistence, and two smaller for ordnance stores.

The officers' quarters are five frame cottages of different size and plan, but all are comfortable and pleasantly situated on the sheltered brow, with a luxuriant flower garden around them. They were cottages of citizens before the point was taken up as a Government post.

The sinks of the men are open trenches, which are closed over with earth when filled. The water-closets of officers' quarters discharge into the bay, into which, also, all post refuse is thrown.

The water supply is unlimited, and of good quality. It is furnished by the water company free of charge, as the works are situated on the Government reservation.

Along the back of the officers' quarters, separating them from the parade ground, is a high sheltered fence or lattice wall of laths, as a protection against the violent winds and sand-drift. The western limit of the post is similarly protected. The area thus sheltered includes the sites of the buildings above mentioned, and measures about five acres.

There are no special means of recreation at the post, except a company library of 125 volumes, but the city is so near that they are unnecessary.

Potatoes and other vegetables had, for a long time, to be purchased in the San Francisco markets, or canned fruits and such like supplies from the commissary; but of late five acres of ground, which were assigned from the reservation at Fort Point as a garden for this company, have been successfully cultivated. Parsnips, carrots, turnips, and onions have been the produce raised in greatest quantity.

The prevailing diseases have been rheumatism, bronchitis, and venereal diseases. Scarlet fever and small-pox prevailed in town, but the post remained unaffected.

Statement showing mean strength, number of sick, and principal diseases at Point San José, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	104.75	186	6	30	11	13	25	.....	43	.....
1869	91.5	115	9	18	1	16	24	4	14	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

THE PRESIDIO OF SAN FRANCISCO, CALIFORNIA.

INFORMATION FURNISHED BY SURGEON J. C. BAILY, ASSISTANT SURGEON CHARLES SMART, AND ACTING ASSISTANT SURGEON L. H. PATTY, UNITED STATES ARMY.

The Presidio of San Francisco, California, is situated in the northwest suburbs of the town, on a gravelly slope which ascends gradually from the sands and salt-water marshes on the southern margin of the harbor of San Francisco. It overlooks the bay, and has in view the posts of Fort Point, a mile to the northwest, near the harbor mouth, that of Alcatraz Island to the north and eastward, and that of Point San José to the east.

The reservation contains about 1,540 acres, and has a frontage on the bay of about a mile and a half. Back from the post the ground rises more rapidly into grass-covered hills. There are no shade trees in the vicinity. The climate is varied and variable; oftentimes mild and pleasant during the early part of the day, and chilly and damp toward its close. Strong winds frequently

prevail toward the end of summer and autumn, while in winter there is much moisture in the atmosphere, either falling as a heavy rain or enveloping the post in a thick penetrating mist, which creeps in from the ocean and spreads itself over the lower-lying portions of the harbor boundaries. Mean annual temperature, 52.50° F.

The site of the post is well drained naturally, by a fall of one foot in twenty, but this is aided by shallow ditches around the various buildings, so that even immediately after heavy rains, there are no standing pools. The parade ground is grassy during the whole year.

The post is built on three sides of a parallelogram, 550 by 150 yards, which is open to the bay or northeast side. The general arrangement is shown in Plate No. 11.

Thirty-six feet in front of the row of officers' buildings, and extending along their whole length, is a wind-fence or lattice screen of lath, 12 feet high, with branches extending at right angles from it to the buildings. This has recently been built to shelter these quarters from the strong winds that sometimes blow from the ocean. Trees, pine and acacias, have been planted at 18 feet intervals between the main fence and the buildings. All the buildings, with the exceptions noted below, are of wood, and well lighted and ventilated by the windows and ridge.

The men's quarters consist of one building, 80 by 18 feet, one 95 by 18 feet, and four, each 51 by 18 feet, each one story and accommodating one company, with kitchens and mess-rooms adjoining; kitchens furnished with monitor ranges; one building, 117 by 25 feet, two story, for two companies, with kitchen and mess-room in an adjoining building, 117 by 16 feet; four buildings, 120 by 30 feet, each for two companies, with kitchens and mess-rooms in basements.

The officers' quarters consist of one building, 114 by 32 feet, three story, with a wing, 40 by 30 feet, thirty-nine rooms, for bachelor officers' quarters; twelve one and a half story cottages, 31 by 18 feet, with water-closets and bath-rooms attached; comfortable and neat, for married officers.

The laundresses' quarters consist of one building, 90 by 28 feet, one story, twelve rooms; one, 45 by 37 feet, two story, twelve rooms; eight, 60 by 27 feet, one story, eight rooms each; one, 160 by 29 feet, with eighteen rooms; one 87 by 55 feet, with fourteen rooms; one, 45 by 26 feet, with three rooms; one, 60 by 23 feet, with three rooms—one story, adobe, occupied by seven families.

The post buildings consist of one building, 36 by 30 feet, one story, four rooms, adjutant's office; one, 40 by 30 feet, two stories, with porch in front; upper story a guard-room; lower, divided into a main prison-room, 35 by 20 by 12 feet, and cells, each 10 by 5 by 12 feet; chapel, 45 by 30 feet; school-house, 30 by 18 feet; bake-house, 42 by 18 feet—oven turns out a batch of 412 rations; hospital, 80 by 40 feet.

The workshops consist of a wheelwright shop, 80 by 30 feet; blacksmith shop, 50 by 20 feet.

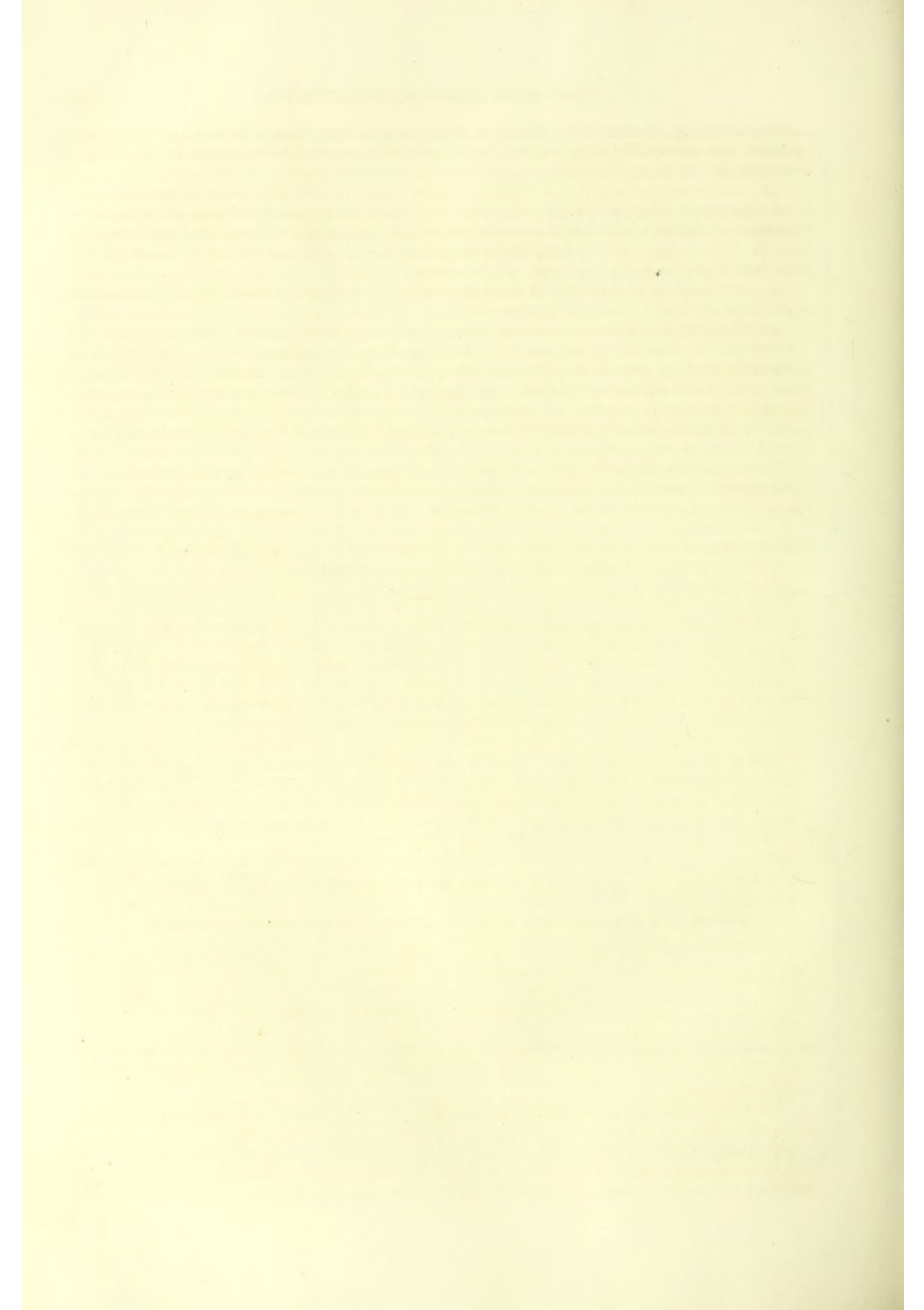
The store-houses consist of a magazine, 28 by 23 feet; quartermaster's and subsistence store-house, 110 by 30 feet, one story, brick foundation; store-house for hay and grain, 66 by 24 feet; store-house for hard-wood lumber, 51 by 18 feet; gunsheds, 175 by 30 feet, with ordnance stores in loft.

The stables consist of two buildings for battery horses, 215 by 30 feet, with eighty-seven stalls each, well ventilated; forage loft overhead; mule shed, 430 by 16 feet.

The hospital at the eastern angle of the parade ground, in line with the officers' quarters, is a two-story building, 80 by 40 feet, with a wing, 35 by 22 feet, on brick basement, with porch in front, and small inclosure behind. It is arranged for fifty beds, to each of which it gives an area of 76 feet, or 1,025 cubic feet. Its average occupancy is seventeen. It is divided into four wards, 40 by 22 by 14 feet, a smaller ward for prisoners, 20 by 10 by 13 feet, and an attendants' room, 20 by 18 by 13 feet; each is furnished with water-pipes and marble basin, wardrobe, bedside tables, and chairs. They are well-warmed by grated fireplaces for coal, and lighted and ventilated by the windows. In addition to these, there is a dispensary, furnished with hot and cold water and the necessary fixtures; a library containing a large and very good selection of books; a post-mortem room with table, and two well-fitted up bath-rooms. The kitchen is likewise furnished with hot and cold water, has a good range, and an adjoining pantry and store-room. The mess-room, 30 by 20 by 10½ feet, is fitted up with the necessary tables and benches, and cupboards for crockery. In the basement, besides the kitchen and pantries, are two store-rooms for medical supplies, and a coal cellar. On the upper floor are two water-closets, which empty through the main sink in the inclosure into the sewer.

PRESIDIO, SAN FRANCISCO, CALIFORNIA.





The regimental library of the Second Artillery is kept at this post, and contains about 1,478 volumes. The hospital library contains 500 volumes, comprising travels, biography, history, fiction, and books of a religious character.

The water supply of this post is derived from the flume of the Spring Valley Water Company. It is forced by a windmill and mule-power into a reservoir at the southern or higher end of the post, whence it is supplied by pipes to the different buildings. The supply is abundant, and the quality excellent. The waste-water pipes and latrines empty into a large covered sewer, which runs on either side of the post, and discharges into tide-water.

A cow is kept for hospital use. A small garden yields all the vegetables necessary for the hospital, and is cultivated by one of the attendants.

About ten acres are cultivated as post garden, producing potatoes, cabbage, turnips, onions, &c.

The post is arranged for sixteen companies, but during the greater portion of the past year its garrison consisted only of the field, staff, band, and Battery M of the Second Artillery, giving a mean strength of 8 officers and 170 men. The quarters occupied by these troops are fitted up with iron bedsteads, and 1,225 cubic feet of air space is allowed per bed. Transient troops have frequently gone into quarters in some of the other buildings. Their diet has been of good quality and variety. A large company garden, well cultivated, renders the post almost independent of other sources of vegetable supplies. The sick list has been mostly composed of venereal diseases contracted in San Francisco, and rheumatic affections, to which the winds and dampness give origin. The daily per cent. of sick to command has been 19. Percentage of mortality to cases treated, .53.

Statement showing mean strength, number of sick, and principal diseases at the Presidio of San Francisco, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	310	491	52	36	4	99	43	5	61	5
1869	319.5	663	122	53	10	141	50	5	107	3

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

YERBA BUENA ISLAND, SAN FRANCISCO, CALIFORNIA.

REPORT OF ACTING ASSISTANT SURGEON DAVID WALKER, UNITED STATES ARMY.

This island, in latitude 37° 48' north, and longitude 122° 26' west, is situated in the Bay of San Francisco, California, some 2½ miles northeast of the city, with an altitude from 35 to 75 feet above sea-level. It is of irregular shape, hilly outline, and contains 116 acres. The only part of its surface fitted for a camp is the small plateau on which the post is located, which is flanked northeast and southwest by hills, and open to the southeast and northwest. The climate is mild but moist, complete saturation frequently occurring at night; the temperature ranges from 40° to 90° F., the yearly mean being 56° F. The prevailing winds are westerly from the ocean; the yearly rain-fall is about 5½ inches.

The surface drainage of the island is satisfactory. Its water supply is of excellent quality and is derived from a well and a tank, filled by exudation from seams in the rock.

The post was established in 1868, and is still in an unfinished condition. The barracks are built of rough boards, set upright and battened, and consist of two buildings, 95 by 30 by 16 feet, ventilated by the ridge, each lighted by ten windows, and warmed by coal-stoves. They are fur-

nished with iron bedsteads, and give 750 cubic feet air space per man of average occupancy. A first sergeant's room and wash-room are partitioned off from each, and adjacent are two kitchens, mess-rooms, and a bakery. One mess-room, 34 by 30 feet, and one kitchen, 24 by 18 feet, furnished with range and cooking-stove, are made use of by the company. The other set is used by the quartermaster's department for storage purposes. The sinks are conveniently placed on a small wharf over the water of the bay. The married soldiers' quarters consist of one building, 44 by 18 feet, with a wing 18 by 12 feet, two story, clapboarded and ceiled.

The officers' quarters are three houses, hard-finished, each having two rooms, 18 by 20 feet, with a wing in rear, 21 by 18 feet, and attics. In the rear are temporary water-closets. The bath-room is contained in the L of the building.

The guard-house is 28 by 28 feet, with two windows on each side, and heated by a coal-stove. Interior unfinished. Average number of prisoners, two.

The hospital is situated on the edge of the plateau, and 42 feet above the level of the sea. It is built of wood, heated by stoves, lighted by candles, and ventilated under the eaves. The ward contains five beds, with an air space of 945 cubic feet per man. A bath and wash room is in course of completion; it is 12 by 6 feet, and contained in the quadrangle of the L, and opposite the water-closet.

The post garden comprises five acres of land, which is cultivated by enlisted men; potatoes, turnips, cabbage, lettuce, tomatoes, peas, &c., are raised. A steamer, in charge of the quartermaster's department, communicates with San Francisco every second day, running two trips.

The command has consisted of Company D, battalion engineers, with an average strength of 116 men. They have been occupied in building quarters, engineer duties, drills, and police. Baseball and other open-air exercises, with occasional visits to the city, have constituted their amusements. The diet has been of regulation quantity and variety, and the articles of good quality. Extras are purchased in the San Francisco markets and from the commissary by the funds of the company, and vegetables are furnished in their season by the garden. Eight per cent. of the command have been daily sick, with no deaths. The sick-list has been composed of venereal cases, rheumatic affections, and cases of poisoning from a species of rhus.

Statement showing mean strength, number of sick, and principal diseases at Yerba Buena Island, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (nine months).....	108.88	278	6	92	5	9	17	31	1	20	.....
1869	99.25	370	27	73	13	5	46	59	.....	45	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP BIDWELL, CALIFORNIA.

INFORMATION FURNISHED BY ASSISTANT SURGEONS D. G. CALDWELL AND CHARLES SMART, UNITED STATES ARMY.

Camp Bidwell is situated in Surprise Valley, on the eastern slope of the Warner Mountains, eight miles from the southern boundary of Oregon, and the same distance from Nevada; latitude 42° 10' north, longitude 120° 15' west from Greenwich; elevation above the sea-level, 4,680 feet. The post was established in August, 1865. The reservation is three miles long, by one and three-eighths mile in width, and ascends gradually from Willow Creek on the east for about one-half mile, after which the ascent is abrupt to the summit of the mountain. The Warner Mountains, like the great

Sierra Nevadas, of which they are really a portion, have a slate base, and superimposed are strata of quartz. Sandstone also abounds near the surface, and forms the greater portion of the lower range of hills. Gold, silver, and copper are found in various portions of these mountains. The ravines traversing their surface contain vast forests of pine and cedar.

Surprise Valley, sixty miles long, and six miles wide, although destitute of timber, is very fertile and well adapted for grazing and agriculture. It contains three lakes of about equal size, their combined area being about one hundred square miles. The lakes have no outlet, and are strongly saline.

The mean temperature during 1869 was 49.64° F.; extremes 18° and 97° F.; the yearly rain-fall 9.9 inches; snow-fall 12.16 inches.

The post is situated near the northeast corner of the reservation. All the buildings are constructed of pine logs, one story high, with shingle roofs. They are warmed by open fireplaces, well lighted, and with apertures for ventilation at the eaves.

The men's barracks, two in number, measure 110 by 26 feet each, and are divided into three squad rooms, and a hall in the center, by log partitions. The buildings are not lined, and the space formed by the angle of the roof is so extensive that the rooms cannot be properly heated in cold weather. The mess-rooms and kitchens are two log buildings, containing two rooms each, furnished with cooking-stoves and dining tables.

The officers' quarters consist of four buildings, each 31 by 42 feet, lined and floored with rough boards. Two of the buildings have bath-rooms.

The guard-house, a similar building to those described, is 24 by 35 feet, containing a cell and guard-room. The cell is lighted and ventilated by two small openings in the wall; there is no means of heating the cell; the guard-room is warmed by an open fireplace.

The hospital, 59 by 23 feet, contains three rooms, designated as dispensary, ward, and kitchen. The rooms are not lined and are uncomfortably cold during the winter. The ward is 22 by 29 feet; contains twelve beds, with 1,200 cubic feet air space to each. There is no bath-room.

The corral is 138 by 229 feet, a portion being roofed for stable purposes. The sinks for the enlisted men consist of wooden buildings placed over a small stream in rear of the barracks. Those used by officers are small buildings placed over pits dug in rear of the quarters.

There are two company gardens, each containing four acres. The estimate of their product for 1869 is: Potatoes, 25,000 pounds; cabbage, 800 pounds; onions, 600 pounds; peas, 300 pounds; beets, 400 pounds; tomatoes, 400 pounds.

There are four hundred settlers in the valley, engaged in agriculture and stock-raising.

Communication is by weekly stage to Reno, on the Central Pacific railroad, liable to interruption by snow during the winter. Time from the post to San Francisco, seven days.

The average sick-report for 1869 was 5 per cent. and no deaths; the prevailing disease being intermittent fever, though few of the cases originated at the post.

Statement showing mean strength, number of sick, and principal diseases at Camp Bidwell, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	102.25	190	40	16	5	8	24	.....	32	.....
1869	120.41	178	23	39	8	15	11	2	26	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP GASTON, CALIFORNIA.

REPORT OF ASSISTANT SURGEON THOMAS F. AZPELL, UNITED STATES ARMY.

Camp Gaston is situated in Hoopa Valley, Klamath County, California, in latitude $41^{\circ} 3' 56''$ north, longitude $123^{\circ} 15'$ west; altitude 397 feet above the level of the sea.

The camp is located on the west bank of the Trinity River, 14 miles above its junction with the Klamath, and between the Trinity and Redwood chains of mountains, which belong to the Coast Range of the Sierra Nevadas. Distant from the village of Arcata 40 miles; from the town of Eureka, 53 miles; from the town of Orleans, 33 miles south by trail across the Trinity Range; from Camp Wright 105 miles north by trail and wagon road.

Fort Gaston, as it was formerly called, was established in December, 1858, by Captain E. Underwood, Fourth United States Infantry, in consequence of Indian depredations in the vicinity, and was named in memory of Second Lieutenant William Gaston, First United States Dragoons, who was killed in an engagement with Indians in Washington Territory, on the 17th of May, 1858. The military reservation is an irregular square, containing 451.5 acres. Hoopa Indian Reservation, near the center of which the camp is located, is about ten miles square. Hoopa Valley is about seven miles in length by an average of two in breadth, with the Trinity River winding from south to north midway between the two mountain ranges.

