Hospitals, infirmaries, and dispensaries : their construction, interior arrangement, and management, with descriptions of existing institutions / by F. Oppert.

HOSPITALS, INFIRMARIES, AND DISPENSARIES

[Hospitäler u. Wohlthätigkeits-Anstalten]

HOSPITALS, INFIRMARIES,

AND

DISPENSARIES:

THEIR CONSTRUCTION, INTERIOR ARRANGEMENT, AND MANAGEMENT;

WITH DESCRIPTIONS OF EXISTING INSTITUTIONS AND 74 ILLUSTRATIONS.

BY

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SECOND (ENGLISH) EDITION, REVISED AND ENLARGED.

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PREFACE TO THE FIRST EDITION.

It might appear superfluous for me to write on Hospitals, and the system of relief to the sick poor, considering the number of treatises and pamphlets relating to the subject. It is scarcely four years since Miss Nightingale presented the public with the third edition of her valuable work, which contributed not a little to diffuse sound principles relative to the construction of Hospitals in this country. Shortly afterwards Dr. Bristowe and Mr. Holmes wrote their able Report, for which the profession owes them its thanks. Nor have continental authors been behindhand. M. Husson's remarkable work stands out overshadowing all others by its splendid illustrations and variety of contents; and a few less comprehensive essays, in which, however, some of the principal points are treated with great clearness, have reached me recently. I venture, nevertheless, to hope that this work will meet with the approval of an indulgent reader. In some degree, I differ from other writers. I am not acquainted with any English work treating the subject as a whole, and comprising Hospitals, Dispensaries, and other means by which relief is afforded to the sick poor. The construction and management of Dispensaries are only second in importance to that of Hospitals, and the relief which the poor obtain by being visited at their homes deserves equal attention. In a country where committees and boards of guardians manage most of these institutions, it may not be out of place to draw everything relating to the system within the sphere of public criticism.

In a former edition written in German, and published in 1859, but now out of print, I described only a few Hospitals, but in the present work I have endeavoured to include all the most noteworthy establishments in existence. The second part, containing these descriptions, may possibly serve as a practical guide to those who

may be inclined to visit the institutions. It has been my object to give more detailed accounts of those establishments which have been opened during the last few years. Some that had not been previously described I specially visited; others I have had occasion to visit at various periods; but in many instances I had to rely on reports and the accounts furnished by other authors, and I confess with pleasure that I have availed myself of descriptions and illustrations found in the valuable works mentioned above.

I should not have been able to lay before the reader these pages, imperfect as they are, if I had not had the assistance of others, who kindly supplied me with correct information and tracings of various buildings. I am greatly indebted to those gentlemen who, at some inconvenience to themselves, cheerfully responded to my various inquiries; and it is in compliance with the expressed wish of many who thus assisted me that I refrain from making their names public.

F. Oppert.

Great Russell Street, *March* 1867.

PREFACE TO THE SECOND (ENGLISH) EDITION.

This edition was preceded by two German ones, in 1872 and 1875. It contains many additional descriptions, and also new illustrations of Hospitals recently constructed, or kindred institutions. The author owes his sincerest thanks to those who have assisted him with information respecting their institutions, and the improvements or alterations which have taken place therein.

F. Oppert.

Berlin, *June* 1883.

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PART I.

I.—ON THE CONSTRUCTION OF HOSPITALS.

1. *Dimensions of Hospitals.*

Formerly large hospitals were founded on the principle that by increasing the number of patients who could be accommodated, the benefit conferred on the sick poor of the community was also increased; but in recent times contrary views are strongly maintained. Large hospitals are described as unhealthy and dangerous to those who seek recovery of health in them. It is stated that a great many sick people living together under one roof engender certain diseases which are well known under the term of hospital diseases. I allude to pyæmia, erysipelas, gangrene, puerperal, typhoid, and similar fevers.[1] That the dangers in question exist is evident from the history of hospitals, especially large hospitals, where, of course, the resulting calamities are greater, and by the reports a better record is preserved than in smaller establishments. Although it is very difficult to prove by statistics that large charities offer less healthy conditions than smaller ones respecting the point in question, yet the fact that all hospitals are liable to such dangers leads naturally to the conclusion that the evil consequences must be more deplorable in the large establishments. A greater number of people are likely to fall victims, and the whole neighbourhood is more endangered, by the hospital being a large focus of disease.