The geological formation of Hoopa Valley is for the most part alluvial, with large deposits of auriferous and micaceous sand along the bed and banks of the river, thickly covered in many places with medium-sized boulders of azoic rock, worn smooth by the action of the water. About two-thirds of the ground occupied by the military reservation is a thick bed of broken shale. This forms excellent paths and roads when beaten hard by usage. The bed-rock of the valley, to judge by its outcroppings, is principally an upheaval of slate, with the laminae now lying at various angles with the plane of the river, generally about 45 degrees. Placer mining is carried on to some extent both above and below Hoopa reservation.

The soil of the military reservation is principally barren and unproductive, and covered with patches of poison oak, lupine, and stunted grass. About 20 acres, however, along the river bank can be advantageously cultivated, the most fertile portion of which is now used as the post garden. Indigenous forest trees and ornamental plants are in great variety.

Wild animals and game of every description are rapidly disappearing from the immediate vicinity of the post. A few deer and an occasional black bear are still to be found within the limits of the Indian reservation, and are yet numerous in the mountains beyond. The same may be said of the wild cat, and the large panther called "the California lion." Cinnamon and grizzly bears are still to be found, it is said, in the mountain ranges in sight of the camp, but they are rarely hunted, as the Indians are afraid to attack them. A peculiar ruffed grouse is plentiful, and much hunted; quail also abound in season; wild ducks appear in numbers on the Klamath. A few snipe and pheasants are occasionally found, and the migratory pigeon arrives in the fall in large numbers.

The fish of the Trinity and Klamath Rivers are of few varieties, but in considerable numbers. They seem only to comprise salmon, sturgeon, and eels; a few brook-trout are caught in the neighboring streams.

The water supply of the camp is obtained from the lower creek, and at a distance of about a mile and a half from the flagstaff. The water is of good quality; it is conducted in ditches along the side of the western hills, and thence distributed throughout the camp. The quantity is ample, and the numerous small divergent streams are rapid and well filled through the whole of the dry season. For purity and convenience of distribution the water supply of the garrison is hardly to be surpassed.

The climate is for the most part pleasant, though subject to rapid changes of temperature, and excessive heat in the summer, as, for instance, on the 3d of August, 1870, at 7 a. m., the thermometer stood at 78° F.; at 3 p. m. it had risen to 116° F., and during the night fell to 75° F.

The low temperature, though seldom below 22° F., is severely felt, on account of the keen and damp winds prevailing in the winter. The following is a summary of meteorological observations for the year ending August 31, 1870: The yearly mean temperature, dry bulb, 57.09°; the lowest—22° F.; highest, 116° F. During the first six days of August the heat was almost unbearable during the day, but the temperature invariably became reduced during the night to between 70° and 80° F., and permitted a refreshing sleep. The amount of rain-fall during the year was 44.79 inches.

The camp is not fortified, and consists mainly of a parade ground about 600 feet square, bounded on the four sides by barracks, officers' quarters, &c., the buildings being of logs, sawn timber, and adobes. The present capacity of the camp is for two companies of infantry.

The barracks consist of two sets of buildings, built principally of logs. One consists of a single dormitory, 30 by 70 by 12 feet, containing thirty-eight double bunks, in two tiers. The other contains three dormitories, the largest 26 by 48 feet, containing twenty double bunks; the second, 26 by 27 feet, containing twelve double bunks; and the third, 26 by 31 feet, with accommodation for thirty-two men; containing in all forty-eight double bunks in two tiers, with accommodation for ninety-six men. These barracks are badly arranged and ventilated, and, if anything like the number of men mentioned was placed in them, they would undoubtedly suffer for want of air space, there being no ridge ventilation, and but imperfect side ventilation. No bath or wash rooms are attached to these barracks.

The officers' quarters consist of seven buildings. Four single sets, and one in process of erection occupy the officers' row; and one single set, and one double, are detached; they are chiefly built of logs and sawn lumber. These quarters are of one story, with the exception of one, which is two stories high and occupied as a double set. The dining-rooms are of logs, whitewashed. The quarters are heated by open fireplaces and wood-stoves. An open water course runs at the rear of each building. There are no bath-rooms or water-closets.

The guard-house is 50 by 22 feet, with a guard-room, 17 by 20 feet, and the balance in cells, 5 by 8 feet. It has a capacity for eighteen prisoners and thirty guards. It is built very strongly of logs, and is well adapted to the purpose.

The hospital consists of a ward, 24 by 27 feet, built of logs, and an addition, 31 by 35 feet, built of rough boards, battened, which is used as a dispensary, &c. A steam bath-room for rheumatic cases, and a store-room adjoin the ward, and in the rear a detached building, 12 by 24 feet, is used as kitchen and main store-room. The plan of the hospital is a very poor one, there being neither ridge nor side ventilation, and although there are seventeen beds reported in the post hospital, still if this number of patients was admitted they would have to be put in tents, as the wards and sick-call-room combined would be over crowded with that number. The light in the rooms is also insufficient, and the building in bad repair.

The stables and granaries consist of four rough buildings of various sizes, and have stalls for seventeen animals, and shed room in the corral for thirty animals; also room under cover for 160,000 pounds of hay, 100,000 pounds of oats, and 20,000 pounds of straw.

The library occupies the north end of a building formerly fitted as a theater, the stage being partitioned off for that purpose. The auditorium is used as a quartermaster's store-room. There are 201 volumes at present, principally of light literature.

There are no arrangements for bathing at the post, an idea being prevalent that the water of the Trinity River is productive of rheumatism, and several cases seem to be traceable to this cause, though it is probably owing to the individual taking subsequent cold through imprudence or the chilliness of the nights.

The post garden, containing about 8 acres, is the only one under cultivation.

The only means of communication between the camp and the neighboring towns is by mule trail over the mountains. This at present is pretty regular, except during the winter season, when the snows are sometimes so heavy and the streams so swollen as to interrupt transit for two or three weeks, or even longer if the season is unusually severe.

The mails for nine months of the year are regularly received and transmitted twice a week. The length of time required for a letter to reach San Francisco is from five to ten days.

The inhabitants of the vicinity are chiefly Indians; a very few whites, as miners and traders, being located on the Trinity and lower Klamath Rivers.

The Indians collected on the reservation adjoining the post are principally of the Hoopa tribe, or "Noh-tin-oahs," as they call themselves, and are separated into small villages called "ranches" in the common designation of the country. These Hoopa villages, although speaking the same language, are constantly hostile to each other, and also to certain ranches of their neighbors beyond, uniting with or against each other in their constant feuds, both for offense and defense, which disunited condition is, perhaps, the principal safeguard of the white population. Two other tribes or nations inhabit the vicinity of Hoopa Valley, speaking totally different languages from each other and from the Hoopas. These are the Klamath Indians or "Sa-ag-its," and the Orleans bar or "Pe-nom-o-ni" Indians.

The prevalent diseases of Camp Gaston are venereal, rheumatic, pulmonary, dysenteric, and malarial.

Statement showing mean strength, number of sick, and principal diseases at Camp Gaston, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868.....	173.83	329	30	27	1	42	42	67	.....
1869.....	149.41	259	13	32	2	40	50	34	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP INDEPENDENCE, CALIFORNIA.

INFORMATION FURNISHED BY ASSISTANT SURGEONS T. McMILLEN AND CHARLES SMART, UNITED STATES ARMY.

Camp Independence is situated in Owen's River Valley, on the eastern slope of the Sierra Nevada, three miles west of Owen's Lake, and at an elevation above the sea of 4,958 feet.

Owen's Valley at this point is about 12 miles wide, having the Sierra Nevada on the west, and the Inyo or Monache range on the east. The highest peaks of the Sierra in this region reach an altitude of 15,000 feet, and are snow-covered during the entire year. The Inyo range is about 8,000 feet high. The bottom lands on either side of the river are very fertile, but the higher grounds of the valley are dry, and bear only patches of bunch grass, artemisia, and valueless shrubs. Pine timber is abundant in the Sierras.

The climate is dry; little rain or snow falling, except on the mountains, so that for cultivation irrigation is necessary. During the year 1869 the rain-fall at the post was 1.13 inches. Snow-fall, (melted,) .16 inches. Extremes of temperature, July 5, 101°; December 22, 10°. Prevailing winds north and southeast.

The town of Independence, the county seat of Inyo County, is two miles south of the post. The nearest railway station is Reno, on the Central Pacific railroad, 271 miles distant, to which point there is a weekly stage. The post was first occupied in March, 1862, to protect some quartz mills and miners from Indian depredations, was abandoned in 1864, and reoccupied in March, 1865, on account of renewed hostilities on the part of the savages.

The post is located on Oak Creek, a large and constant tributary from the Sierra to Owen's River. The reservation is three-fourths of a mile long by one-fourth of a mile wide, with a fall of one foot in thirty from west to east. The soil is light and sandy. In addition there is a wood reservation of two miles square in the Sierra, four miles west of the post, and a grazing reserve three miles square one mile east of the post. A short distance above the post a dam has been

constructed on the creek, and the water led in three streams through the camp. One supplies the quarters of the men and officers; a second, the hospital, and the third the quarters of the married soldiers. After passing through the post these streams irrigate the post garden. The drainage is excellent.

The great desideratum at the post is shade during the summer months, as there are few shade trees, and no verandas around the buildings. A large number of trees have been set out, but as yet have not attained sufficient size to be of use.

The buildings are all constructed of adobe, plastered and whitewashed outside and in, shingled, and, with the exception of the store-house, floored. They are sufficiently large, comfortable, and well arranged.

The company barrack, 96 by 28 feet, has no special means of ventilation. The average air space per man is 400 cubic feet.

There are four sets of officers' quarters. The hospital measures 41 by 34 feet, and is fitted up for six beds.

The post is a very healthy one; the duties of the troops being light, the air pure, and the food excellent. The post garden has furnished more vegetables than could be consumed.

No diseases can be said to prevail. Lead colic occurs among the neighboring miners from smelting ores of argentiferous galena.

The population in the vicinity is about 2,500, four-fifths being Americans, the rest Mexicans.

Statement showing mean strength, number of sick, and principal diseases at Camp Independence, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Epidemic catarrh.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	74.66	85	7	12	8	1	6	7	1	7	1
1869.....	61.83	96	12	18	4	.....	.....	13	1	9	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP WRIGHT, CALIFORNIA.

INFORMATION FURNISHED BY ASSISTANT SURGEON E. J. MARSH, UNITED STATES ARMY, AND ACTING ASSISTANT SURGEON J. McNAER, UNITED STATES ARMY.

Camp Wright is situated in Mendocino County, California, at an elevation above the sea of about 1,800 feet. Round Valley, in which the post is placed, is in the Coast Range of mountains, by the high ridges of which it is surrounded, and is about eight miles in diameter. No roads enter it, but there are several trails. The nearest town of any note is Ukiah, distant 65 miles. Capto, in Long Valley, 25 miles south, is the nearest post office, from which a tri-weekly mail is brought to the post. Owing to the steepness of the trails all supplies are packed into the valley on mules.

An Indian reservation, upon which about 2,000 Indians of various tribes have been gathered, is established two and a half miles from the post, and about thirty American families are settled in the vicinity. The soil is fertile, producing large crops of cereals and all kinds of vegetables. Round Valley was first occupied by troops in the latter part of 1858, was abandoned in 1861, and reoccupied in December, 1862, when the present post was established, and named in honor of the department commander. The military reservation is one mile square.

The post is situated about one-half mile from the dividing ridge, on the western side of the valley, on a slightly undulating gravelly bottom, which in summer becomes parched.

The supply of water is deficient in the vicinity of the post during the dry season. Two wells supply the garrison during winter and spring, but from July to October these become nearly dry, and water is hauled from a creek about two miles distant. Eel River nearly surrounds the valley, is fordable in summer, but in winter swells to a rapid and dangerous stream.

The mean temperature during the year 1869 was 66.86° , the extremes being 20° in December, and 101° in August. The climate is very dry, except during the rainy season, and there is scarcely any dew. The rainy season varies greatly, from November to July, or from January to May. Little or no snow falls here. Rain-fall for 1869 was 36.84 inches. The drainage is good, and all the quarters are shaded by fine oak trees.

The company barrack is an adobe building, 200 by 30 feet, and 12 feet high to the eaves, giving 853 cubic feet per man. It has no special means of ventilation. The men's bunks are double, and in two tiers.

The officers' quarters consist of three buildings, one brick and two frame; each containing three or four rooms and a kitchen.

The hospital is a coarsely built, one-story frame building, 44 by 18 feet, neither lathed nor plastered. The ward, 24 by 18 feet, contains seven beds, giving 600 cubic feet per bed, but the average number of occupants is only two. All sinks at this post are open trenches, filled in with earth as required.

The principal diseases at the post are intermittents and rheumatism. Venereal diseases, contracted from the Indians, are frequent. The supply of food is good, and vegetables are abundant.

Statement showing mean strength, number of sick, and principal diseases at Camp Wright, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Diphtheria.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	103.58	263	16	29	1	.....	40	44	1	38	1
1869.....	81.41	146	9	28	4	1	17	10	4	27	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP HALLECK, NEVADA.

INFORMATION FURNISHED BY ASSISTANT SURGEON B. F. POPE, UNITED STATES ARMY.

Camp Halleck is situated at the foot of the eastern slope of the Humboldt Mountains, 15 miles east of the North Fork of the Humboldt; latitude $40^{\circ} 35'$ north, longitude $115^{\circ} 50'$ west; altitude, about 6,000 feet.

Halleck station, on the Central Pacific railroad, is 12 miles distant. The post was established in July, 1867. The reservation contains about nine square miles, including some good grass land, and abundance of timber. The soil is fertile, and yields well if properly irrigated. The air is dry and bracing, and the temperature varies from -22° to 94° F. The winter snows are very heavy.

The barracks consist of two buildings, each 60 by 25 feet; one built of logs, stockade fashion, the other of adobe. They are well ventilated, badly lighted, and fitted up with double bunks in two tiers. Air space per man 374 cubic feet. There are no wash or bath-rooms. Married soldiers are quartered in a frame building, 84 by 24 feet, and 9 feet high, divided into seven sets of two rooms each.

There are four houses for officers' quarters, each of one story, 30 feet square, and built of adobe. The walls are plastered with mud, the ceilings are of wood, and a piazza extends along the front of each house.

The commissary store-house is a log stockade, 80 by 20 feet.

The guard-house is a log stockade, chinked with mud, 30 by 40 feet. The guard-room is 15 by 20 feet, and the prison-room 13 by 15 feet. There are three cells, badly ventilated.

The hospital is an adobe building, 40 by 30 feet. The ward is 18 by 22 feet, and contains six beds, giving 600 cubic feet of air space to each. There is no wash or bath-room. The hospital is

warmed by fireplaces, and is well ventilated. Authority has been given for the erection of a new hospital.

The water supply of the post is from a stream which rises in the mountains on the south. It is distributed by detailed men or by prisoners. The drainage of the post is good.

Company gardens are cultivated, and yield well.

The prevailing diseases at the post are those of the mucous membranes.

Statement showing mean strength, number of sick, and principal diseases at Camp Halleck, Nevada, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	74	64	4	15	11	.....	3	1	6	.....
1869.....	138.08	97	5	11	5	11	9	1	18	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP McDERMITT, NEVADA.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS GEORGE GWYTHYR AND WILLIAM H. CORBUSIER, UNITED STATES ARMY.

Camp McDermitt is situated in Humboldt County, Nevada, latitude $42^{\circ} 58'$ north, longitude $117^{\circ} 40'$ west; altitude 4,700 feet. Camp Winfield Scott is 35 miles south; Camp Three Forks 75 miles northeast, and Winnemucca, the nearest town, is 80 miles south by west, on the Union Pacific railroad.

The post was established in 1865, and named after Lieutenant Colonel C. McDermitt, Second California Cavalry. In 1866-'67 the post was built. It is near the mouth of a cañon, formed by a break in the Santa Rosa Mountains, through which runs a very clear and pure stream known as the east branch of Quinn's River. Wood is very scarce. A few antelope, deer, and mountain sheep are found in the vicinity. Prairie and sage chickens and ducks are plentiful. The streams abound in mountain and salmon-trout. The post is built around a parade 660 by 225 feet. The men's quarters are two stone buildings, each 104 by 24 feet. The dormitory gives at present 700 cubic feet air space per man. The bunks are double in two tiers. There are no wash or bath rooms. There are three sets of officers' quarters, two only of which are used as such. One is built of adobe, the other of stone.

The guard-house is a stone building, 23 by 23 feet, with no flooring or ceiling.

The hospital is a stone building, 40 by 28 feet, divided in half, one part of which is a ward, 24 by 17 by 8 feet; the other half is subdivided, and used as dispensary and kitchen. The ward is well heated, lighted, and ventilated, and contains four beds, giving to each 918 cubic feet of air space. There is no wash-room or dead-house. The surgery and kitchen require ceiling. There is no kitchen proper. This is much needed, and the small compartment in rear of the dispensary, now used as a kitchen, is requisite for store-room and sleeping-room for the steward. There are two stables; one of stone, 184 by 28 feet; the other frame, 147 by 32 feet. The store-house is a stone building, 75 by 34 feet, partitioned off into three rooms.

All the water used at the post is obtained from the river. It is very good until the snow on the mountains is melted. When the river becomes low and filled with vegetable matter, casks are sunk near the river so that the water may filter through the gravel into them. There are neither sewers nor drains; slops, offal, &c., are carted half a mile below the post, and there thrown out.

A post garden has been created within one mile of the post, in which a good variety of vegetables were raised, but nearly all of its products were consumed by the grasshoppers last summer; vegetables for the hospital and troops were bought from citizens at a distance.

The only communication with Winnemucca, the nearest railroad station, is by stage running from Camp Scott to the railroad. There are bi-weekly mails from Camp Scott, carried across the trail by men detailed for that purpose; it takes a letter from ten to twelve days to reach here from Washington, and from five to six days from San Francisco, California. The country is sparsely settled, there being but four settlers within eight miles of the post. Attached to the post, under protection of the military, and living on the opposite bank of the creek close by, are a number of Pah-Ute Indians, about one hundred and fifty persons. They are fed and protected by the post, and some of them are found useful as herders of stock, being competent and trustworthy.

The register of sick since the establishment of the post in 1865 shows conclusively the healthiness of the locality. No epidemic and but little endemic disease has presented itself. No sickness has been observed among the Indians.

Statement showing mean strength, number of sick, and principal diseases at Camp McDermitt, Nevada, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Venereal diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1868, (ten months).....	87.1	71	11	10	1	5	1	17	1
1869	50.41	80	18	15	.....	1	5	11	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP WINFIELD SCOTT, NEVADA.

INFORMATION FURNISHED BY ACTING ASSISTANT SURGEONS J. C. WATKINS AND F. DENICKE, UNITED STATES ARMY.

This post is in the northwestern corner of Paradise Valley, about forty miles from the Humboldt River, latitude 41° 34' north, longitude 117° 30' west. The soil is fertile; timber is almost entirely wanting.

The barrack is an adobe building, 120 by 30 feet, containing two dormitories, allowing 423 cubic feet air space per man. There are no wash or bath rooms. The officers' quarters are two adobe buildings, each containing four rooms. The commanding officer occupies a small stone hut.

The store-houses are two sod buildings, thatched, each 80 by 20 feet. The guard-house is of stone.

The hospital is a sod building, thatched, 40 by 24 feet. The ward is 15 by 20 feet, and 9 feet high, and intended for six patients, giving 450 cubic feet air space to each. The building is totally unfit for a hospital.

Statement showing mean strength, number of sick, and principal diseases at Camp Winfield Scott, Nevada, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Epidemic catarrh.	Venereal diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	44.66	108	1	12	31	2	11	1	4	1	7	.....
1869, (six months).....	46.23	48	.....	4	4	.....	.....	4	4	.....	17	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DEPARTMENT OF ARIZONA.

POSTS DESCRIBED.

Camp Whipple, Arizona Territory.
Camp McDowell, Arizona Territory.
Camp Lowell, Tucson, Arizona Territory.
Camp Grant, Arizona Territory.
Camp Mojave, Arizona Territory.
Camp Verde, Arizona Territory.
Camp Colorado, Arizona Territory.

Camp Bowie, Arizona Territory.
Camp Crittenden, Arizona Territory.
Camp Date Creek, Arizona Territory.
Camp Cady, California.
Fort Yuma, California.
Drum Barracks, California.

EXTRACTS FROM SPECIAL REPORT OF ASSISTANT SURGEON CHARLES SMART, UNITED STATES ARMY.

* * * * *

The posts in Arizona at present in existence have, with the exception of Fort Yuma, been established during or since the war of the rebellion. Most of those in the south were intended mainly for the protection of agricultural settlements, and to guard the main roads running through the Territory; those in the north as points from which to carry on operations against the hostile Indians. With few exceptions they are built of adobe, the buildings being arranged along the sides of a square parade ground. Soldiers' labor has mostly been employed in their construction. The site having been selected, the men commence work by digging a large hole or adobe pit in the ground near by. The earth thus obtained is broken down, and sifted to free it from coarse gravel; the resulting mixture of fine gravel, sand, and clay has some chopped straw or grass added to it, and is then formed into a thick paste, with water, which is packed into molds, allowed to set for a few minutes, and then turned out to dry in the sun. Two or three weeks' exposure usually suffices. The bricks are generally 16 by 12 by 4 inches. By the time that a sufficient number of adobes have been formed for the erection of the proposed buildings, those first made are dry enough for building purposes. The walls are then raised, adobe mud being used to cement the layers of bricks. The height varies from 10 to 12 feet, but one wall is raised a few inches higher than the other, that the flat roof which is to cover them may have inclination to carry off the rain-fall. Ridge roofs are generally avoided, as they are apt to leak at the ridge, and much slope impairs durability by permitting the rapid washing away of the mud covering. Cottonwood timbers are then laid across from the front to the rear wall, and upon them is packed a layer of willow branches, or square ribs; some coarse grass is then laid in adobe mud over these, and the whole plastered thickly over with successive coatings of the adobe mud, and a finish of sand or lime mixture. The roof is made to project a foot beyond the face of the wall to carry the rain clear of the building and prevent its influx through the interval left between the top of the wall and the under surface of the roof. This interval of 6 to 8 inches, depending on the thickness of the cottonwood beams, extends along both sides of the building. It is closed in by bricks, if the house is to receive a finish of adobe plaster and whitewash on the inside, but in most instances it is left open, and answers the purpose of ventilation admirably. Pine timber has to be used for the door and window-frames, as the cottonwood, though much more easily obtained, is so lax in its tissue and saturated with moisture that its warping in drying unfits it for such use. Indeed, it is employed for roof beams only on account of the difficulty of obtaining other timber. Frequently the beams in progress of time curve upward at the ends, converting what was originally a flat roof into a shallow reservoir, from which the rain finds its way by many apertures into the interior of the building. The ground forming the floor of the house is then cleared out and firmly stamped.

Most of the buildings are long, and divided into rooms by transverse adobe partitions. They are generally insufficiently lighted, and this remark more specially applies to the barrack buildings or men's quarters. The cause of this is probably the fear of weakening the wall by the insertion of many windows. In such as have the interval between the wall and roof closed up, and no other special means of ventilation provided, the ventilation is very inefficient. The bunks are built of cottonwood saplings, with slats of old packing boxes or stout willow branches. With few exceptions they are arranged in two tiers, like the berths of a ship. On account of the superficial incapacity of the barrack, none of the company buildings are large enough for the accommodation of the command, if of full strength, and many have by far insufficient cubic space for the number of men actually quartered in them. But the great objection found by the troops to quarters of this kind is the character of the roof. None are free from leaks. At one post during a continued rain such men as could procure shelter tents pitched them over their bunks in order to keep themselves dry, at least during the hours of their sleep. Tent flies and wagon covers were made use of to protect the worst points in the roof, but notwithstanding all that could be done the earthen floor of the room became a mud-puddle, and, for want of sufficient sunlight and ventilation, remained damp for many weeks afterward, while the sick-list was crowded with bronchial attacks and rheumatic affections, attributable to the condition of the quarters. Nor was the hospital at this time in better condition. Beds occupied by dysenteric patients almost in *articulo mortis* had to be moved from one position to another to avoid the muddy water flowing through the leaks in the roof, until at last no dry spot could be found, when they had to be protected by rubber blankets and gutta-percha bed-covers. The roofs continue water-proof much longer at some posts than at others, which may in part be accounted for by differences in the percentage of clay in the adobe mud; but as the roofs at the same post vary much in their power of withstanding the weather, the fault in bad cases is chiefly due to want of care in construction. However, with shingled roofs, ample air space, and sufficient lighting and ventilation, the adobe house can be made a most comfortable resting place for the soldier after the exposures and fatigues he is frequently called upon to endure on service in this Territory. * * * *

The ration of the soldier in this Territory is deficient in nothing except vegetables. A large cattle herd is usually guarded at each post, and the beef killed as required. It is destitute of fat, and usually tough, as the cattle before reaching the post have to undergo a most fatiguing march, and on their arrival may find very indifferent grazing grounds, or none whatever. On account of the poor quality of the fresh meat its ration was at one time increased to one and three-quarter pounds. The full ration of flour baked into bread has often been issued by commanding officers, when hard service was or had been exacted of the men. The bread is usually of good quality. A common complaint against that made from Sonora flour is its grittiness. This arises from the softness of the stone used in the Sonora flouring-mills. The want of vegetables is not so severely felt now that the subsistence department has on hand at each post a supply of canned fruits and vegetables for sale to officers and men. This, with the produce of post gardens and purchases from farm settlements and traders by company funds, enables the troops to pass the winter and spring free, except in individual cases, from any symptoms of scurvy. It may be said that with few exceptions post gardens in Arizona have proved a failure. This is partly owing to want of knowledge and attention on the part of the men detailed for duty in the garden, partly to want of interest in some cases on the part of commanding officers, but chiefly to the nature of the garden produce. Green corn, radishes, melons, cucumbers, tomatoes, and beets can be raised with facility, but their season lasts only for a few weeks. In some places cabbage heads well, but no post has been successful in raising a supply of potatoes and onions. In cases of necessity for vegetable food, as in scurvy, occurring on scouting expeditions, the mescal plant can be had recourse to, and a *chenopodium* and portulaca, which are frequently boiled and used with vinegar by the Mexicans as greens. Several species of lepidiæ grow along the rivers. Grapes are found in many places, currants and gooseberries at Date Creek, and the *cuniga* and mulberries at Skull Valley and a few other points. Although the soldier is often called upon to bear with deprivation of vegetable food and the continuance of a salt ration, all such deprivation increases the company fund, and permits of larger purchases for the improvement of his diet on his return. Yet when, as in this country, the pound of potatoes sells for 25 cents, great results cannot be expected from company funds.



The ration usually carried on the mountain scouts consists of pork, flour, coffee and sugar. The flour is eaten as flapjacks fried in pork fat. Very seldom are the men enabled to improve their diet by the killing of deer, antelope, or turkeys, on account of the scarcity of large game and the want of time and opportunity for hunting while engaged on these expeditions. On one occasion pinole, sugar, and dried beef were the only provisions carried on a six days' scout. The pinole was prepared from a mixture of wheat and corn, by roasting, and then grinding it coarsely; the beef by being cut into thin strips and hung up in the sun to dry. The smoke or light of the soldiers' cooking fires have frequently discovered their presence to the Indians, and led to the failure of the expedition; as no fire was required in the preparation of the pinole ration, it was considered peculiarly adapted to scouting service. It dispensed also with the necessity for a pack train. Each man carried behind him on his saddle his six days' rations and a quart tin cup. On arriving in camp a handful of the pinole and sugar was placed in the cup, water added, and the thick paste eaten as supper. Breakfast was a repetition of this. The dried beef was generally chewed on the march to stave off hunger until camping time. Colics were common as a result of this diet. Great satisfaction was felt by all at a return to pork, flapjacks, and warm coffee at the end of the six days. The experiment was not repeated.

CAMP WHIPPLE, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEONS P. MIDDLETON AND CHARLES SMART, UNITED STATES ARMY.

This post is on the left bank of Granite Creek, one of the radicles of the Rio Verde, half a mile above the town of Prescott, Arizona Territory. The valley of this creek is one of the many to be found around the base of Granite Mountain, the northern extremity of the Sierra Prieta. Its whole extent is covered with pine timber, and as the small plateau on which the post and town are built is receded from, the ground, still timbered, becomes much broken by ravines, and finally rises to the bare mountain peaks of grayish granite. But on the northwest, beyond the immediately surrounding hills, the country is open and rolling, covered with bunch grass and dotted with spreading juniper, until the Bill Williams and San Francisco Mountains break through and interrupt its undulations. Prescott, formerly the capital of the Territory, is a small town, the center and supply depot of a large but sparsely settled mining and agricultural district. The numerous valleys within a radius of 30 miles have rich but limited bottom lands, many of which are cultivated, and yield all the produce of temperate climates; the mountains are rich in free gold and gold sulphurets. It is reached from San Francisco by way of Los Angeles to Fort Mojave and Willow Grove, which lies west from it about 100 miles, or along the southern road from Los Angeles and San Bernardino, by way of La Paz, on the Colorado River. There is no direct eastern route from Prescott, communication being effected by way of Camp Date Creek, 60 miles southwest to Maricopa Wells, and thence eastward, by way of Tucson, to the Rio Grande. Letters travel to San Francisco in about fifteen days; to Washington in twenty-five to thirty days. The mails are frequently attacked by hostile Indians.

The climate of this district is mild during the spring and summer months, there being none of the long continued and scorching heats which, in the southern portion of the Territory, kill all vegetation except that on the margin of the streams. Frequent rains fall in the autumn, and during the winter the mountains are covered with snow, which, in severe seasons, may lie even in the valleys for two or three weeks at a time.

The post was established in 1864 as the then headquarters of the District of Arizona. The site selected was on a small plateau, half a mile above the town, and 70 feet above the level of the creek, to which it inclines, yielding a good natural drainage. The plan of the post is shown in Plate No. 12. It originally consisted of a rectangular stockade, the wall of which formed the outer wall of the various buildings inclosed in it. It was built of strong undressed pine logs, the crevices being filled in with mud, and the roofs of all the buildings shingled. Ventilation was imperfectly effected, as most of the doors and windows opened on the inclosed parade ground. The men's quarters, kitchen, and bakery occupied one side, with the officers' quarters opposite. The store-rooms another, with the guard-house, adjutant's office, and laundresses' quarters opposite.

One company of infantry at the present time occupies this stockade. The dormitory is 80 by 20 feet, giving scarcely 300 cubic feet air space to each man of its average occupancy. The cavalry quarters, which were erected in 1867 for temporary shelters to the scouting troops, are about 100 yards lower down, and nearer the creek. They are log huts, each 53 by 19 feet, giving 400 cubic feet air space per man, of an occupancy of twenty men. For a long time they were without floors, windows, or bunks, but recently have undergone repairs and improvements which will contribute much to the preservation of the health of the men. All are heated by open fireplaces. Kitchens and mess-rooms for these troops are about to be constructed. The officers' quarters are similar in construction to those of the men, and in very poor condition. The guard-room is 16 by 20 feet, with three grated windows and no fireplace, and affords scarcely 300 cubic feet air space per man.

The corrals are stockades near the cavalry quarters. The water is of excellent quality and supplied from wells by means of a force-pump. The building used as a hospital was originally erected in 1864, as the quarters of the commanding officer, District of Arizona. It is a strong structure of hewn pine, floored, ceiled, and plastered, well lighted, with ridge ventilation, and warmed by open fireplaces and stoves. It can accommodate twenty-four patients, giving each 800 cubic feet of air space, but its average occupation is but fourteen. It has a kitchen, 12 by 12 feet, a mess-room, 12 by 16 feet, a dispensary, 16 by 16 feet, and store-room, 12 by 12 feet, with furnishings complete, and in excellent condition. The bath and wash room has the water supplied from tanks, and the waste water carried off by lead pipes. It is situated on an elevated ridge, about midway between the post and the town, with some shade trees around it. The drainage is natural, toward the bed of the creek. A garden of three acres adjoins the building, and is cultivated by the convalescents.

One great objection to this hospital is its distance from the post, and, among other things, the consequent labor required to keep the tanks supplied by the water-wagons. There is no ambulance at the post. One wheeled litter and Army wagons are the only transportation for the sick. Supplies are obtained yearly from the Assistant Medical Purveyor in San Francisco.

The ration issued is generally of good quality, and of the regulation allowance and variety. There are no company or post gardens, so that the vegetables obtained by the men are very limited in quantity, and mostly by personal purchases, as the company savings amount to little or nothing.

The market price of vegetables is 20 cents per pound. Milk, butter, eggs, and chickens are very rare articles of diet in this, as in other parts of the Territory, and are sold at high prices. It is expected that some of the land on the reservation will be laid out during the coming season as company gardens, so that scurvy, which has frequently appeared among the men, may be prevented in future. The cavalry companies have suffered considerably from sickness on account of the lack of fresh vegetables, their frequent absences from the post, placing them on a poorer ration, the hard riding, want of sleep, and exposure on scouts, and the poor quarters to which, until recently, they have had to return for rest. In addition to scurvy, and its frequent accompaniment, diarrhoea, intermittent and remittent fevers are the only diseases prevalent at the post and its vicinity.

The hostile Indians are tribes of Apaches on the east, and the Hualapais on the west. They are very active in their hostility, attacks upon settlements in the neighborhood or on travelers on the roads being of constant occurrence.

Statement showing mean strength, number of sick, and principal diseases at Camp Whipple, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	183	353	87	60	1	20	31	39	4	40	1
1869	206.25	188	33	36	2	18	.....	24	1	18	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP McDOWELL, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEONS CHARLES SMART AND C. DEWITT, UNITED STATES ARMY.

This post is situated on the west bank of the Verde, about eight miles above its junction with the Salt River, in latitude $33^{\circ} 40'$ north, and longitude $111^{\circ} 40'$ west, at an elevation of 1,800 feet above the sea-level. It is 45 miles north of the Maricopa and Pimo villages, and the same distance southwest of Camp Reno. It is reached by steamer from San Francisco to San Diego, California, thence by mail stage via Yuma to Maricopa Wells, from which place a weekly mail is carried north to the post. The Indians have seldom interfered with this mail route, but the rising of the Colorado in Southern California frequently delays the transmission of the mails, and the floods of the Gila and Salt River have cut the post off from communication with the outside world for three and four weeks at a time. Letters usually reach San Francisco in fifteen days, and Washington, by the eastern route in twenty-five. This part of the Rio Verde basin is surrounded by mountains; the high line of the Mazatsal peaks on the east, 20 miles distant; a lower range, to which no name has been applied, 15 miles distant on the west; the numerous low peaks from which the river issues on the north, and the grotesquely abrupt mountains of the Salt River country on the south. On both sides of the Verde, near the post, the mesa rises almost from the water's edge, becoming more and more broken by deep and narrow ravines, until it blends with the foot-hills of the mountain ranges on the east and west. The river is thus well confined, and its bottom lands free from marshes. The strip of easily irrigated bottom land is very narrow, yet much good soil could be reclaimed by irrigation from large acequias. Cottonwood, willow, and elder grow along its banks, tangled frequently by grape-vines, which yield a small acid fruit. Mesquite, ironwood, palo-verde, artemisia, and species of *opuntia* and *cereus* cover the mesa, in some parts even rendering it impassable; the more open parts furnish indifferent grazing. Scrub and live-oak, and pine of large growth are found on the Mazatsal, but the building timber is almost all in inaccessible situations. Quail and rabbits are abundant on the mesa, and deer are found in the mountains, but less frequently than in the more northern portion of the Territory. Coyotes, rattlesnakes, scorpions, lizards, centipedes, and tarantulas, are to be met with here as in other parts. The soil is dry and porous, and well drained by its decided slope toward the ravines.

Some remains of Aztec civilization are found in this part of the country. The ruins of a large and complex structure existed on the site selected for the post, but it is now almost destroyed, as its stones were used by the troops in constructing temporary shelters and laying foundations for some of the post buildings. It was built of washed stones from the river bed, and although the highest portion of its ruined wall did not exceed three feet, the ground plan was perfectly preserved. Another such is situated on a knoll at the southern border of the reservation. Again, where the road to Maricopa Wells crosses the Salt River some large acequias are to be seen, which at a former period must have irrigated many miles of adjacent country. Another system of acequias which, in former times, irrigated the country near the mouth of this river, has recently been cleared out in part, and a thriving settlement, named Phenix, established by American and Mexican settlers. Stone hammers and hatchets, and washed rocks, with rude pictorial and hieroglyphic etchings, are sometimes discovered near these ruins. Fragments of painted pottery are very common.

The post was established in 1865, by five companies of California volunteers, as a point from which to operate against, or treat with, the Indians of the neighboring mountains. The reservation taken up measured, from the center of the parade ground, three miles north and south and two miles east and west. This included the greater part of the arable land in the immediate neighborhood. Building was immediately commenced and continued until early in 1866, when the essential part of the post was finished. One hundred and fifty acres of the bottom land were then cleared for cultivation, water being brought to it by an acequia from a point four miles up the river. This labor was performed by the garrison, then consisting of three companies of the Fourteenth Infantry, who had been sent to relieve the California troops, but the subsequent working of this "Government farm" was by employés of the Quartermaster Department. After this it was leased to certain

citizens, under contract to produce grain for the quartermaster and cavalry animals, and furnish the same to Government at a given figure. This system is still in operation. Of the grounds ten acres were reserved by the troops as a post garden. Corn, sorghum, beans, tomatoes, beets, radishes, and melons grew well, but potatoes and onions did not thrive. Grape cuttings from Los Angeles were placed in the soil, but proved a failure, possibly from imperfect preservation during their journey.

After the construction of the buildings and preparation of the grounds for farming, the military history of the post consists of a record of scouting expeditions against the Indians, occasional parleys concerning cessation of hostilities, and the escort, fatigue, and guard details necessary at an exposed frontier post. Some portions of the command, chiefly F, Fourteenth, and A, Thirty-second Infantry, were employed during the winter of 1867-'68 in building a wagon-road through a pass in the Mazatsal range to a point on Tonto Creek, where an outpost, Camp Reno, was established and held. This creek is also tributary to the Salt River, which it joins at the southeastern base of the Mazatsal. The valley is very fertile and affords good grazing, but no settlers have yet ventured into it. Many old ruins are found in it, and remains of acequias, marking its former cultivation.

The climate is warm and dry. Although the thermometer in the day-time in summer may show a high degree of heat, the nights are commonly not oppressive. Thunder clouds from the mountains drop a heavy passing shower once or twice a month. In winter the rains are lighter, though of much longer duration. Snow falls on the mountains, but not on the mesa. For the year ending June 30, 1869, the average temperature was 69.46° F., the extremes being 25° and 114°. Difference between wet and dry bulbs, 7.68°. The winds are variable and light, except when immediately preceding a thunder storm.

The post as planned and built in 1865 consisted of a parade ground, 525 by 435 feet, with its center one-third of a mile from the margin of the river, and 50 feet higher than its level. This height, attained by gradual rise of the ground, gives, with the aid of some shallow trenching, a very efficient surface drainage. The buildings were arranged along the sides of the parade ground as follows: On the west and furthest from the river the quarters of the commanding officer, a comparatively large square building, with a hall and two rooms on either side. The house is shaded by brush awnings, and has in rear, fenced in, a small yard as a site for the necessary outbuildings. On the south a line of quarters for officers; four houses facing the parade, each divided into four rather small rooms. A kitchen was afterward attached to the rear of each of these buildings. Two adjoining rooms in this line are used as a post adjutant's office. On the north, immediately opposite the officers' quarters, four sets of company barracks, with their gables toward the parade. Each is 187 by 24 feet, and is divided by transverse partitions into two dormitories and four smaller rooms, for use respectively as kitchen, mess-hall, office, and store-room for company property. The hospital was placed on the west, and the quartermaster's store, bakery, and sutler's store on the east of this column of barrack buildings, and separated from them by broad streets. On the east the guard-house, ordnance store-house, and house for the preservation of fresh meat for issue. Outside of these lines of buildings were the corrals, of high, close-set upright posts, on the southeast, and the laundresses' quarters, of primitive looking adobe huts on the north. The sinks, still further north, were deep trenches, inclosed by a thick wall of willow and cottonwood branches. Dry earth is used as a deodorant. At its establishment this post was intended to be the largest and most solidly built in the Territory. For ornaments and future shade a line of cottonwood saplings were planted at short intervals along the sides of the parade ground, and were watered assiduously for two years, during which time they flourished and promised well, but after this they showed signs of decline, in spite of the attention paid to them, and so came to be neglected. All the buildings were of adobe, with earthen floors, mud roofs, and open fireplaces. The roofs were flat, and had mud, sand, and lime cement laid over seguara ribs, which in turn were supported by cottonwood timbers. These timbers, or *vigas*, raised the roof from 8 to 10 inches above the wall, and so left ample space for ventilation. But, however carefully built by the California troops, the buildings proved unequal to the heavy washing showers of the summer, and the penetrating rains of the winter months. The roofs leaked almost from their first exposure, and the walls cracked and washed away in place after place, until, in spite of constant repairs, many of the houses became almost untenable. Three of the barrack buildings are now abandoned. The fourth is still occupied,

but much labor is required after every heavy or continued rain to keep it in repair. The other companies are in shelter-tents; brush shades have been erected over the tents, each of which is occupied by two men, and furnished with raised bunks. The kitchen and mess-room, in rear of each company camp, are built of brushwood and canvas. Cooking is done over open fireplaces. In addition to the buildings already indicated, there is a recently-built house, for some time occupied as headquarters District of Arizona, situated half way between the post and the river, and nearly in line with the north side of the parade ground. It is built after the plan of the commanding officer's quarters, and is now used as quarters by officers.