It follows on the same grounds that should any infectious disease be accidentally brought into a hospital, the number of people who run the risk of catching it increases with the size of the building, and the best remedy against evil results which exists—that is, by completely emptying, and, for a time, closing, the establishment—is the more difficult to apply the larger the number of inmates.

I can bear testimony to one fact, that the hospital air of large establishments, without actually leading to disease, tells upon the constitution. I observed that my colleagues who resided with me

[1] No metropolitan general hospital can boast of having had no cases of hospital disease during a period of ten years

in one of the largest charities (Charité Hospital) lost their fresh complexions after staying there for six or eight months, and that they regained it after leaving and living in the town for a time.

In favour of large hospitals it may be urged that they offer great facilities for clinical instruction, and some of them have obtained great celebrity in this respect. But, on the other hand, there are some smaller institutions in existence which receive, almost exclusively, clinical cases, and are quite sufficient for the purposes of medical education.

It might further be said that recent improvements in the construction and management of hospitals may be expected to reduce the dangers arising from hospital diseases to very narrow limits; but our experience on this point dates from too recent a period to be conclusive, and to trust too much to good arrangements would be presumptuous.

I do not think myself entitled, with our limited experience, to mention an exact number of patients that on no account should be exceeded; but whenever a new hospital is to be erected, the danger of having too many sick people under one roof, or living close together, should not be lost sight of, and moderate dimensions insisted upon. In large cities, to have only small hospitals would be inconvenient and a useless expense.

Besides the sanitary principles we have to regard the actual wants of the population for whose benefit the hospital is founded; and although there is a great number of sick poor, only part of them can claim in-door treatment.

Further researches ought to throw more light on the point, but I do not think I am far wrong when I state that for every thousand inhabitants the hospital ought to have four beds for the sick poor. If this is right, a town of 50,000 inhabitants need not have a hospital for more than 150 patients, supposing there is a Union infirmary for fifty beds. It must be borne in mind that a part of the surrounding country relies upon the town. In London there should be accommodation for 16,000 poor patients. A hospital containing 400 beds would amply suffice for the wants of a surrounding population of 100,000 inhabitants who are distributed over a large area. But the hospital, if not exactly in the centre, would still not be inconveniently situated. If the area be larger, those of the sick poor who live farthest away from the building find some difficulty in being conveyed to it. It has further to be considered what other institutions afford relief to the sick poor of the district or town—for instance, if many poor are sent to a convalescent institution.

It is important that all the points mentioned are considered

beforehand, and that the building has the right dimensions at the commencement. To enlarge hospitals is, in general, unadvisable. It was frequently done formerly; but unless the eventuality is foreseen and considered in the original plan, it leads to faulty arrangements and dispositions.

2. *Site—Town or Country.*

There is sometimes a difficulty in selecting a proper site for a new hospital. As it is intended for the local wants of a certain district, nothing seems more natural than to have it in the centre of that district; but to this there are objections, on sanitary grounds, especially in large towns. In small places the hospital, even if removed from the centre of business and life, can hardly be at an inconvenient distance for the patients. But it is otherwise with large cities like London, Berlin, Vienna, or Paris, and there have been warm discussions on the matter. What can be said on the subject I believe I may sum up by considering the following points:—

1. The general healthiness of the locality. 2. The easy accessibility for patients and others who visit the hospital. 3. Convenient position for clinical instruction. 4. Cost of erection and maintenance.

Ad. 1. It can hardly be doubted that in general better conditions for health are found in the country than in a large town, and I would not say a word more about it if this had not been disputed. Not to speak of statistics of mortality, which are in favour of country districts, I first mention the well-known fact that the country is in general considered a health-resort by townspeople, and frequently recommended by the profession as such. Purity of air consists principally in the absence of such impure exhalations and bad smells as are produced by the overcrowding and industrial occupations of large cities. The air is always purer and less liable to become stagnant in the country, whereas the immense extent of buildings in London and other large towns arrests to some degree the free circulation of the atmosphere.