The guard-house consists of a guard and prison-room, the former 16 by 28 feet, the latter 30 by 28 feet, affording ample space for the occupancy; ventilation good.

The magazine, 16 by 15 feet, is the only building at the post where the roof fits tightly down into the wall.

The quartermaster's and commissary store-house is 130 by 23 feet, and is divided into four rooms. It is in bad repair.

The bakery, 34 by 20 feet, is furnished with two ovens, and can turn out over five hundred rations in a batch.

A number of Americans and Mexicans connected with the Government farm have built adobe and brush huts between the river and the post.

The hospital is 120 by 23 by 12 feet, and is divided by transverse partitions into a kitchen, 15 feet, a mess-room 18 feet, two store-rooms, one 7, the other 19 feet, a ward 35 feet, and a dispensary 19 feet long. The ward is furnished with eleven iron bedsteads, to each of which it affords an air space of 750 cubic feet. It is heated by an open fireplace, lighted by four windows, and well ventilated by these and the interval between the wall and roof. The mess-room is separated from the ward by the store-rooms, so that, to reach it, patients have to go out and pass along the front of the building. The kitchen is well furnished.

The cemetery is distant about a quarter of a mile northwest from the buildings. It measures 75 by 60 feet, is surrounded by a temporary fence, and contains the graves of twenty-six soldiers and seven citizens.

The medical history of the post shows the prevalence of scurvy among the troops while occupied in building during the winter of 1865-'66, and its tendency to reappear as the end of winter or beginning of each succeeding spring approached. But careful cultivation of the post garden and the preparation of pickles for winter use, with the occasional purchase of potatoes and onions from Sonora, (25 cents per pound,) and the canned supplies on hand in the subsistence department, are deemed sufficient to keep the garrison free from scorbutic taint. The regular ration of the camp is fresh beef three times a week; but frequent absences from the post on scouting duty, by placing men on a salt ration and depriving them of vegetables, may produce slight cases of the disease at any season. The summer of 1866, during which the men were engaged in digging the ditch for irrigation and clearing the ground for cultivation, was characterized by an outbreak of dysentery and dysenteric diarrhoea. In the following years this disease did not reappear.

The water supply has been wagoned in barrels from the Rio Verde since the post was established. It is of excellent quality. An attempt was made to sink a well on the parade ground, but no water was struck. Cases of malarial disease did not occur among the troops until scouting was commenced, and the command exposed in malarious districts.

Although the Rio Verde contains an abundance of fish, the troops seldom have recourse to fishing as a pastime, the produce being soft and flavorless.

The post library, containing 200 volumes, and that of Company G, Twenty-first Infantry, of 100 volumes, mostly novels, are in much demand. Two papers only are received, although others have been written for by the post treasurer. A billiard table for the use of the officers is kept by the trader.

The inhabitants of the surrounding country are roving bands of hostile Apaches, dwelling in the mountains on the north and east. On the Gila River, south of the post, are the villages of the Pimos and Maricopas, two friendly tribes, who farm on the reservation assigned to them. Many of them have been enlisted as scouts for service with the expeditions from the post, and the tribes often send out war parties of their own against the Apaches, with whom they have been at war from time immemorial.

Statement showing mean strength, number of sick, and principal diseases at Camp McDowell, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Catarhal affections.*	No. of deaths.
1868	181.5	545	62	133	5	36	22	42	89	1
1869	220	492	177	101	4	14	1	28	62	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP LOWELL, TUCSON, ARIZONA TERRITORY.

REPORT OF ASSISTANT SURGEON CHARLES SMART, UNITED STATES ARMY.

This post is situated on the eastern outskirts of the old Mexican town of Tucson, Arizona Territory, at a height above the sea-level of about 2,000 feet. At a distance of a mile from camp, and separated from it by the town, the Santa Cruz River flows northward from the Santa Rita Mountains towards the Gila. To the west of the river is a long, low range of hills, which terminates abruptly 16 miles northwest of the post. North of the post, and 13 miles distant, is the south point of the Sierra Catarina, which range extends north and eastward until it becomes blended with the mountains on the San Pedro River, 30 miles distant on the east. The post is reached from San Francisco, California, by steamer to San Diego, in Southern California, and thence by mail stage by way of Yuma to Tucson. Mails run east and west twice a week, usually with great regularity, but liable to occasional interruption from Indian attacks and flooding of rivers. A letter will go to department headquarters at San Francisco, in from ten to fifteen days; to Washington, by the eastern route, in from fifteen to twenty days.

Tucson first became a military post during the late war, when the volunteer column from California advanced through Arizona Territory. On account of its situation it was made a depot for the supply of the posts in Southern Arizona, and on the relief of the volunteers by the regular troops in February, 1866, it was continued as such, a company of cavalry being stationed in the camp to guard the stores of the depot quartermaster and escort his trains to the various posts. Shortly afterward, however, as cavalry was required for scouting duty in the neighborhood of Tubac, on the Sonora line, this company was replaced by one of infantry.

The camp is placed upon a hard gravelly mesa or table-land, about 40 feet higher than the level of the water of the Santa Cruz River. This mesa is a part of the vast extent of rolling ground which extends from the Rio Grande westward beyond the Colorado into Southern California. Its soil is dry, and subsists only stunted specimens of mesquite, sage-brush, two or three species of acacia and various cacti. It is interrupted at long intervals by abrupt and very rugged sierras, and at intervals scarcely less long, by small water-courses, often dry during the greater part of the year, but in the rainy season overflowing their banks, and flooding the various strips of bottom land through which they travel, and which, in consequence of the annual overflow, bear a luxuriant vegetation during the remainder of the year. The Santa Cruz, one of these streams, runs northward from the Sonora line past the west side of the town and post, and continues its course to a point about four miles below, where its waters cease to run above ground, on account of the porous character of the soil. The dry bed of the river, however, can be traced for 100 miles further to its junction with the Gila below the Maricopa villages. For a distance of about three miles north and south, and on both banks of the river to the west of the town, are the fields which are cultivated by the Mexicans, producing yearly two crops, one of small grain, such as barley or wheat, sown in November and harvested in May, the other of corn, planted in June and harvested in October. As cultivation can only be carried on successfully by irrigation, it follows that more or less of the fields are constantly under water, which, combined with the heavy rains in July and

August, the tropical vegetation and its rapid decay, favors the development of the malarial poison, and accounts for the cases of remittent and intermittent fevers and diseases of the liver which prevail among the Mexican inhabitants during the months of August, September, and October. The camp, however, being separated from these fields by the town, and being on a somewhat higher level, is almost exempt from these malarial visitations.

The reservation has been well cleared of all the mesquite and sage-brush which at one time covered it. The ground is firm and smooth, so that it can be kept neat and clean with the expenditure of but little labor, and would be almost a dead level but for the shallow arroyos which drain off the heavy autumn rains. Other than the mesquite, so valuable as a fuel, the mesa presents no plant of any importance, but the river bottom furnishes a number of useful anti-scorbutics in species of portulaca and chenopodium, while the hills on the west are covered with the columnar seguara, the fruit of which during the months of June and July is collected by the Indians, and either eaten in its fresh state, preserved as a honey, or fermented into an intoxicating liquor. Silver and copper are found in the mountains to the west and south.

The water of the post and town is obtained from wells, which vary in depth from 12 to 35 feet; the well in camp is of the latter depth, and furnishes a supply of much purer water than any in Tucson, at least in its freedom from organic matter. Although it contains a large proportion of lime, (with some magnesia and the alkalies in combination with carbonic, hydrochloric, and sulphuric acids,) it exercises no evil effect on the health, even of those who have been unaccustomed to its use.

The year is divided into rainy and dry seasons. The spring rains occurring in February fetch up the first or small grain crop of the farmers. After this rain is a rarity until July, when the heaviest falls of the year take place. Even during this month, however, the rain-fall seldom exceeds two inches in Tucson, although on the surrounding mountains it may be such as to flood all the valleys leading down from them. Snow is occasionally seen during the winter months in the crevices on the northern slopes of the Santa Rita and San Pedro Mountains, but it seldom falls on the mesa. The winds are generally light and variable. The mean temperature for the year ending June 30, 1869, was 67.25° F., the hygrometric column being for the same time 62.07°, while the highest observed temperature was 111° F., at 2 p. m. June 15, and the lowest 22° F., at 7 a. m. of January 16, 1869.

The camp consists of two lines of A tents, with a street between them. These are the quarters for the men. They are shaded, like all the rest of the canvas shelters, with a brushwood awning. The tents each accommodate two men, and are furnished with roughly-built bunks, raised from 1½ to 2 feet from the ground. On the south side of the line of tents is the parade ground, and wall tents of the officers of the command, while on the north side is the well, and beyond it the kitchen, bakery, and mess-tents, and the tents of the company laundresses, two in number. The kitchen is an old adobe building, with crumbling walls and leaky roof. The food is cooked over an open fireplace. The mess-room consists of two hospital tents, roughly fitted up, with tables and benches. The bakery is small, but possesses a very good oven of burned bricks. The guard-house, until the summer of 1869, consisted of a frail structure of logs and brushwood, ventilated by its imperfect construction. In June of that year a new guard-house was built on the west side of the quarters of the men. It is a strong adobe building, consisting of a guard-room, prison-room, and five cells. The guard-room is ventilated by the windows and open fireplace. The prison-room, 22 by 15 by 12 feet, with an average occupancy of five men, thus affording an air space of 790 cubic feet per man, was originally ventilated by six loop-holes, but these proving insufficient, it was found necessary to add two iron-barred windows, each two feet square. The only other adobe building on the reservation is a solidly-built magazine and ordnance store-room, situated at the southwest corner, about 400 yards from the men's quarters. This apparently detached position was elected that the building might be in place should a permanent adobe barrack be erected. The sinks are built of brushwood, and are at a distance of 100 yards from the nearest quarters. There are no store-houses on the reservation, the garrison drawing all supplies direct from the depot at Tucson. The depot quartermaster rents from the citizens of the town a sufficient number of houses and corrals for the storage and shelter of his supplies and transportation.

The hospital is an old adobe building on the main street of the town, at a distance of about 1,000 yards from the camp. Even were this building in good condition, its position in the center

of the town, its proximity to the irrigated fields in the river bottom, its distance from camp, and the smallness of its rooms, render it undesirable as a hospital; but when, in addition to this, its leaky roof, worn-out floor, and rain-washed walls are taken into consideration, and the series of old sinks that are covered up in its inclosure, it is found to be totally unfitted for such a use. These facts have been appreciated by the post commander and medical officer, and application, accompanied with plan and estimate, was made for permission to build an adobe hospital of twelve beds on the reservation. The application was not favorably considered on account of the probable temporary character of the camp. There is no well attached to the building; all the water used in the hospital has to be carried from a well about 400 yards distant. Water could readily be found in the hospital inclosure, but the presence of the sinks forbids the sinking of a well in this place. Medical supplies are obtained from the Assistant Medical Purveyor in San Francisco, a year's supply being required for at one time.

The mean strength of the garrison for the year ending June 30, 1869, was four officers and ninety men. These troops were employed in scouting the neighboring mountains for hostile Indians, escorting trains through the country, holding the picket posts of the Cienega de las Pimas and the Tres Alamos, guarding the depot of the assistant quartermaster at Tucson, and performing the necessary guard, fatigue, and extra duties of camp. The constant active service required of the men did not admit of opportunity for drilling.

The picket post of Cienega de las Pimas, 30 miles east of Camp Lowell, was established in October, 1868, on account of repeated attacks made by hostile Apaches on trains and travelers near that point of the road leading from Tucson to the Rio Grande. The position selected was the highest point of the broken country in the vicinity of the cienega or marsh; this for reasons military as well as hygienic. A rude but commodious and weather-proof hut was built of cottonwood timbers, roofed with wagon covers, and furnished with raised bunks. The picket, consisting of a non-commissioned officer and ten men, was relieved every thirty days. The ration here could be supplemented by hunting, as quail, duck, and rabbits were plentiful in the neighborhood, and antelope were occasionally to be found on the mesa.

The picket post at the Tres Alamos was established in 1867 for the protection of agricultural interests on the San Pedro River, fifty miles east-northeast of Tucson. The valley of the Tres Alamos is settled by four American and several Mexican farmers, who raise corn, beans, and melons on the bottom lands, irrigating by means of acequias. The picket, consisting of a non-commissioned officer and ten men, was stationed on a rising ground at a little distance from the irrigated fields in an adobe hut, which was rather small and imperfectly ventilated. This party was also relieved once a month, and during their stay could improve their ration not only by hunting, but, at certain seasons, by farm produce. At both of these posts the water supply was good from a running stream. The suffering from intermittents was much less than one would imagine from viewing the character of the surrounding country.

The parties engaged in scouting after hostile Indians have had but little opportunity of improving on their salt ration, and scorbutic symptoms have been a not infrequent accompaniment of a return from a trip into the mountains, the more especially as even on their return to Camp Lowell fresh vegetables were found to be a rarity. The commissary recently has had a supply of canned vegetables, fruits, and jellies, which are sold to the men on the approval of the post commander. In town the nominal price of butter is \$1 50 to \$2 per pound; eggs, \$1 per dozen; chickens, \$1 apiece; and all vegetables 25 cents per pound; yet very great difficulty was found in obtaining these articles at any price.

Fever first showed itself in most of the men while out on scouting duty in unhealthy parts of the country, or on escort duty to some of the more sickly posts. Cases originating at Camp Lowell were rare. Cases of diarrhoea and occasionally dysentery occurred. Venereal diseases have been very rarely seen, although the dance-houses of the town are the chief resorts of soldiers on pass.

Connected with the post is a detachment of twenty tame Apache Indians, who have been enlisted as scouts. Two or three of them are sent out with every expedition from the posts in the southern district of Arizona. These men, when not on duty, live in the village of their own people, half a mile south of the reservation. They appear to be very liable to attacks of pulmonary disease on exposure during the winter.

In addition to the American and Mexican inhabitants of Tucson, about 2,000 in number, and the village of about 30 tame Apache families, Papagoe Indians are frequently found in the neighborhood of the post. They are friendly to the whites and peaceable in character, occupying themselves in raising corn and melons. Their nearest settlement is on the Santa Cruz, 10 miles south of Tucson, at the old Jesuit mission of San Xavier del Bac. No hostile Indians live in the vicinity of the post; the Apaches who murder and plunder on the roads radiating from Tucson dwell in the more northern mountain ranges.

Statement showing mean strength, number of sick, and principal diseases at Camp Lowell, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	127.66	324	213	8	1	8	6	9	2	11	6
1869.....	103.25	227	144	27	3	6	6	6	.....	5	2

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP GRANT, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEON CHARLES SMART, UNITED STATES ARMY.

Camp Grant is situated at the junction of the Aravipa with the San Pedro River. Its elevation above the sea is about 2,500 feet. It is distant east from Maricopa Wells 100 miles, north from Tucson 56 miles, and west from Camp Goodwin 60 miles. The mail route from San Francisco is by way of San Diego, Yuma, Maricopa Wells, and Tucson, whence a weekly mail is dispatched north to the post. But well-escorted trains and travelers may proceed from Maricopa Wells direct, without circling southward by Tucson, as there is a good road along the Gila River between the two places. On both roads Indian attacks are of frequent occurrence. Letters reach San Francisco in twenty, and Washington in twenty-five days, when there are no delays.

The post was established by the California volunteers with the view of restraining the Indians, and protecting the southern line of travel between California and the eastern States from the ravages of the Apache tribes living north of the Gila. It was originally built immediately on the bank of the San Pedro River, but in 1866 twenty out of twenty-six adobe buildings, composing the post, were swept away by the flooding of the stream. A new site was then chosen on a flattened knoll in the angle formed by the junction of the two streams. From this position, looking toward the southeast, the basin of the San Pedro is seen to stretch until it becomes almost lost on the horizon, with a range of abrupt and rugged mountains on the west, and a series of high rolling hills on the east. Toward the northwest are the mountain ridges and peaks among which the stream courses on its way to the Gila, twenty miles below, and beyond them the still higher ranges on the north of that river. The knoll is situated close to the base of the steep western mountain ridge, from which it is separated by the San Pedro.

The valley of the San Pedro varies in width from one-half to four miles. Many parts of the valley can be cultivated by irrigation. Several attempts have been made to reclaim the ground in the immediate neighborhood of the camp, but without success.

The Aravipa, which issues from a deep and narrow cañon on the northeast, sinks in traversing the San Pedro Valley, except during rains, when its shallow, sandy bed frequently overflows, and becomes unfordable.

The prevailing winds are from the southeast down along the course of the San Pedro, carrying with them the malaria from the marshes along its banks, and exposing the troops stationed on the knoll to its deleterious influence. The mean temperature of the year was 67° F.

The camp is composed of adobe, stockade, and reed buildings, supplemented by tents. All the roofs are liable to leak in rainy weather. There are three sets of soldiers' quarters; one is adobe, 120 by 24 feet, with the usual mud roof, earthen floor, and open fireplaces, ventilated by the doors and windows, and affording to its average occupation 400 cubic feet per man; two are rather open stockades, thatched with cane and reeds, and freely ventilated by the interstices in the walls. They are 103 by 20, and 140 by 22 feet, and give 470 and 450 cubic feet air space respectively. The bunks are rudely constructed, but single and well-raised from the ground. The mess-rooms and kitchens in rear of these are each about 50 by 18 feet; one is of adobe, a second stockaded, and the third a framework of reeds.

The bakery is furnished with a good oven, large enough for the supply of the three companies. The married soldiers are accommodated in wall tents.

The officers' quarters, adobe, consist of four sets of two rooms, each room 15 by 18 feet. There were six officers at the post during the year, two of whom had their families with them.

The store-houses are one adobe, the other a stockade, each about 70 by 25 feet, with the corrals in the rear.

The guard-house is of adobe, lighted and ventilated by the fireplace, doors, and windows. It is 34 by 17 feet, and affords 400 cubic feet to each man of its average occupancy.

The hospital at first consisted of a building 30 by 16½ feet, which is the ward; but recently a wing was added to it, 18 by 18 feet, as a dispensary, store-house, and surgeon's office. The ward is furnished with eight iron bedsteads, and has an average occupation of eight, giving per man 650 feet. When, as is often the case, a larger number of patients require admission into hospital than this ward can accommodate, hospital tents are pitched adjoining, and furnished with iron bedsteads. There is a kitchen, 16 by 16 feet, of adobe, but no mess-room.

Vegetables are obtained from the subsistence department preserved in cans, but the main supply is from the company gardens in the river bottom. Onions and potatoes are sometimes brought up from Sonora, via Tucson, at 25 cents per pound. Chickens and eggs are scarce, having to be brought from Tucson or Maricopa Wells, while butter is almost unknown. The water of the San Pedro River is used only by the quartermaster animals and for washing. It is pleasant enough to the taste, and turbid only during heavy rains, but coming, as it does, through swampy country above the post, may be impregnated with malaria. A supply of excellent water is obtained from a well, 90 feet deep, sunk in the parade ground, worked by a wheel and axle, and well protected from surface drainage.

The diseases are all malarial, and prevail to such an extent during the autumn and winter months as to unfit the garrison for any active service. In 1868 intermittents were so general that the affected troops had to be moved from the post to a temporary convalescent camp, 28 miles south, on the road to Tucson. This was the nearest place which could be found at the same time supplied with water, accessible to wagons, and thoroughly free from any miasmatic influences.

A tribe of Apache Indians, the Aravipas, dwell in the mountains near the post. At one time, for a short period, they were friendly, at least in their professions, and received rations from the subsistence department. As many as 700 of this and neighboring tribes or families have been in at one time. But it is some distance from the post, north of the Gila River, that the greater portion of the hostile Apaches that infest Southern Arizona have their more permanent rancherios.

Statement showing mean strength, number of sick, and principal diseases at Camp Grant, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	214.83	2,096	1,735	266	1	5	27	8	.....	11	2
1869	151.5	643	561	35	4	3	1	6	2	17	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP MOJAVE, ARIZONA TERRITORY.

REPORT OF ACTING ASSISTANT SURGEON F. S. STIRLING, UNITED STATES ARMY.

This camp is situated on a gravel bluff on the east bank of the Colorado River, near the head of Mojave Valley; latitude $35^{\circ} 6'$ north, longitude $114^{\circ} 31'$ west; altitude, 600 feet above sea-level, and 75 feet above the river. It was established in 1858 for the protection of emigration over the Southern Overland Route to California, the Mojave and other Indian tribes being then hostile, and having in the summer of 1857 committed depredations on parties of emigrants. The Indians remained hostile until severely defeated by the troops under Major Armistead, who encountered them in the valley below the fort and drove them back with great loss. They then sued for peace. The post was abandoned in May, 1861, and regarrisoned in May, 1863, by two companies of the Fourth regiment of infantry, California volunteers.

The plateau extends north and south about 40 miles, with an average width of 10 or 12 miles. There are two reservations, each three miles square. The camp is built on the upper one. The lower reservation is on the low bottom land, about six miles south of the post. Part of it is subject to overflow; the soil is fertile, and is covered with coarse grass, cottonwood, and mesquite trees, with a dense undergrowth of willows and arrow-weed. With this exception the country is a waste. The elevated plains are covered sparsely with a growth of greasewood bush, interspersed with varieties of the cactus family.

The mineral resources of this portion of the Territory are vast, though but partially explored. Immense mines of copper are found in the Sacramento district, 25 miles northeast of this camp. The ore is a red oxide, combined with a carbonate. Large deposits of argentiferous galena, assaying 60 per cent., are found in the same district, while in the Black Mountains, 10 miles in an easterly direction from here, rich lodes of gold and silver-bearing quartz are found. Several mills have been erected, and will, by their production of the precious metals, soon fill up the country with persons who will develop to the utmost the resources of Northern Arizona.

Rabbits and quail are found in large numbers; ducks and geese abound in the sloughs, and the river affords an abundance of fish of the salmon species. Deer, mountain sheep, and antelope are found in the hills. The mountains, on either side of the river, are barren and destitute of timber. But few springs of water are found in the adjacent mountains, and the country may be described as a sterile plain, broken by arroyos or dry gulches.

The climate is healthy, the winters pleasant, but the summers extremely hot. The extremes of temperature are 35° and 118° F. There is no rainy season, though thunder showers are frequent in July and August. The annual rise of the Colorado takes place in June. The prevailing winds in the summer are from the south, and, passing over the arid plains, the air is so heated that it scorches like that from an oven. The nights are so hot that no one can sleep in the house, and the whole garrison lie on the open plain, endeavoring to catch the faintest breeze.

The troops now occupy the new adobe barrack, erected during the past year, though the buildings are not entirely finished; the old stockade buildings formerly used as soldiers' quarters are being demolished for building material. The quarters afford an abundant air space to the men, are furnished with fireplaces, well lighted and ventilated by windows. Single bunks are used. Contiguous to the barracks are adobe buildings, erected and formerly occupied by citizens, now used as quarters for married soldiers.

The officers' quarters are two stockade buildings, containing four rooms each, much dilapidated. The new quarters are unfinished. Those now used have one window in each room, and a mess-room in rear. The adobe building now in process of erection is 40 by 50 feet, and intended for two officers.

The store-house for the commissary and quartermaster department is a new adobe structure, too small for the purpose.

The guard-house is an old stockade building, insecure and dilapidated, and entirely unsuited for the purpose for which it is used. It contains two rooms, poorly ventilated, and lighted only by

doors. Heating is effected by means of a fireplace. The average occupancy of the guard-house is six prisoners.

The hospital is an old, dilapidated stockade building, not worth repairs, with dirt roof and floor. A new building is much needed, and will be commenced as soon as possible, the work to be done by the troops. The present hospital is warmed by means of fireplaces, and lighted by windows. The ventilation is deficient. The ward, 28 by 25 by 10 feet, generally contains six beds, giving to each a cubical air space of 1,166 feet. There are no bath or wash rooms; a bathing-tub is used in the ward.

The supply of water is afforded by water-carts filled at the river, and that used for drinking purposes is cooled in "oyers," or earthen jars covered with matting. The water of the Colorado, although muddy, does not produce diarrhœa or other unpleasant effects. Natural drainage is good. All refuse, dirt, and litter are removed from the vicinity and carried off by the river.

Subsistence and other stores are received by light-draught steamboats on the river. Vegetables are scarce, and are with difficulty obtained from California. Several cases of incipient scurvy have occurred, but yield at once to vegetable diet. A large supply of canned fruit and vegetables for the use of the enlisted men is a great necessity here, as no post garden can be cultivated. Such articles can be obtained from the commissary department at low prices. Potatoes and onions are brought 250 miles from California. Milk costs \$1 50 per gallon; butter, \$1 per pound; eggs, \$1 per dozen; potatoes, 12 to 15 cents per pound; and onions, 20 to 25 cents per pound.

The only means of communication is by wagon and horseback, with occasionally a steamer from Fort Yuma, California. Mails are received each week from the west, via La Paz, and from the east via Salt Lake City; the mail is carried on horseback, requiring sixteen days to department headquarters.

The Indian tribes on the river are peaceable; they cultivate corn, wheat, beans, and squashes, planting after the annual overflow. During the winter months, when their stores of provisions are low, they are furnished with small supplies of flour from the post. No depredations have been committed in the valley, and many of the hostile Hualhapis have surrendered and come in.

Statement showing mean strength, number of sick, and principal diseases at Camp Mojave, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	84.08	263	26	35	2	61	11	16	3	25	3
1869.....	78.83	122	21	29	.....	21	1	3	1	8	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP VERDE, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEON CHARLES SMART AND ACTING ASSISTANT SURGEON W. H. SMITH, UNITED STATES ARMY.

Camp Verde, formerly known as Camp Lincoln, is situated on the east bank of the Rio Verde, about 50 miles east of Prescott, the nearest town, and by way of which it receives all its supplies and mails, and 90 miles north of Camp McDowell by trail along the Rio Verde. The Verde Valley, during the greater portion of its course from north to south, is extremely narrow, being little other than a cañon with rugged and barren hills on either side, but in this locality it is about seven miles wide, with a rich alluvial bottom, which, to some extent, has been farmed by settlers. When irrigated it is very fertile and yields fine crops of corn, which is the staple product. The

Black Mountains bound it on the west and the Mogollon range on the east. On the tongue of land formed by the junction of Beaver Creek with the Verde, three-quarters of a mile below the post, there is a considerable tract of low bottom, on which a rank vegetation springs up after the spring and autumn rains. This appears to be the chief source of the malarial diseases which affect the garrison, more especially at the latter season. The water of both these streams is of excellent quality, free from any marked amount of organic or inorganic impurities, and turbid only during floods. Cool water, even in the hot summer season, can be obtained from a small spring on Beaver Creek. There are rich grazing and fine timber in the vicinity of the camp, and game in abundance.

The spring rains occur during March, and, with the snow on the mountains, usually occasion floods, which inundate many of the bottom lands; similar floods are an accompaniment of the July rains; but the rapid current of the river, the sandy soil of the inundated lands, and the high winds which are prevalent during these stormy months, speedily drain and dry off all surface water.

The mean annual temperature for the year ending June 30, 1869, was 60.75° F.; the extremes being on September 2, 107° F., and December 15, 24° F.

The post was originally established by two companies of Arizona volunteers, mostly Mexicans who were in service during the late war. It was an outpost from Fort Whipple, and intended to protect the Prescott country and admit of its settlement. The shelters built by these troops were of the most primitive character; and even on the advent of the regular troops in 1866 they were but little improved, consisting of excavations on a hill-side, completed with logs and shelter tents. The hospital was a small log house, 15 by 13 feet, containing three beds. Its site was an elevated piece of ground one-quarter mile from the Verde, with excellent surface drainage and a porous gravelly soil. Better and more permanent quarters were commenced on the same site in 1868, but two sets of company barracks are the only buildings as yet completed. One set is unoccupied by troops, but is used in part as a quartermaster and subsistence store-room. Each building is 100 by 26 by 10 feet, with adobe walls, shingled roof, and earthen floor, and is partitioned off into two dormitories, 40 feet long, by an office in the center, 20 by 26 feet, which communicates with the former. Each dormitory has an open fireplace, four windows, a door opening on the parade, and another communicating with the office. But as these were found to be insufficient for satisfactory ventilation, a ventilator was opened in the wall of each room near the roof. The only fixtures or furniture is a double line of bunks, two tiers high, each 4 feet wide, and accommodating four men. But little over 300 cubic feet of air space is permitted to each man, of average occupation. All the other buildings of the post are irregular, being for the most part the remains of the old camp. There is no mess-room, the men eating their rations in quarters.

The officers' quarters are miserable hovels, that of the commanding officer being formed of rough boards, with gaping seams. Its size is 12 by 13 feet.

The guard-house is a small stockade, with canvas roof, lighted by the door and roof, and sufficiently ventilated by the crevices between the posts forming the walls.

After the log hospital of three beds mentioned above was disused, the sick were placed in a ward of hospital tents, with an adobe fireplace and chimney built at one end. Average occupation of this, seven men. Since the recent completion of the second set of company quarters the sick have been moved into one of its dormitories for treatment until such time as a hospital is built.

The post garden, situated six miles below the post where Clear Creek joins the river, is nominally cultivated by from three to five men detailed for that duty; but the supply is not such as the extent and fertility of the soil at command would yield with careful cultivation. It has produced, however, a small cart-load of onions, beets, corn, cabbage, melons, and cucumbers twice a week for four or five weeks during the season, and provided the garrison with sauerkraut during the winter; chickens, eggs, and butter are hardly to be obtained, but deer are sometimes shot in the mountain gorges. In this vicinity there are three or four small ranches farmed by German and American settlers.

The diseases which prevail are chiefly malarial, consisting of intermittents, hepatic affections, and diarrhœa. During the dryer seasons of the year most of this class of cases come from the men on duty at the post gardens and other low localities.

In addition to the few settlements on Clear Creek, there are some ranches on the Agua Fria,

about midway between the post and Camp Whipple. In the Agua Fria district there are also many auriferous ledges, mostly of free gold.

The hostile Indians, Tonto Apaches, occupy the mountains south of the post through which the Verde cañons its way toward Camp McDowell, and to the eastward the difficult country in the neighborhood of the Mogollon ridge.

Statement showing mean strength, number of sick, and principal diseases at Camp Verde, Arizona Territory, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869.....	69.91	146	51	21	1	2	5	21	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP COLORADO, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEON CHARLES SMART, AND ACTING ASSISTANT SURGEON WASHINGTON WEST, UNITED STATES ARMY.

This camp is on the east bank of the Colorado River, on the Mojave Indian reservation, 322 miles from the mouth of the river, and 440 feet above the sea-level. La Paz is the nearest post office, and is 40 miles distant along the river. Letters require ten or fifteen days to reach San Francisco; twenty-five or thirty to Washington.

The camp was established in the latter part of 1868, in anticipation of trouble from the river Indians. It is placed immediately on the river bank, above overflow, on the low level bottom, which is about 250 yards wide at this point. Beyond this bottom to the eastward, a mesa or tableland rises with a gradual ascent to a height of 40 or 50 feet, and extends to the distant mountain ranges. It is almost destitute of vegetation. The country on the opposite bank is similar in character. Some of the fertile bottom lands along the river are cultivated by the Indians. Cottonwood, mesquite, ironwood, willow, and arrow-wood grow along its banks. The climate is similar to that of Fort Yuma, California.

The camp is a temporary one, consisting of brush huts, which afford some protection from the rays of the sun, but none from the rains and violent sand-storms prevailing during the winter and early spring months. Their only furnishings are rudely-built bunks, raised a foot or more from the ground. The rations are cooked and eaten in the open air. There are no married soldiers in camp. The officers live in wall tents pitched underneath a brush shade at one end of the line of huts for the men. The bakery, of stone and adobe, is the only building of comparatively permanent materials. The hospital, ward, dispensary, and store-room is a hospital tent.

No post garden has been cultivated, but vegetables in their season can be obtained from the Indian settlements. Canned stores are also on hand in the subsistence department for purchase.

There have been no deaths at the post. Venereal diseases, contracted among the Mojave Indians on the reservation, constitute the majority of the cases on the sick report.

The Indians in the vicinity are large, muscular, and well formed, but without any tendency to civilization, their only object of existence being to satisfy the cravings of appetite and the animal passions.

Statement showing mean strength, number of sick, and principal diseases at Camp Colorado, Arizona Territory, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhoea and dysentery.	Veneral diseases.	Scurvy.	Rheumatism.	Catarrhal affections.*	No. of deaths.
1869	73.41	191	37	30	26	6	13	7	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP BOWIE, ARIZONA TERRITORY.

INFORMATION DERIVED FROM REPORTS OF ASSISTANT SURGEON CHARLES SMART, UNITED STATES ARMY, AND ACTING ASSISTANT SURGEON W. H. SMITH, UNITED STATES ARMY, 1870.

Camp Bowie is situated in a pass in the Chiricahua Mountains, known as Apache Pass, through which the road from Tucson to Mesilla penetrates, about 100 miles east of the former town. It is in latitude $32^{\circ} 40'$ north, longitude $109^{\circ} 30'$ west, and elevated about 4,826 feet above the sea. The post was established under the name of Fort Bowie, in August, 1862, by Company G, Fifth California volunteer infantry, as a protection to the road at this dangerous point, and as a guard to the important springs found here. It was placed on the summit of a hill overlooking the water supply, having high mountains on the north and south, and the broken rocky country constituting the pass on the east and west, beyond which, in these directions, the view becomes more open, and the scrub oak growth of the highlands gives place to grass.

Up to 1868 the post was a most irregular one, the houses, or rather huts, being built on and under the ridges of land on the hill summit and slope, but at that time a new post was commenced on an adjoining hill which afforded a better site.

The reservation includes about one square mile, and is in every part well drained by the irregularity of the surface. A ledge of gold-bearing quartz has been discovered within one-fourth of a mile of the reservation, and a ten-stamp mill erected, but so far its working has been unprofitable, and it now stands idle. It is generally supposed that a good mill erected at Bear Spring, about three quarters of a mile from the post, where a sufficient supply of water can be had, backed by sufficient capital, could be profitably employed in grinding ore from the Harris mine, the one spoken of. Large game, as turkeys, deer, and bear, is found in the mountain country.

The company barracks, an adobe building with mud roof, is 120 by 22 feet, and has a kitchen attached, 15 by 15 feet. It is warmed by open fireplaces, and ventilated by apertures in the wall near the roof; its air space to its average occupation is 400 cubic feet per man; it has no other furniture than the rough bunks constructed of poles, cut in the ravines near the post. Since the above description was obtained two new barracks have been erected, one on the east side of the parade ground, 156 by $30\frac{1}{2}$ feet, containing two squad-rooms, one store-room, one office, and one library; the building is roofed with mud, its walls being of adobe; attached to it is a mess-room and kitchen, 56 by 16 feet, built in a like manner. The other set is on the north side of the parade ground, built of the same material, 118 by 24 feet, containing two squad-rooms, store-room, and office, with a mess-room and kitchen, 66 by 16 feet, attached to it. The sinks are open, on the edge of a ravine, from which deposits are swept away by the rains.

There are two sets of officers' quarters, each consisting of two rooms, 15 by 15 feet, with kitchen and mess-room adjoining. As, including the medical officer, there are six officers at the post, three of whom are married, some of the old buildings are made use of to supplement these quarters. The quartermaster's store-house, 88 by 22 feet, has two rooms for officers in one end, and an ordnance store-room in the other. A new hospital has been built, occupied, and vacated as inadequate,

and is now occupied by three bachelor officers; it has four apartments, with a kitchen and dining-room adjoining.

A new building has been erected containing the offices and store-rooms of the acting assistant quartermaster and acting commissary of subsistence. The building occupied as guard-house, adjutant's office, and quartermaster's store-house, is now the post hospital. The vacated commissary store-room, after having been used as a barrack room, is now a granary. A new guard-house, 36 by 16 feet, with two rooms, has been built in the rear of the present hospital.

A bakehouse has been erected on the east side of the parade ground; also, on the north side of the parade ground, a corral, with carpenter shop and blacksmith shop attached to it.

Vegetables are always scarce at this station, as none can be raised and few purchased anywhere in the neighborhood. The supply of canned fruits from the subsistence department was useful but inadequate, in view of the scarcity of fresh vegetables. As may be inferred, a scorbutic taint has at times affected the men, debilitating them, and rendering them prone to diarrhœa. Attacks of intermittent occur only in those who have received the germs of the disease away from the post.

The only settlers in this part of the country are the few men at work at the quartz mine. Frequently, however, emigrants from Texas to California, most of whom are in very destitute circumstances, call upon the post medical officer for assistance and supplies for their sick and wounded. Bands of hostile Indians, Apaches, are constantly in the neighborhood, watching for favorable opportunities to interrupt the traffic on the road.

Communication from San Francisco is effected by means of the mail route from San Diego, California, via Fort Yuma and Tucson. The mail coach arrives from the east on Thursdays, and from the west on Tuesdays of every week, but arrives very irregularly. Trains and mails are frequently attacked by Indians in this vicinity.

Statement showing mean strength, number of sick, and principal diseases at Camp Bowie, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhœa and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868	80.75	131	48	27	1	.....	5	15	2	6	1
1869	115.16	255	106	70	.....	2	3	13	.....	15	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP CRITTENDEN, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEON CHARLES SMART AND ACTING ASSISTANT SURGEON B. SEMIG, UNITED STATES ARMY.

Camp Crittenden is distant from Tucson south-southeast 56 miles, from Camp Wallen west-northwest 20 miles, and about 12 miles directly east of the peak of the Santa Rita Mountain. It is reached from San Francisco via Fort Yuma and Tucson. Letters eastward and westward, to Washington, and San Francisco, California, require about twenty days to reach their destination. Both routes are liable to interruptions from Indians and delay from floods. The mail is usually served weekly at the post.

The garrison of this place, on entering the Territory in 1866, were stationed at Fort Mason, a post established at Calabasas, on the Santa Cruz River, 13 miles south of Tubac; but as malarious fever, diarrhœa, and dysentery prostrated the greater part of the command, it was soon afterwards removed to a location which presented fewer of the causes engendering the paludal poison.

The new post, Camp Cameron, was situated on the northwestern base of the Santa Rita Mountain, 16 miles northeast of Tubac, and 45 miles south and a little east of Tucson. It was on a dry, rocky mesa, on the north bank of a clear mountain stream which sank at a little distance below the post. The men were quartered in A tents, the officers in huts, which were a conglomerate of stone, rawhide, planks, canvas, and logs. From this the troops were moved to Tubac, on account of Indian outrages committed there. A church and a number of adobe buildings were turned over by the citizens for their accommodation. In February, 1868, they were ordered to the position which they now occupy, for the purpose of promoting the settlement of the Sonoita Valley and continuing their protection of the Sonora frontier. The site selected was a high ground, surrounded by deep ravines, half a mile northeast of the remains of old Fort Buchanan, a military post which was abandoned at the breaking out of the war of the rebellion.

The surrounding country is rolling and affords excellent grazing. It is sparsely timbered with live-oak trees of small growth, but which become more luxuriant as the mountains are approached. Pine timber is plentiful in the gorges of the Santa Rita.

The soil is a reddish yellow clay intimately mixed with a large proportion of coarse gravel, a compound which retains surface water in situations where there is no natural drainage. The camp, however, is well drained naturally by its slope, and this is aided by some superficial drains tending toward the ravines. One of the ravines on the southern aspect of the camp shallows out into a marsh, for the drainage of which no work has yet been attempted.

Southeast of the post, and a quarter of a mile distant, is the source of the Sonoita River, which, after a west-southwest course, empties into the Santa Cruz near Calabasas. Cottonwood, willow, sycamore, elder, and walnut are found along its banks. The valley widens out in many places into valuable agricultural lands, which can be irrigated with little labor. Each company of the garrison cultivates a garden about four miles below the post, near the now deserted settlement of Casa Blanca.

Southwest from camp, and one and a half miles distant, is a warm spring, the water of which is clear, inodorous, and tasteless, and of a temperature of 81° F. A mile beyond this, in the same direction, are the Monkey Springs, which cover all surrounding objects with deposits of travertine. A well in the center of camp furnishes water for drinking and cooking, which is clear, cool, and agreeable to the taste. That from the source of the Sonoita is employed for washing and bathing. Game is abundant in the surrounding country. The mean temperature for the year ending June 30, 1869, was 58.59° F., the extremes being, on July 1, at 2 p. m., 105°, and on December 14, 1868, at 7 a. m., 25° F. Rain-fall 15.6 inches. Snow falls occasionally, but lies only for a short time. The prevailing winds are south and westerly.

During the first year the three companies, which for the most part of the time formed the garrison, lived in A tents, and made use of such of the old buildings of Fort Buchanan as could be made serviceable. One by one, as the buildings of the new post were finished, they were occupied. At the present time two sets of company quarters are completed, a guard-house, hospital, commissary store-house, corrals, and sinks. No officers' quarters have yet been built, but three mess-rooms, with kitchens adjoining, are used as quarters for the time being. Of the old buildings which have been repaired for temporary use, one is the quartermasters' store-house, another that of the post trader, while three are used by quartermasters' employés, and one by the only soldier's family at the post. These are all in poor condition, and leak badly during rains. No mess-rooms for the men have been built yet.