Now it might with some reason be said that the air gets vitiated in *any* hospital, wherever it is situated; that hospitals breed a noxious atmosphere of their own, owing to the number and condition of their inmates; but then we have every reason to suppose that the surrounding healthy country air is a better agent for restraining this evil than town air.

Ad. 2. If we consider the convenience of the patients themselves, we might at first sight be induced to believe that town hospitals are far preferable. It would be in many cases quite impossible to remove

patients suffering from severe injuries, or from fever, even to a moderate distance, because they might die on the road, or in consequence of removal. On the other hand, we find a great many patients are admitted into central hospitals who live at a distance of three or four miles from the building. As regards the friends of the patients, I should not think it a great drawback if their visits were to be curtailed by the distance, because those patients who are dangerously ill are better left alone, and those who are convalescent make friends in the hospital. Besides, in large towns every one gets used to distances, and country hospitals would be in most cases accessible by railways. In the Berlin Charité Hospital, which lies at some distance from the centre of the town, the visits of the patients' friends were so numerous on Sundays that they had to be prohibited, and a week-day appointed.

Other persons who have to visit the hospital are the members of the committee, the physicians, and surgeons. If the management of the hospital is vested in a committee of unpaid gentlemen, who meet weekly or fortnightly, as is mostly the case with London charities, I have serious doubts if it would be preferable to have the establishment in the country. Although the sense of the public duty they have to fulfil is happily very strong in these members of committee, yet it might, under adverse circumstances, be found a little too onerous to meet frequently. A remedy for this would be central offices, to which there are other objections. As regards the medical officers, they do not live in the country but in town, and generally in the most central parts of it, because they must be easily accessible to private patients, who live all over the large metropolis. They would therefore have to sacrifice more of their time to the hospital if its site was some distance from their residences. Some of them would perhaps find themselves compelled to sacrifice their hospital appointments to their private practice, on account of the distance; but there would always be many eminent men left to supply their places.

Ad. 3. I have no doubt that a central position commends itself more for clinical instruction than one at a distance. Some bring forward as a reason why the science of medicine might be better studied in a country establishment, that the students are removed from the temptations of the town, and that they will bestow more of their time on useful labour. But then you might answer that hitherto students have not been led astray by the attractions of the gay life of large towns, but are in general well conducted, industrious, and much intent upon acquiring scientific knowledge, and that the dulness of country life would not improve their intellect; besides, if they live within the

hospital walls in town, they are as safe as in the country. But the real importance of a central position lies in the opportunity afforded to the students of availing themselves of the public libraries and museums, and finding everything they want for scientific purposes within easy reach.

The professors of medicine and surgery would certainly prefer a central position for the hospital and school of medicine.

Ad. 4. The cost of building-ground must be considerably less in a place remote from town, and therefore the expenses will be reduced. But the price of building materials does not differ in town or country; the expense of conveying them to the latter is possibly higher.

The price of food, medicines, coals, etc., with which a hospital is supplied, is most likely less in the country, or at least not higher, if they are supplied by contract, as is generally the case in England. But where a central board provides them, and they are kept in central depôts, as in Paris, the cost of conveyance makes some difference. The hospitals nearer the depôts are supplied at less cost than those at a distance.

Wages and salaries are more likely to be higher in town than in the country, and the cost of maintenance in general is found less in the latter than in the former.

Only a few years ago these points were discussed in learned societies. The Chirurgical Society of Paris, after lengthy debates, came to the conclusion that only small hospitals for urgent cases, and those required for clinical instruction, should exist within towns, and that not only would the salubrity of the larger hospitals be improved by their extra-urban position, but also their construction would be rendered more economical by reason of the reduced cost of land. Granted that these principles are theoretically right, as I think they are, supposing always that the hospitals for clinical instruction are really allowed in sufficient number, I do not see the possibility of strictly following them up everywhere in practice. The central establishments of London could not be removed into the country; and supposing they were, I am afraid they might, in the course of time, become the centre of a densely-populated neighbourhood, because a hospital is likely to attract a great many to settle near it. There is no doubt that most London hospitals have not a site that is in accordance with the principles advocated by the majority of the profession in this and other countries at the present time. It may, however, be supposed that the consequences of this would be more seriously felt if London was more an inland city than it is.