The new buildings are all of adobe, and furnished with mud roofs, except the guard house, which is shingled; this exceptional roof was found during the past season to be the only one which was weather-proof. As shingles can be cut by soldier labor in the Santa Rita Mountains, it has been suggested that all the roofs be so constructed.

The two sets of company quarters are built each in the form of the letter E, and consist of a main building, 117 by 18 by 11 feet, two wings, each 18 by 18 by 11 feet, one of which is the first sergeants' room, and a kitchen, 20 by 16 feet, and bakery, 20 by 14 feet. These quarters afford to the men occupying them an air space per man of 600 cubic feet; but that this may be so, a detachment of one of the companies is obliged to live in tents near by. They are warmed by four fire-places, lighted and ventilated by nine windows, two doors, and a number of loopholes, six inches

square, near the roof. The bunks are well raised and solidly built, each accommodating two men; the only fixtures are wooden arm-racks and benches.

The guard-house consists of a guard-room, and prison-room communicating with it; the former is $17\frac{3}{4}$ by 20 by 9 feet, giving to an average occupancy of twelve men 266 cubic feet of air space; the latter, $17\frac{3}{4}$ by $15\frac{1}{2}$ by 9 feet, furnishes each of its eight occupants with 310 cubic feet. Each of the rooms has a fireplace, and as ventilators, in lieu of windows, the prison-room has apertures in the wall near the roof.

The commissary building is 100 by 21 by 9 feet, and has the corrals near by it, surrounded by an adobe wall, 132 by 100 feet. Refuse from the corral and camp is wagoned to a ravine 350 yards distant, where, when dry, it is burned.

The hospital has been built on the lowest portion of the site of the camp, and is the building nearest the marsh above mentioned, receiving from it, with the prevailing winds, the full influence of its exhalations. The roof is in such poor condition that during a late storm the floor became flooded, and the patients had to be removed from the ward. It has since been repaired, and covered with a layer of lime and fine sand. The building is divided into a ward, 55 by $17\frac{1}{2}$ by 11 feet, and a dispensary, $14\frac{1}{2}$ by $17\frac{1}{2}$ by 11 feet. The ward contains twelve beds, to each of which it affords a superficies of 80 feet, and an air space of 880 cubic feet. Average occupation, four. Tents are made use of as kitchen, mess-room, and bath-room. As yet there is no store-room other than the dispensary.

The cavalry of this command has been almost constantly employed in scouting and escort duty, while the infantry have performed most of the camp duties, including the building of the greater portion of the post. Their recreations comprised base ball, and exercise on the horizontal and parallel bars.

The full regular ration has been issued to the men, and, with the exception of the beef, its component parts have been of good quality. Corn, cabbage, onions, potatoes, tomatoes, and peas are obtained from the company gardens, in part also by purchase with company funds, and by personal purchases of the soldiers. Vegetables from the Sonoita and Santa Cruz Valleys are worth 20 to 25 cents per pound. Eggs from Sonora are \$1 a dozen. Butter is seldom seen, and is received only from San Bernardino, in Southern California, by way of Tucson, scarcely any being produced in the adjacent country.

Scurvy was to some extent present in the command during the winter months; but in May, when the produce of the company gardens became available, the disease disappeared. Intermittent fever is the prevailing disease.

A few settlers, farming parts of the Sonoita Valley, are the only inhabitants in the vicinity of the post; but Apache raiding parties frequently pass in the neighborhood.

Statement showing mean strength, number of sick, and principal diseases at Camp Crittenden, Arizona Territory, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (9 months).....	207.88	716	1	564	49	5	16	12	4	1	12	3
1869.....	137.83	663	.....	487	62	6	7	9	12	.....	20	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP DATE CREEK, ARIZONA TERRITORY.

INFORMATION FURNISHED BY ASSISTANT SURGEONS R. M. O'REILLY AND CHARLES SMART, UNITED STATES ARMY.

Camp Date Creek, until recently known as Camp McPherson, is on the left or south bank of the creek, about 700 yards distant from it and 100 feet above its level. Communication with San Francisco, California, is effected by way of Camp Whipple and Prescott, which is 60 miles distant by the road, although but little more than half that distance in a direct line northeast, and with Washington by way of Maricopa Wells and Tucson. The road from La Paz, on the Colorado River, east to the mining town of Wickenburg, passes the post, intersecting the northern road to Prescott. The upland valley in which the camp is placed is surrounded by high lands. Three miles distant on the east is the divide between the waters of the Hassyampa, tributary to the Gila, and the Williams Fork of the Colorado, of which Date Creek is one of the headwaters. The soil of the valley is gravelly and well covered with gramma and gayeta grasses, except where the underlying metamorphic rocks crop out into broad belts of cactus and yucca-covered *mal pais*. Half a mile down stream, to the west of the post, the creek flows through a cañon 150 feet wide and from 50 to 200 feet deep, below which there are some strips of fertile bottom land, on which farms have been located by a few settlers. Mesquite, cottonwood, and willow grow along the creek.

The climate of this part of the country is hot and dry, with a rainy season occurring in autumn. The mean temperature for the year ending June 30, 1869, was 63.04° F., with the wet-bulb indicating 54.75°. The extremes of temperature were 21° and 108° F. Prevailing wind, southerly.

The Date Creek Camp was originally established in 1864, by California volunteers. In 1866 the troops were moved 25 miles north on the road to Prescott for the protection of settlers in Skull Valley. In 1867 the command returned to Date Creek, and went into quarters close to the bank. This position was found to be very unhealthy, the greater portion of the men being prostrated during the fever season commencing with the July rains. Hence in 1868 they were moved to the higher ground further from the creek—the present location. In this the drainage is good, both from the gravelly character of the soil and the incline toward the bed of the stream.

The buildings are arranged so as to inclose a quadrangular parade ground—the men's quarters, kitchens, and post bake-house on the north, those of the officers on the south, the guard-house on the east, and hospital on the west. The soldiers' quarters are two adobe buildings, each 76 by 20 by 13 feet, with shingled roof and earthen floor. Ventilation is effected in each by eight windows, two doors, a series of apertures, 9 by 4½ inches, just above the ground level, and an air space between the roof and walls. These are aided by an open fireplace at each end and a wood-stove in the center. Air space per man of average occupation, 350 cubic feet. The bunks are framed, and, with the arm-racks, form the only fixtures of these dormitories.

The hospital is a shingled adobe building, warmed and ventilated in the same manner as the quarters of the men.

The arrangement of the building is shown in Figure 58. A, ward, 30 by 18 feet; C, surgery, 14 by 12 feet; D, dispensary, 14 by 14 feet; E, store-room, 14 by 8 feet; K, kitchen, 14 by 14 feet; M, mess-room, 14 by 12 feet. Height of rooms, 14 feet.

The ward is furnished with twelve beds, to each of which it affords 630 cubic feet of air space. Its average occupation is six patients. Its supplies are obtained from San Francisco, California, and are required for yearly. No ambulance at the post.

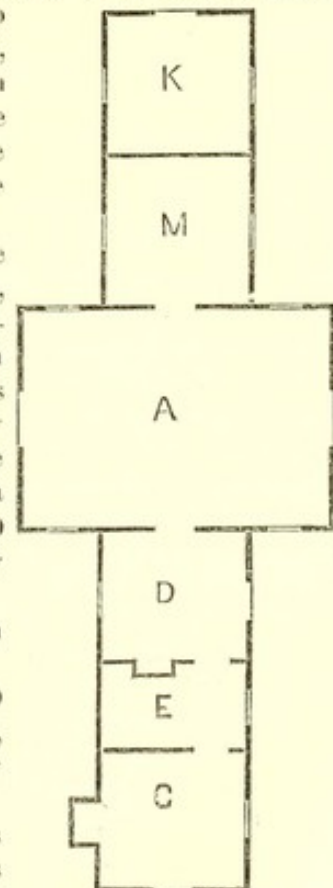


Figure 58.—Scale 20 feet to 1 inch.

The first sergeant's room and company store-room, each 16 by 14 feet, and the kitchens (two in number) and bake-house, each 23 by 14 feet, are of the same kind of materials as the barracks. No mess-rooms have yet been built. The officers' quarters are four mud-roofed adobe buildings, each containing a single room, 26 by 13 feet. The guard-house, at present, is represented by wall tents for the ten members of the guard and average of three prisoners. The quartermaster and subsistence store-house is outside the line of buildings around the parade. It is 100 by 22 feet, built of stone and roofed with shingles. The sinks, properly in rear, are open trenches with willow shades.

The water supply is carted from the creek in barrels and run through charcoal filters. It is largely impregnated with organic matter. In the unhealthy autumn season permanganate of potash was likewise made use of. A well is being sunk.

The diseases prevalent are all of malarial origin. It is expected that the removal of the camp from the immediate neighborhood of the creek, and success attending the attempt to sink the well, will materially decrease the sick rate of this post.

The Indian tribes in the vicinity are hostile; Yavapais and Apache Mojaves.

Statement showing mean strength, number of sick, and principal diseases at Camp Date Creek, Arizona Territory, for the year 1869.

Year.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Scurvy.	Rheumatism.	Catarhal affections.*	No. of deaths.
1869.....	108.16	364	132	79	9	1	1	17	16	.....

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

CAMP CADY, CALIFORNIA.

INFORMATION FURNISHED BY ASSISTANT SURGEON CHARLES SMART AND ACTING ASSISTANT SURGEON F. A. ROMATKA, UNITED STATES ARMY.

Camp Cady is situated in San Bernardino County, on the road leading from Wilmington, on the coast, into Northern Arizona. The road to Salt Lake City branches off a few miles west of the post. The town of San Bernardino lies west about 130 miles; Hardyville, on the Colorado River, about the same distance east. Communication with San Francisco, California, is effected by means of steamer to Wilmington, whence the road leads eastward by San Bernardino. Letters reach San Francisco in eight days; Washington in eighteen.

The post, as it now exists, was established in the autumn of 1868, about half a mile distant from the point formerly occupied. This situation was originally garrisoned, about fourteen years ago, to protect the sparsely settled districts of Southern California, and the line of travel between them and Utah from the inroads of Pi-Utes and Mojave Indians. The post is placed about 300 yards from the north bank of the Mojave River, on a small plateau 30 feet higher than the bed of the stream, but a little lower than the level of the surrounding country. This point is in part sheltered by a few low hills, against the western base of which is impacted much of the sand which would otherwise sweep over the camp with the prevailing winds. The neighboring country is part of the Colorado desert or plateau, a level sand waste, which, from this point of view, is encircled by bare and grotesquely eroded mountain ranges, which rise from 1,000 to 4,000 feet above the desert level. These are from 20 to 60 miles distant from the post, and are said to be rich in silver and lead. The plateau bears little other than the wild sage, and in many parts is destitute even of this, bearing, instead of vegetation, a white, glistening efflorescence of soda salts. A few scattered bunches of grass grow along the river, and stunted specimens of cottonwood, mesquite, and willow, tangled with wild vines. Attempts have been made to cultivate a post garden, but the alkalinity of the soil has rendered them all fruitless. Antelope and mountain sheep are sometimes seen on

the mountain ridges, but it is chiefly along the river that game is discovered, consisting of rabbits, quail, ducks, and geese. A small water turtle is found, and some mountain trout. The coyote, lizards, snakes, scorpions, tarantulas, centipedes, and all the other inhabitants of the American desert are plentiful here.

The soil is sandy, with an admixture of clay, which, when sun-dried after rain, gives its surface a firm coating, as if covered with a layer of adobe plastering.

This part of the country has its dry and wet season, but the latter is usually abortive, the quantity of rain being small. The temperature of the year has been 63.18° F., the wet-bulb showing for the same time a mean of 62.69°. The extremes were 116° and 22° F. The prevailing winds are from the west, frequently blowing strong and continuously, constituting sand-storms, in which the air is so clouded with fine particles that objects within a few yards are only visible. The mirage is of frequent appearance.

The post has a parade ground 300 yards square, and has the buildings arranged along three of its sides. The buildings are of adobe, floored, and shingle-roofed, plastered outside and plastered and whitewashed inside. The officers' quarters is the only building ceiled. The hospital and laundresses' quarters have not been built. For temporary use as such the buildings of the old camp are retained. Cases requiring hospital treatment are few.

The barrack building is 86 by 26 by 12 feet, but has the northwest and southeast corners partitioned off as temporary dispensary and saddler's shop respectively. It is heated by stoves when necessary, lighted and ventilated by twelve windows and three doors, and has furnished, to the average occupation of the past year, 650 cubic feet of air space per man. The bunks are temporary structures made by the men. In rear of this building is one, 48 by 18 feet, partitioned into a kitchen and mess-room.

The officers' quarters is one building, 36 by 18 feet, divided by a hall into two rooms. There is a wing in rear, 14 by 12 feet, and a small out-house as kitchen.

The building constructed as a guard-house is 26 by 18 feet, and divided into two rooms, which, for the time being, are occupied as quarters by the post surgeon and his family, a hospital tent being used meanwhile as guard house.

The store-house, 76 by 24 by 14 feet, is divided into a room for quartermaster's stores, one for subsistence, and an office. The corrals and sinks are near the river, sufficiently distant from the quarters.

The water supply is at present obtained from springs in the bank of the river, at the site of the old post, half a mile distant. Some half a dozen wells have been dug, and water invariably found at from 3 to 5 feet, but it has proved unfit for use from its alkalinity.

The ration issued has been of good quality, but the commissary department has been almost the only source of vegetable supplies. A good stock of canned vegetables has been on hand for purchase. Potatoes and onions are occasionally brought from San Bernardino. There have been no diseases at the post, except trivial cases. Care has been taken to secure all the vegetables possible as preventive of scurvy.

The hospital is kept well supplied with medicines and stores by yearly requisitions on the medical purveyor at San Francisco, California.

There are no inhabitants in the vicinity. Occasionally a band of hostile Indians, supposed to be Pi-Utes, cross the road on their way to or from the Colorado River.

Statement showing mean strength, number of sick, and principal diseases at Camp Cady, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Venereal diseases.	Scurvy.	Rheumatism.	Catarhal affections.*	No. of deaths.
1868.....	51.16	104	21	24	1	4	3	12	9	.....
1869.....	26.33	46	12	12	2	1	.....	5	1	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

FORT YUMA, CALIFORNIA.

REPORT OF ASSISTANT SURGEON J. V. LAUDERDALE, UNITED STATES ARMY.

After receiving the Gila at a point 160 miles from its mouth, the Colorado River turns suddenly westward and forces its way through a rocky defile, 70 feet high, 350 yards long, and 200 yards wide, thus cutting off a narrow rocky bluff and leaving it as an isolated eminence on the California side of the river. On this rocky eminence, which has been shifted not many ages since from the Arizona to the California side of the ever-varying stream, (and during high water it is hard to tell which side it is on, as the water flows freely all around it,) stands Fort Yuma, (latitude $32^{\circ} 32'$ north, longitude $114^{\circ} 36' 9''$ west,) rising gray and somber above the broad sea of green as it is approached on the emigrant road from Pilot Knob. At this point the bottom lands adjacent to the river average seven miles in width, and are covered with a dense growth of cottonwood and mesquite. Chains of low serrated hills and mountains limit the view on nearly every side, all bare and gray save when painted by the sun with delicate tints of blue and purple.

History says that in the year 1540 the Viceroy of Spain sent Fernando Alarchon to explore the Gulf of California, and he discovered the mouth of the Colorado, which he describes as "a very mighty river which runs with so great a fury of stream that we could hardly sail against it." The difficulty of ascending this river is due to the tidal wave flowing from the ocean through the Gulf of California, and to a greater or less distance (depending on the height of the annual overflow) up the river, renders it unsafe for any but light-draught boats to make the attempt. All freight from San Francisco must be reshipped at the mouth of the river, and the boats are able to run up as far as Fort Yuma, where the average depth is 4 feet. During the months of June and July the flood from the hills meets the tidal waves from the Gulf and causes an overflow or setting back of the waters over the California desert, filling up the basins and that long bayou known as New River, from which, during the summer, it gradually recedes or is evaporated by the burning sun. The course of the river from the gorge at Fort Yuma is remarkably straight as far as Pilot Knob, a distance of 10 miles; the banks are regular, and the current so rapid that bodies set afloat at the fort will be carried nearly to the Knob.

Before reaching the fort the road leads the traveler through a long avenue, shaded by young cottonwoods and mesquite, with an impenetrable growth of arrow-bush and cane; at length he arrives at the bend of the river, and the water no longer bears the Colorado or ruddy tint which gives it its name, but appears of a muddy color, the red being due to reflected light. What appeared in the distance to be a heavy fortification resolves itself into a collection of substantial adobe houses, inclosed by deep verandas with venetian blinds, which shut out every direct ray of sunlight and exhibits an air of privacy unsurpassed by the surroundings of a Mormon harem. Shade trees are an impossibility, and "grassed surfaces" unknown. Paragraphs 42 and 43, Revised Regulations, do not apply to Fort Yuma.

Leaving the flat land along the river, we ascend the rocky hill toward the fort, and, by an easy winding roadway, cut out of the side of the bluff, reach the hollow square called the parade. Not one single blade of grass, or vine, or tree, worthy of the name, is seen; all is rock and the débris of rock, and in many places the abraded faces of the crumbling feldspathic granite forms the substantial but gritty pathway.

All the buildings at the post are of sun-dried brick, and neatly plastered within and without. They are constructed one story high, with lofty ceilings, large rooms, with double sash doors extending from floors nearly to ceiling, and affording the freest ventilation. The roofs are made double like the walls, inclosing an air chamber, and over all a metal sheeting. Each house is surrounded on all sides by a veranda, and adjacent houses have their verandas meet so that an inmate may pass from house to house without exposing himself to the sun.

That which entitles Yuma to the designation of fort are certain unpretentious intrenchments scattered along the slopes of the bluff, which command the river and the bottom-lands adjacent; they are not visible from the river, and the spectator is not aware of their existence until he

steps to the edge of the bluff and looks down upon their gabion revetments. They were constructed for barbette guns, but are now dismantled.

This not being a point for offensive operations, the garrison is small and chiefly engaged in guard duty at the large quartermaster's depot across the river, and in escorting supply trains to the interior of Arizona.

The parade we find a stony lawn; the rocky hill roughly dressed and made smooth by filling in with fine grit, and inclosing a square 200 by 600 feet in extent, with a gentle slope toward the river. The arrangement of the post is shown in Figure 59.

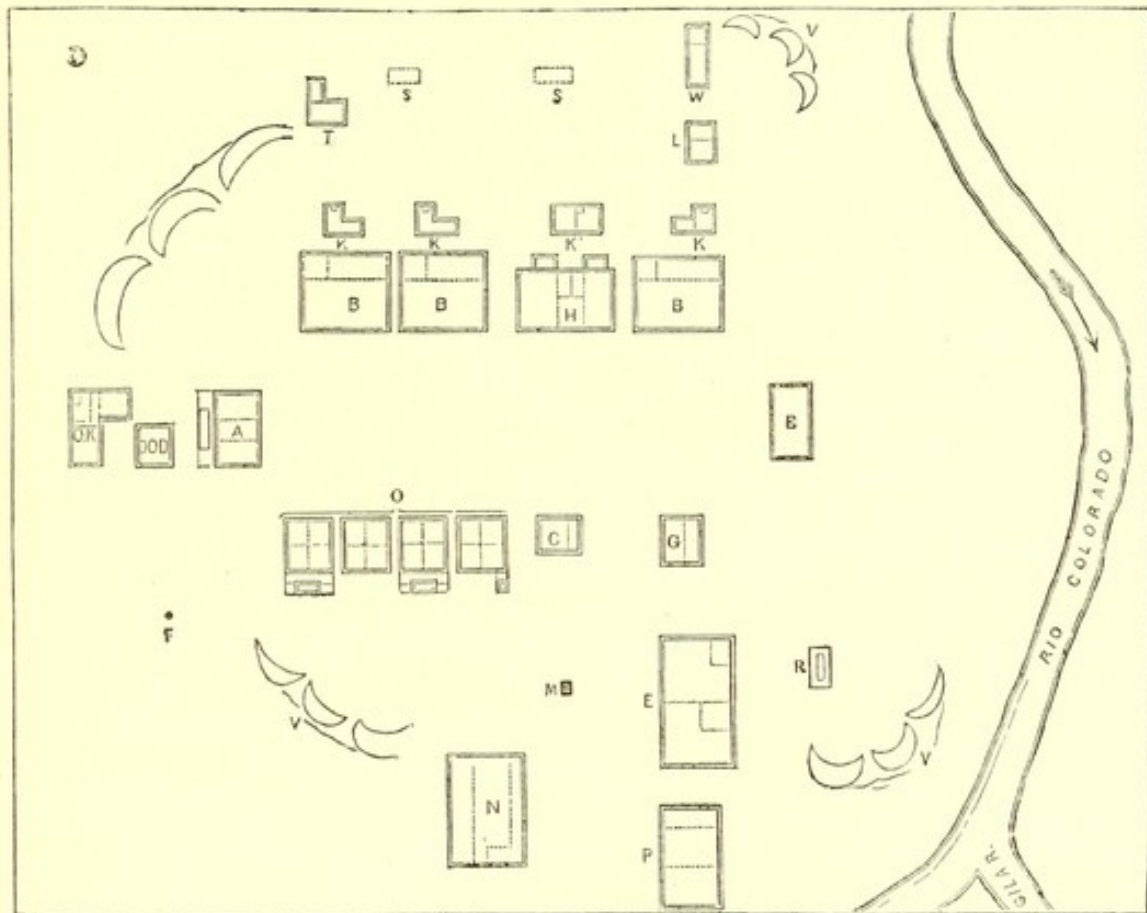


Figure 59—Scale, 160 feet to 1 inch.

A, commanding officer's quarters; B, company quarters; C, quartermaster and adjutant's offices; E, store-houses; F, flag-staff; G, guard-house; H, hospital; K, kitchen; L, ordnance office; MN, corral; O, officers' quarters; OD, dining-room; OK, kitchen; P, shops; R, reservoir; S, sinks; T, sutler's store; V, bastions; W, bakery.

This post is well selected as a defense against Indians; it is very healthy, but it is impossible to find a more uninviting spot for a residence than this small promontory of decomposing trachyte. The earth and rock are of that light ash-gray color so trying to the eyes that it is a relief to stand near the flag-staff at the brow of the hill and look out upon the green vegetation that everywhere covers the bottom lands.

Being near an extensive desert the air is very dry, and evaporation is rapid. Rain seldom falls; the annual quantity does not exceed five inches. During the months of April, May, and June no rain falls; then, with the thermometer at 105°, the perspiration is scarcely seen upon the skin, and it becomes dry and harsh, and the hair crispy. Furniture put together at the North and brought here falls to pieces; traveling chests gap at their seams, and a sole-leather trunk contracts so that with difficulty the tray can be lifted. Furniture to hold together must be made of the very driest timber. The extreme dryness of the atmosphere is observed in the ink that dries so rapidly upon the pen that it requires washing off every few minutes. A No. 2 "Faber" leaves no more

trace on paper than a piece of anthracite, and it is necessary to keep one immersed in water while using one that has been standing in water some time. Newspapers require to be unfolded with care; if rudely handled they break. I was called to inspect some commissary stores a short time ago, and the loss they had sustained was remarkable. Twelve-pound boxes of soap weighed ten pounds. Hams had lost 12 per cent, and rice 2 per cent of their original weight. Eggs that have been on hand for a few weeks lose their watery contents by evaporation; the remainder is thick and tough; this has probably led to the story that our hens lay hard-boiled eggs.

The mercury gained the highest point last summer, on the 2d day of July, when, for two hours, it stood at 113° in the shade. All metallic bodies were hot to the touch; my watch felt like a hot boiled egg in my pocket; the cords of my grass hammock were like heated wires. At such times, if the wind is from the south, the air is like that from the mouth of a furnace, hot and ovenish.

The effort to cool one's self with an ordinary fan would be vain, because the surrounding atmosphere is of a higher temperature than the body. The earth under foot is dry and powdery, and hot as flour just ground, while the rocks are so hot that the hands cannot be borne upon them. The parade is always hot at midday, and the story told of the dog that ran on three legs across it, barking with pain at every step, may be correct, though I have never seen it tried.

This post, although not the most southerly, is the hottest military post in the United States; the mean annual temperature is 76.86°. The highest temperature recorded in our books since 1850, when the post was established, is 119°, observed at 2.25 p. m., June 16, 1859. The monthly mean for July, 1868, was 93°, and for nineteen days the mercury at 2 p. m. stood above 100°. A temperature of 100° may exist at Fort Yuma for weeks in succession, and there will be no additional cases of sickness in consequence.

The dress must be of the lightest, suitable to the temperature. The lightest woolen fabrics that are made should be worn next to the skin, or, if woolen is not borne well, cotton. The dress of the natives is very simple. The heavily fringed kilt, made of the bark of the cottonwood, or woolen yarn, in two divisions which hardly come together at the hips, and worn about the loins, is the fashion which obtains among the Yuma women, while the men of this tribe encumber themselves with about two yards of muslin, and a belt or strap.

Ice is never seen, not even on the coldest day in winter. I do not think it would be desirable to have the article in summer if it could be furnished. The water we drink is relatively cool at 60° to 75°, and is very refreshing.

We have none of the malarial diseases incident to the cities of the Gulf of Mexico, or along the eastern seaboard. The heat depresses the already debilitated, and we miss the tonic effect of cold weather; but those who come here in good health, and observe the ordinary rules for preserving it, will have nothing to fear from the high temperature.

Statement showing mean strength, number of sick, and principal diseases at Fort Yuma, California, for the years 1868 and 1869.

Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhoea and dysentery.	Venereal diseases.	Scurvy.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868.....	97.5	135	.....	17	29	20	8	13	.....	11	3
1869.....	128.5	111	1	16	20	17	.....	9	1	2	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

DRUM BARRACKS, WILMINGTON, CALIFORNIA.

INFORMATION FURNISHED BY SURGEON W. F. EDGAR, UNITED STATES ARMY, AND ASSISTANT SURGEON CHARLES SMART, UNITED STATES ARMY.

Drum Barracks is situated in Los Angeles County, California, one mile from and 35 feet above tide-water in the Bay of San Pedro, in latitude $33^{\circ} 42'$ north, and $118^{\circ} 17' 8''$ west longitude. The town of Los Angeles is 20 miles distant north. The seaport of Wilmington lies between it and the bay. On all other sides it is surrounded by a plain which reaches inland to the spurs of the mountain range of California. The soil is a light, sandy loam, barren of shade trees and bearing but little grass, although it produces well when irrigated; but there is little cultivated land in the neighborhood on account of the want of water. The climate is mild, temperature 63° F.; extremes, 102° and 32° F. Usually a light breeze from the southeast blows during the forenoon, but is replaced after midday by one stronger from the northwest. Occasionally sand-storms occur.

The post was established during the late war as a depot for the supply of the column of troops which passed onward into Arizona. It was built for five companies, and to supply it with water a ditch and flume from the San Gabriel River were constructed at great expense. The post is now in poor repair and the flume valueless, the water supply being carted daily from the wells at Wilmington. The buildings are seldom occupied, and troops passing in transit to or from Arizona usually go into camp somewhere in the vicinity. Sick men from these passing commands are frequently left for treatment at the post, and the hospital for this reason has been kept in better repair. There are no quartermaster or subsistence store-houses at the post; these are at a depot near the wharf in Wilmington. Communication with San Francisco, California, is by steamer every Thursday, arriving on Saturday.

The permanent garrison consists of a detachment of infantry, 20 strong, which is employed in guard and fatigue duties, but is too weak to be able to keep the post in good repair. No gardens are cultivated, but fresh vegetables, grown inland, can be purchased during their season.

The post is built on the four sides of a square of eight acres, and is arranged as follows: On the east the men's quarters, with the laundresses' quarters and bakery in rear; on the west, officers' quarters; on the north, commanding officer's quarters and adjutant's office, with the hospital in the northeast angle; on the south the guard-house, magazine, and ordnance store-room.

The men's quarters are five sets of frame buildings; each set 80 by 30 feet, one story, with ten windows, two doors, and a ventilating flue, 3 by 3 feet, in the center of the roof; each set is furnished with wooden bunks, and would give about 400 cubic feet air space per man of the average strength of an infantry company. Each building has a veranda in front and a large wing in rear, formerly used as kitchen and mess-hall.

The officers' quarters on the west side are two large two-story wooden buildings, with veranda in front. Each contains four rooms on each floor, 20 by 18 feet, with two one-story wings in rear intended as dining-rooms and kitchens. In the inclosure in rear are also sinks, private stables, and fuel houses.

The set of quarters on the north side are in better repair. The building is 40 by 35 feet, cottage-built, with two rooms, 20 by 15 feet, and three 11 by 12 feet, dining-room and kitchen attached. The hospital is a two-story frame building, with veranda in front. It is 80 by 40 feet, and has two wings, 30 by 15 feet, and is divided into two wards, 39 by 40 feet; two 15 by 19 feet, and one 40 by 15 feet, an office, 15 by 19 feet, a surgery, 15 by 19 feet, and a steward's room, 15 by 15 feet, a store-room, 15 by 15 feet, a kitchen, 15 by 20 feet, a dining-room, 15 by 40 feet, and a bath-room, 15 by 10 feet. Sinks are 100 feet in rear. The wards can accommodate forty-two patients, to each of which is allowed 1,200 cubic feet of air space.

The cases of disease left for treatment by troops in passing are usually rheumatic or bronchial affections, or diarrhoea. There are no ambulances or other transportation at the post; but such as may be necessary can be obtained of the quartermaster's department at Wilmington.

Statement showing mean strength, number of sick, and principal diseases at Drum Barracks, California, for the years 1868 and 1869.

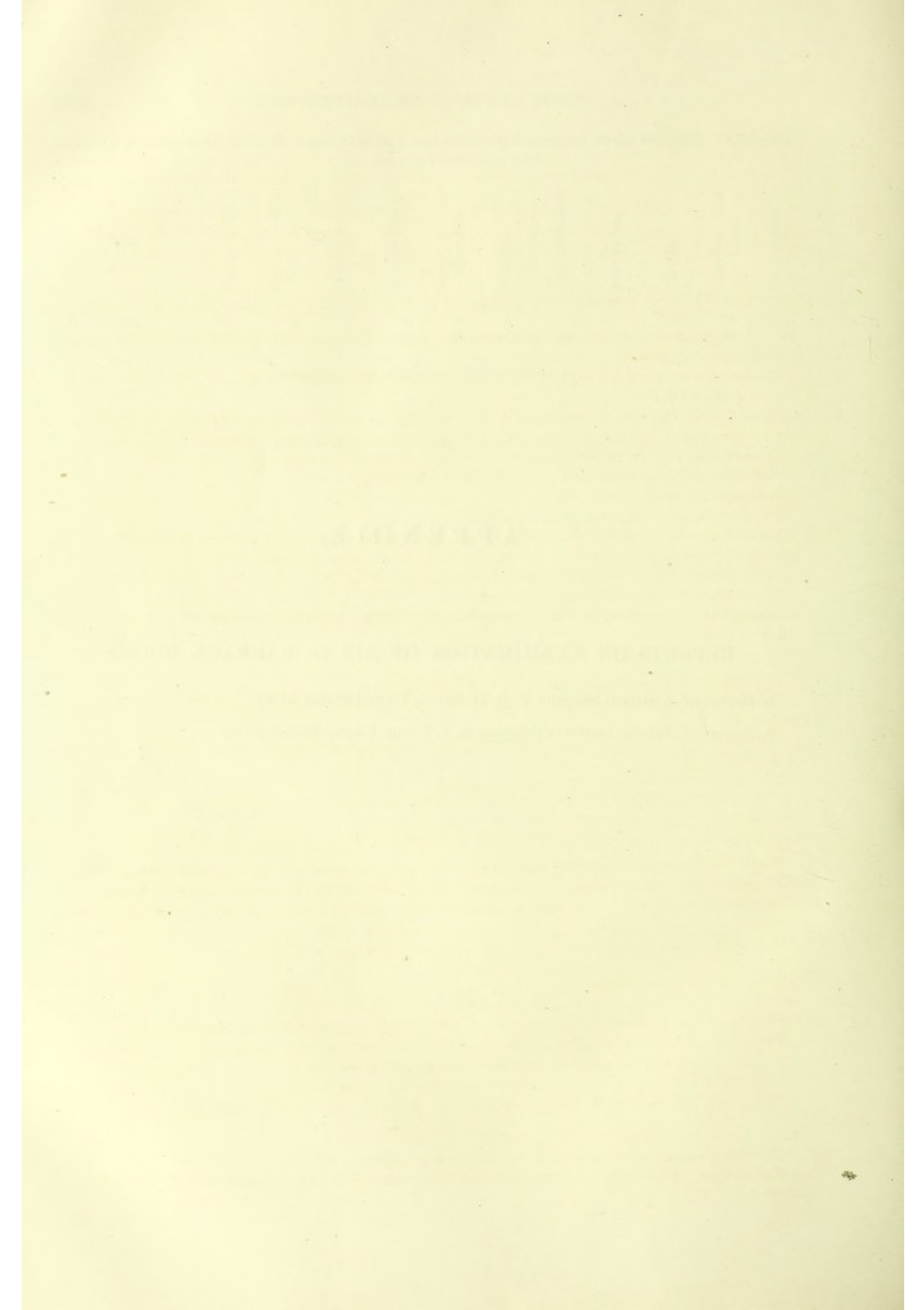
Years.	Mean strength.	Whole number taken sick.	Typhoid fever.	Malarial fevers.	Diarrhea and dysentery.	Tonsillitis.	Veneral diseases.	Rheumatism.	Phthisis.	Catarrhal affections.*	No. of deaths.
1868, (4 months).....	99	46	1	2	10	.....	6	1	2	10	.....
1869.....	119.5	172	.....	27	26	2	37	9	1	20	1

* Include laryngitis, bronchitis, pneumonia, and pleurisy.

APPENDIX.

REPORTS ON EXAMINATION OF AIR IN BARRACK ROOMS.

1. Report of Assistant Surgeon V. B. Hubbard, United States Army.
 2. Report of Acting-Assistant Surgeon B. F. Craig, United States Army.
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APPENDIX.

REPORT OF ASSISTANT SURGEON V. B. HUBBARD, UNITED STATES ARMY, WEST POINT, NEW YORK.

For the estimation of the *carbonic acid*, the process followed was that given in Frezenius's "Quantitative Analysis."

For the estimation of the *organic matter*, the process followed was that given in "Parke's Manual of Practical Hygiene."

For the determination of the amount of carbonic acid, solutions of both calcium and barium hydrates were used; the proportion of CO^2 was determined by a standard solution of oxalic acid.

The first analysis was made of the air contained in the artillery barrack.

Date and hour of examination: July 22, 1870, 1.30 o'clock a. m.

Room on the ground floor.

Contents of the room, in cubic feet, 13,016.25.

Superficial area of windows and door open at the time of examination, in feet, 131.75.

The air examined was taken at an elevation of 2 feet 6 inches from the floor.

Temperature of the room at the time of examination, 81° F.

No perceptible breeze moving at the time.

Sleeping in the room at the time of examination, 19 men; unoccupied bunks, 3.

Estimation of CO^2 .

The volume of air examined was 3,700 cubic centimeters.

The solution of calcium hydrate indicated the presence of 6.25 milligrams of CO^2 in the volume of air examined.

The solution of barium hydrate indicated the presence of 6.50 milligrams of CO^2 in the same volume of air.

Taking the mean of these as the correct amount, and reducing the volume of air examined at 81° F., to what it would be at 62° F., we find 9.58 volumes of CO^2 in 10,000 volumes of air.

Estimation of organic matter.

Three thousand four hundred and nine cubic centimeters of air were passed through one liter of pure water, and the amount of organic matter taken up by the water, estimated by means of a standard solution of potassium permanganate. The air was found to contain .00440 grams of oxidizable animal organic matter per 1,000 cubic centimeters of air.

The second analysis was made of the air contained in the cavalry barrack.

Date and hour of examination: July 22, 1870, 3 o'clock a. m.

Room on the second floor.

Contents of the room, in cubic feet, 16,803.36.

Superficial area of windows and door open at the time of examination, in feet, 111.

The air examined was taken at an elevation of 2 feet 6 inches from the floor.

The temperature of the room at the time of examination was 78° F.

A slight breeze moving from the southwest at the time of examination.

Sleeping in the room at the time of examination, 16 men; unoccupied bunks, 17.

Estimation of CO^2 .

The volume of air examined was 4,340 cubic centimeters.

The solution of calcium hydrate indicated the presence of 7.37 milligrams of CO^2 in the air examined.

The barium hydrate indicated the presence of 7.25 milligrams of CO^2 in the same volume of air. Proceeding as before, we find 9.30 volumes of CO^2 to 10,000 volumes of air.

Estimation of organic matter.

Three thousand four hundred and nine cubic centimeters of air were passed through one liter of pure water, and the amount of organic matter taken up by the water estimated by means of a standard solution of potassium permanganate. The air was found to contain .00292 grams of oxidizable animal organic matter per 1,000 cubic centimeters of air.

The third analysis was made of the air contained in the engineer barrack.

Date and hour of examination, July 26, 1870, 2 o'clock a. m.

Room on the second floor.

Contents of the room, in cubic feet, 6,296.40.

Superficial area of windows and door open at the time of examination, in feet, 63.

The air examined was taken at an elevation of 2 feet 6 inches from the floor.

The temperature of the room at the time of examination was 85° F.

A fresh breeze blowing from the west. Circulation of air in the room good.

Sleeping in the room, at the time of examination, 9 men; unoccupied bunks, 2.

Estimation of CO^2 .

Proceeding as in the cases of the first and second analyses, 10,000 volumes of air were found to contain 9.37 volumes of CO^2 .

Estimation of organic matter.

Proceeding as in the above analyses, the air was found to contain .003430 grams of oxidizable animal organic matter per 1,000 cubic centimeters of air.

The fourth analysis was made of the air contained in the cadet hospital.

Date and hour of examination, July 28, 1870, 2 o'clock a. m.

Ward on the first floor.

Contents of the ward, in cubic feet, 4,480.

Superficial area of windows and door open at the time of examination, in feet, 73.35.

The air examined was taken at an elevation of 2 feet and 6 inches from the floor.

The temperature of the ward at the time of the examination was 77° F.

A slight breeze blowing from the south-southeast. Circulation of air in the ward good.

Sleeping in the ward, at the time of examination, four patients, (cadets.)

Estimation of CO^2 .

Proceeding as in the above analyses, 10,000 volumes of the air were found to contain 5.68 volumes of CO^2 ; but, owing to a suspected error in manipulation, the test was repeated on the following morning, (July 29,) at the same hour, under similar circumstances, and 10,000 volumes of air were found to contain 5.52 volumes of CO^2 . The thermometer in this examination indicated 76° F. A brisk breeze was blowing from the north-northeast. Rain, with thunder and lightning, from 10 p. m. to 10.30 p. m., 28th instant.

Estimation of organic matter.

Proceeding as in the above analyses, the air was found to contain .001875 grams of oxidizable animal organic matter per 1,000 cubic centimeters of air.

To account for a portion of the discrepancy in the results obtained from the calcium and barium tests for CO^2 in the artillery and cavalry barracks, it should perhaps be stated that in the artillery barrack the calcium test was used first, and immediately after entering the room.

The barium test was used afterwards; and seven men, in addition to those sleeping in the room, were introduced to conduct and assist in the experiments; while in the cavalry barracks the barium test was used first under similar circumstances.

It is but right that I should mention that these analyses were made chiefly by Captain Lorenzo Lorain, Third United States Artillery, for the past eight years assistant professor of chemistry in the United States Military Academy, assisted by Lieutenant John Pitman, United States Ordnance Corps, instructor in chemistry.

SPECIAL REPORT OF ACTING ASSISTANT SURGEON B. F. CRAIG, UNITED STATES ARMY.

GENERAL: I have the honor to submit the following report on the ventilation of the soldiers' quarters at certain posts which I visited, in accordance with your instructions:

There are two radically different methods by which the amount of ventilation of a room may be ascertained. One of these is to measure mechanically the quantity of air that enters or leaves it, a measurement which may be made with tolerable accuracy by small anemometers, in those cases where all the air enters or leaves through one or more ventilating shafts or other air passages so placed as to be accessible for purposes of experiment. This condition of things is to be found in buildings in whose construction certain plans of ventilation have been provided for, but is not met with in the quarters usually occupied by United States troops. The other method of measuring ventilation is to determine the amount of vitiation of the air of an apartment occupied by a given number of persons.

In an occupied room the air undergoes various alterations, which, for the most part, are the results of the passage of portions of it through the lungs of the occupants. The most noticeable of these alterations are those of temperature, of moisture, of the amount of organic matter of various kinds, and of the amount of carbonic acid; and by measuring the extent of any of these changes a basis may be obtained for some sort of calculation as to the rapidity with which the air in the room is renewed. They are very far, however, from giving equally satisfactory means of calculation.

The change of temperature is well marked in a very crowded room in cold weather when there are no artificial sources of heat present, but as a general thing the difference of temperature between the external and the internal air is either too slight or too much dependent upon causes incapable of exact estimation to be made of practical use for determining the amount of ventilation.

The augmentation of the moisture of the air would seem, at first sight, to be of more value as an indicator, as in passing through the lungs the vapor of water in the air is increased, in some cases, as much as seventeen times, or from one to seventeen grains in a cubic foot; and if the methods for the ready estimation of the moisture of the air were sufficiently exact in their results, they could, in dry cold weather, be advantageously employed in this connection; but, as it is, their accuracy is not great enough for this particular purpose.

The perception by the sense of smell of the presence of organic matter is the usual and the standard test of the fact of insufficient ventilation. For the simple fact of good or bad ventilation, the accuracy of this test is greatly influenced by the temperature, and it is sufficiently delicate only in a tolerably warm room.

When we attempt to determine the amount of organic emanations from the body present in a given space, we find that they are so small in actual mass, and of so complex and so indefinite a character, that they evade to a certain extent the powers of chemical titration.

The measurement of the carbonic acid which is added to the air by animal respiration is much freer from the difficulties above alluded to. The quantity given off is more considerable, as air, in passing through the lungs, has its carbonic acid increased about one hundred times, or from about four parts in ten thousand to four parts in one hundred. Moreover, the chemical affinities of carbonic acid, although comparatively feeble, are well defined, and it is capable of tolerably exact chemical estimation.

In examining the air of soldiers' sleeping apartments, I noted its condition as to organic matter, as far as indicated by its odor, and measured its moisture by means of the improved hygrometer of the Medical Department, but the most important part of the examination was the determination of the carbonic acid.

This was made by the well-known process of Pettenkofer, which depends upon the power of solutions of lime and of baryta to absorb carbonic acid from the air, and to precipitate it in an insoluble form. The determination was made both for the external and for the internal air, and it was then assumed, in accordance with the experiments of Mr. Edward Smith, that a sleeping man produces about four-tenths of a cubic foot of carbonic acid per hour, and will therefore increase the amount of it in one thousand cubic feet of air, to the extent of four parts in ten thousand, and in two thousand feet, to the extent of two parts in ten thousand, &c., so that from the percentage of carbonic acid we may infer, by computation, the number of cubic feet of fresh air received per

hour for each man. Of course an allowance is to be made for the amount of air originally contained in the room, and this is determined on obvious principles, by considering the size of the room, the number of its occupants, and the length of time during which it had been occupied by them when the air was collected.

As soldiers are supposed to enter their quarters at a certain hour in the evening, and to remain in them through the night, without materially altering their ventilation, this allowance can be made with some approximation to accuracy, in a way which will be shown further on.

A solution of baryta, of carefully measured strength, was employed for the absorption of the carbonic acid, but in some cases circumstances led to the substitution for it of a solution of lime.

The chief modifications of Pettenkofer's original process were these: Dilute hydrochloric acid, of such strength that one cubic centimeter was equivalent to one milligram of carbonic acid, was used instead of the oxalic acid solution of Pettenkofer, as being less liable to alter by keeping, and the solution of baryta, after having been spread over the sides of the jar, and exposed for several hours to the action of the contained air, was taken up by a long pipette and transferred to one of the small flasks known as Schuster's alkalimeters. In this it was allowed to settle and to deposit the suspended carbonate. The clear liquid was then carefully poured off, drop by drop, into a measured quantity of standard acid, contained in a porcelain capsule, in which it had been mixed with a few drops of tincture of litmus, until the color was brought to the tint which the same litmus tincture gave to distilled water. The quantity required for the neutralization of the acid was determined by weighing the flask both before and after the titration. When the baryta solution was first transferred from the jar, the beak of the flask was sealed by tallow or simple cerate, to prevent access of air, and when the final testing was to be made, a hole was pricked through with a needle, to allow of its being poured out. When lime water is used for absorbing the carbonic acid, a much longer exposure is required to give accurate results, and it should remain in the jar for at least twenty-four hours. The solution of baryta, which absorbs carbonic acid from the air very rapidly, was kept in small and well-stopped bottles, one of which was opened whenever a determination was to be made, and what was not used at the time thrown away, so that the baryta water was never taken from bottles which had been kept on hand after being partially emptied. This precaution was not found necessary with the lime water.

The barracks were generally visited, for the purpose of collecting the air, about three hours after the men had gone to bed; but in two or three instances the visit was made shortly before reveille, or after the room had been occupied for about eight hours. In most cases fires were in use in the quarters; and the question may be raised whether the accumulation of carbonic acid may not have been increased by the products of combustion of the fuel. This question, I think, can be answered in the negative, as in all cases the stoves were burning with a very good draught, and the current of air from the fire up the stove-pipe was too quick and steady to leave it at all probable that a diffusion of gases took place backward into the room.

The first post visited was Fort Adams, in Newport Harbor. The troops there are lodged in casemates 54 feet long by 18 wide, giving 972 square feet floor space, and with cubic contents of about 10,700 feet. The ceiling and walls, or rather the furring of the walls, are built inside of the original masonry of the casemate, and in the ceiling are two large circular openings which communicate with a hollow space under the stone arch. Immediately under the coping of the scarp wall are openings which are probably the termination of ventilating flues ascending from the roof of the casemate arch. In this way a communication exists between the interior of the casemates and the external air through the openings in the ceilings, and whenever these openings were examined a slight current of air was found moving through them downward into the room. Each casemate is provided with two chimneys, and has windows opening in front on the parade ground, and in the rear through loop-holes into the ditch. The ventilation of these casemates depends in summer chiefly on doors and windows being left open, and in winter on the draught up the chimneys, and the compensating inward flow through the openings in the ceilings, and through accidental crevices. One of the chimneys is always closed by a fire-board through which the stove-pipe passes, and the other is generally open and provided with a grate. A good deal of the outward draught of air takes place around the stove-pipe, if it passes loosely through the fire-board, and that opening might in all cases advantageously be enlarged to allow of the freer access of air into the chimney, which the presence of the stove-pipe converts into an efficient ventilating shaft.

At Fort Adams the wind blows constantly for the greater part of the year, and by connecting the ventilating flues in the masonry with cowls turning toward the wind, or with some equivalent arrangement, their ventilating action could be made much more considerable. In connection with such a device a shaft could be carried down from one of the apertures in the ceiling, and be made to introduce fresh air under the stove; or sheets of wire-gauze could be placed immediately below the apertures to warm and diffuse the entering air. The openings which can be made into casemates are so limited that the forcing through them of currents of wind, in connection with measures for increasing the efficiency of the chimneys as upcast shafts, is the only practicable method of securing a very large ventilation. The amount of ventilation which at present exists may be seen by the following experiments:

Visited at 12.30 night of October 4-5, casemate on western half of southeast front. Number of men in it fifteen, giving to each a floor space of 65 feet, and cubic space of 713 feet. There was a fire in the stove, and the temperature of the room was 69° F., six degrees above that of the external air. The wind was from the southward, blowing obliquely into the mouths of the ventilating openings on the scarp wall. The air of the room being driven through a jar for a few minutes, 25 cubic centimeters of standard lime-water were put in and the stopper inserted. After a sufficient lapse of time to make the action of the lime-water effectual, the absorption of carbonic acid was determined, and, corrections being made for temperature, &c., was found to amount to 9.67 parts in 10,000. The external air received into a jar at the same time yielded 4.08 parts in 10,000. This leaves 5.59 parts in 10,000 for vitiation of air. As on the supposition that each man produces 0.4 cubic feet of carbonic acid per hour, an accumulation of 4.00 per 10,000 would correspond to a ventilation of 1,000 feet per man per hour, 5.59 corresponds to a ventilation of 712 feet per man per hour. As the room, however, had been occupied for about three hours, one-third of the cubic contents per man is to be subtracted from this apparent ventilation, which will leave 474 cubic feet per man, or $15 \times 474 = 7,110$ cubic feet of air passing through the casemate every hour.

On the 6th of October air was taken from the same casemate before reveille, and found to contain 10.07 parts per 10,000. The determination of carbonic acid in the external air was rendered uncertain by an accident, but as it may be assumed to be substantially the same as on the preceding night, the excess of carbonic acid in the air of the quarters would be 5.99 per 10,000, corresponding to a ventilation of 667 feet per man per hour. From this subtract one-eighth of the cubic space per man, and we have a ventilation of 578 feet per hour, and as a mean of the results of examinations at the different hours of midnight and of day-break, 526 feet per man, or 7,890 feet for the whole room.

The quarters were several times visited, and air collected during the month of September; but from the lameness of my hand at that time interfering with the proper performances of the manipulations, I have not perfect confidence in the accuracy of the results. Moreover, at that season the windows were always found more or less open, so that the condition of things may be regarded as coming under the head of summer ventilation. The amounts of carbonic acid found during this warmer season indicated a ventilation of from 1,000 to 3,900 feet per man per hour.

The largest amount of ventilation was found in the quarters of the band, on the northern front. These were of different arrangement from the other quarters, and the original flues for carrying off the smoke from the guns opened directly into the apartment, and acted efficiently as upcast shafts, while on the opposite side of the room a brisk wind was blowing against the partially opened windows. In winter, when the windows are closed, the ventilating flues would probably cease to draw so well.

At some distance from the fort are sets of quarters for married soldiers, to which I did not make any night visits. Each set consists of a small room used as a kitchen, eating-room, and company laundry, and an attic chamber above, of 954 cubic feet capacity. The greatest number of persons sleeping in one of these rooms is seven, viz., a soldier, his wife, and five children. The ventilation is by a staircase into the room below and a window, which can hardly be kept open in cold weather.

I proceeded to Boston Harbor from Newport, and visited there Forts Independence and Warren, at each of which a company of artillery is stationed.

At Fort Independence quarters for the men have been made in the rear or inner portions of the casemates, which are separated from the gun-gallery by large doors. The gun-gallery is ex-

ceedingly damp; and when a board is removed from the floor of the quarters, the stones beneath are seen to be wet. The quarters have each a floor space of 21 by 17, or 357 square feet, and a cubic capacity of 3,927 feet. In the middle of the ceiling is a place for a register ventilator, which, however, has never been put in, excepting in the quarters of the non-commissioned officers.

On the night of the 13th-14th of October one of the rooms was visited. There were nine men in it, giving 436 cubic feet to each man. One window was open at top to the extent of 150 square inches. At the other end of the room was a stove with a fire in it, the stove-pipe going through a brick wall into the chimney. Around the stove-pipe was an irregular opening, through which a rapid current of air was passing. The temperature of the air was 70° , and its moisture 4.62 grains in a cubic foot. The carbonic acid, as determined by a solution of baryta, was 7.18 in 10,000. The external air had the temperature of 57° , and contained 3.56 grains of water in a cubic foot. Its carbonic acid was 3.68 in 10,000. This gives an excess of 3.5 per 10,000 for the internal air. Making allowance for the capacity of the room, this indicates a ventilation of 997 feet per man, or 8,973 cubic feet per hour for the room.

At Fort Warren the quarters were of a much better character than at Independence. They were casemates of 540 feet floor space, and 8,100 feet capacity. In front were two windows opening on the parade, and in rear three windows opening through loop-holes into the ditch. In the ceiling were two openings of apparently about 12 by 14 inches each, and near the floor eight apertures of 8 by 6 inches, closed by registers. On looking at the top of the scarp from the outside, a number of small openings could be seen in a stone-work revetment of the slope of the parapet, which probably were connected through passages in the masonry with the above-mentioned ventilating openings. When one of the registers near the floor was opened, a current of air entered the room through it; there also seemed to be an inward current through the openings in the ceiling. There were two chimneys in each casemate, both of them, however, having their fire-places closed up by brick-work, and through one of these brick fire-boards the pipe of the stove was passed.

Two casemates were visited on the night of the 14th-15th October. In the first of them there were eleven men. A fire was burning in the stove; the pipe passed through the brick-work screen with a loose fit, and around the pipe there was a strong draught into the chimney. One of the foot-board registers was open, the others closed. Two of the windows in the rear were partly open, and one window in front was down a little at top. The temperature of the air was 70° , and its moisture 4.29 grains to the cubic foot. The carbonic acid was 6.26 in 10,000, an excess of only 0.77 over the external air. This corresponds to a ventilation of 54,450 for the room, or 4,950 for each man.

The second casemate contained ten men. It had two windows open in rear, one pane of glass broken in front, and one foot-board register open. The condition of things differed from that in the first casemate only in this, that the stove-pipe passed through a closely-fitting hole, and thus the ventilation into the chimney was cut off. The temperature was 72° , and the moisture 4.76 grains in a cubic foot. The carbonic acid was 8.37 in 10,000, and the computed ventilation for the room 12,000 cubic feet per hour, or 1,200 feet per hour for each man. The great difference in the ventilation of the two casemates is evidently due to the want of an opening into the chimney of the one last examined. The external air had a temperature of 52.5° , 3.41 grains of moisture to the cubic foot, and 5.49 parts carbonic acid per 10,000—a notably larger proportion than any previously found out of doors. It may be mentioned that on this night there was seen from the post a brilliant and remarkable aurora.

In New York Harbor I visited Forts Wood, Wadsworth, and Hamilton, and the post at Willet's Point.

At Fort Wood the men were quartered in frame barracks outside of the fortification, the rooms being about 1,320 feet floor space, and 15,860 feet cubic capacity. There are twelve windows on each side, and three ventilators in the roof. The first room which I visited contained fourteen men. There was a fire in one stove, the stove-pipe passing up through a ventilating shaft, and many of the windows were down at the top. The temperature of the room near to where the jar was filled was 59.5° , its moisture 3.75 grains in a cubic foot, and the carbonic acid 5.12 parts in 10,000.

Another barrack was occupied temporarily by troops that had just arrived at the fort. There were forty men in it. The stoves were not yet ready for use. Many of the windows were open at top, but rather less freely so than in the first barrack. The temperature was 58° , the

moisture 4.02 grains in a foot, and the carbonic acid 9.13 in 10,000. The external air was of the temperature of $47^{\circ}.5$, 3.29 grains of moisture to the foot, and 4.62 carbonic acid. The calculated ventilation for the first room was 106,700 cubic feet per hour, and for the second, 30,700. This large difference between barracks of the same size and character is to be attributed to the influence of the fire in the stove of the one first visited.

At Fort Wadsworth the men had been removed from the casemates, and quartered in frame barracks. The one in which I collected air was a ceiled room, 81 by 27 feet floor space, and 10 feet high, it contained fifteen men, giving to each the ample allowance of 1,458 feet of cubic space. Along the middle line of the room were three chimneys, belonging originally to other buildings which had stood on the same ground. Into two of these chimneys were inserted the pipes of two stoves, in which fires were burning, and in the sides of all three chimneys were round holes a few inches in diameter. Five of these holes were open, beside others which were occupied by the stove-pipes, or closed by obstructions, and through the five open holes most of the ventilation of the room seemed to take place, the current of air into them being very rapid. In the ceiling of the room were three openings of about 20 inches square, leading into the space between the roof and the ceiling. The effect of these as ventilators was less apparent. There was no wind blowing at the time; but if a window was raised on either side or at either end of the building, a current of air rushed in, showing that the three chimneys acted vigorously in exhausting the air from the room, and that free openings for the entrance of air was the only thing needed to make abundant ventilation. At one end of the room a pane of glass was broken out, and through this the air was passing in rapidly. All other access of air to the room was through accidental crevices. The temperature of the air was 70° , the moisture 4.07, and the carbonic acid 6.24. The thermometer out of doors stood at 47° , the moisture was 2.60, and the carbonic acid 4.23. From these data we are to infer a ventilation of 22,710 feet per hour for the room, or 1,514 feet to each man.

At Fort Hamilton I found a large garrison quartered in casemates of an inferior kind. Those in which the greater part of the men were lodged are 44 feet by 14, with an offset some 4 feet deep in the thickness of the wall, the total cubic space being about 7,700 feet. The rooms are ceiled and furred, and along the arch of the ceiling is a broad slit guarded by lattice-work, while along the foot-board are numerous narrow slits covered by wire nettings. What communication, if any the space between the furring and the masonry has with the external air could not be made out either at the fort or from an examination of the plans and drawings at the Engineer Bureau in Washington.

In a casemate which I visited at midnight there were eighteen men sleeping, and the carbonic acid in the air amounted to 14.06 per 10,000. The external air contained 4.22 per 10,000, and the ventilation, therefore, would be only 260 feet per man, or 4,680 for the whole room.

I also visited the guard-rooms or prisons at Fort Hamilton, which are low and damp casemates. In the one from which I collected air there were twelve prisoners; a fire was burning in the stove, the pipe passing up through a flue. Two embrasures and four loop-holes, closed only by gratings, allowed a pretty free entrance of air. The amount of carbonic acid found was 5.76 per 10,000. Just over the bunks where the prisoners slept the accumulation was no doubt greater.

Between the fort and the post hospital are quarters for married soldiers of the same insufficient size and ventilation as those noticed at Fort Adams.

The last post visited was Willet's Point, which is occupied by the engineer battalion. The men were quartered in old frame barracks, the new barracks in course of erection not being yet completed. Air was collected from a barrack room occupied by twenty-eight men, which had a floor space of 58 feet, and a cubic capacity of 780 cubic feet per man. The room was not ceiled, and the height to the ridge-pole was 15 feet. Above the ridge were small turrets with windows on all sides, intended to serve as ridge ventilators. These turret windows were closed at the time of my visit, but along the eaves fifteen or twenty small ventilators were standing open. Fires were burning in two stoves, the pipes of which passed out through narrow sleeves or tubes of earthenware or metal, which extended downward for a short distance from the ridge, inclosing the pipes. These acted as good ventilators, as far as their insufficient size permitted. The carbonic acid from the air taken at midnight was found to be 4.96 per 10,000, an excess of 1.90 over that of the external air. With a capacity of room of 780 cubic feet per man, as above stated, this gives a ventilation of 1,845 feet per man.

Another jar was filled in the quarters of the band, a somewhat smaller apartment, in a barrack from which the turret ventilators had been removed, on account of their seeming to endanger the security of the building. There were eleven men in the room, and about 1,500 cubic feet of space for each. No stoves were up, and no windows or other ventilating apertures were open, all the air which entered or left the room passing through crevices of the wood-work. The amount of carbonic acid found was 10.67, and upon calculation the ventilation indicated is reduced to 25 cubic feet per man per hour, or 275 feet per hour for the whole room, showing that where the ventilation depends entirely on the action of the wind in blowing through crevices, it may, at times, even in a frame building, be practically suppressed.

With regard to the general results of the above detailed examinations, it may be remarked that the amount of air which writers on hygiene have held to be the minimum supply consistent with perfect healthfulness, viz., 2,000 cubic feet per man per hour, was, at the posts which I visited, attained only in exceptional instances; but that in most cases an extension and slight modification of the existing systems of ventilation would probably give a sufficient circulation of air.

The efficient agent or motive power in winter ventilation is the heat of the fire, and more particularly that portion of the heat which is communicated by the stove-pipe to the air of the shaft or chimney through which it passes out.

In our military hospitals the stove pipe passes out through a large shaft which opens freely into the room, but in quarters provision for the access of air to the chimney is apt to be deficient or altogether disregarded.

The upcast ventilation set in motion by the heat of the stove is, moreover, often held in check by the want of openings for the entrance of the external air, and this difficulty must inevitably increase as the winter advances and the entrances for cold air are closed up by those sleeping near them.

Ventilation should not be made to depend upon the endurance by men of unpleasant and dangerous currents of cold air; and where the inhabitants of a room cannot so choose their sleeping places as to be out of draughts, the cold air on entering should have, as far as possible, the general temperature of the room immediately imparted to it. There are two general methods of doing this, one of them that of Franklin, who connected with the stove a shaft which brought in the outer air—a plan which requires the stove to be placed as far distant as possible from the ventilating chimney; and the other is represented by a contrivance shown me at the rooms of the Board of Health in New York, of a large metal box intended to be placed in a window-sash from which a pane of glass had been removed. This acts both by imparting the warmth of the metal to the entering air, and by causing it to mix more thoroughly with the air of the room.

In buildings erected for quarters there is no doubt but that proper ventilation can be secured by a little intelligently-directed labor and expense, but in casemates which were put up for a different purpose, and in which even small alterations are costly, the question is different. Certain casemates, as those of Fort Independence and of Fort Hamilton, are evidently not suitable for habitations. Casemates of a more modern character of construction, like those of Fort Warren, are greatly superior to those first-named in all sanitary aspects; but as there are limits to their possible ventilation which do not exist elsewhere, the cubic space per man should be greater than that afforded in barracks; and casemates must always be regarded as quarters in which men are particularly liable to suffer from the evils of overcrowding.

Very respectfully, your obedient servant,

B. F. CRAIG,
Act'g Asst. Surgeon United States Army.

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