Other Features of Site.

To construct the building in such a way that the front or longest side of a ward face the north or north-east would be a mistake, because on this side the cold and the wind are most felt. Rain comes most from south-west, and south-east seems therefore preferable. If one side looks south-east, the other faces the north-west, and this seems to be the best position, except in the case of wards for diseases of the eye, where the patients require as little sun as possible. Their wards may lie northwards, but all other patients want light and sunshine.

Under no circumstances should the site of a hospital be where fever is endemic or epidemic (*see* Milan Military Hospital), near river deltas, or where the soil produces miasma. The neighbourhood of sewers, especially open ones, rag merchants (rags containing sometimes contagious matter), bone-boiling, gasworks, chemical or large factories in general, and places where there is much noise and bustle must be avoided, because patients make a better recovery where the locality is quiet. It is advisable to build a hospital on elevated ground, so that its architectural beauty is conspicuous to the eye, that the patients enjoy a view over the country, and that it may be above the bad smells, if there are any, and in purer air. It should not be so elevated, however, that it is reached with difficulty by carriages or visitors, but on gently sloping ground near a placid river, in a position where the soil is fertile, and surrounded by large grounds.

The foundation of the building should be in dry ground, or the moisture will ascend in the walls and make them damp. There should be good drinking water in the neighbourhood.

When a committee have decided on the erection of a hospital, they should obtain the advice of a leading member of the medical profession regarding the site and other important points to be mentioned hereafter.

3. *Exterior of a Hospital.*

There is a middle course possible between extravagant splendour and shabbiness of the exterior of a building. A hospital is principally a useful institution, and the architect must not lay too much stress on a captivating outside. A palace may have many columns of marble or granite, projecting balconies, and towers, but a hospital should aim at more simple attractions. It may look pleasing without such a profusion of ornaments as are presented by a Gothic church, and imposing even when constructed on plain principles. Whatever may be the style of architecture—Gothic, Italian, or mixed—I should not object to a fine clock-tower and an ample porch; the

chimneys need not look ugly, and narrow entrance doors can be avoided. The architect ought to dispense with arched windows; a little stained glass in the chapel is not very expensive. Simple iron railings may surround the building at some distance, and there need not be an entrance looking like a triumphal arch. The material of which the walls are built should be good bricks, and the architect may avail himself of Portland stone and terra-cotta. If the walls are to be plastered it is better to leave that until about a year after the completion of the building, for the walls to get thoroughly dry; and it is better to plaster or cement them first inside and then outside, because if the outside is left open to the drying action of the atmosphere the inside walls retain less humidity.

Rain-gauges and water-pipes ought to be placed in proper positions, the latter not exposed to the frost, but secured against it by Portland cement.

4. *Drainage.*

This is an important question. A great many towns have now a system of drainage, by which the refuse is removed and used as manure in the country. If the hospital is situated in a place where this system is in action, its refuse is carried off like that of other buildings; but where sewers are not available, the hospital has its own cesspools.[1] In the first case, the hospital drains are brought into connection with the main drains, and made of the same material as the latter. Cast-iron is the best, but expensive; brick or brick-cemented drains occasionally get broken, and let the fluid escape. If the place where the breakage happens is near a well, this gets contaminated with organic impurities. Salt-glazed stoneware drain-pipes, although good in themselves, are liable to break. They are, however, generally used.

All drains should be laid to a depth that will prevent them from being frozen in cold weather, and should be constructed in the outer walls of a hospital, and not run underneath it, for with the greatest care it may happen that they will require repairs, and the joints do not always fit air-tight, so that sewer gas may escape.

The latest plan for ventilating drains is by having the vertical drains into which the pipes take the refuse from the water-closets and sinks open at the upper end, where a charcoal box with a perforated bottom is placed, or ventilating pipes are carried to the top of the chimneys.[2]

Drains are cleansed by flushing. For this the channel is blocked at the lower end, and large quantities of water admitted into the

[1] *See* Royal Surrey County Hospital, Guildford. [2] *See* Dundee Royal Infirmary.

upper one. If the impediment is removed, the water rushes with great force through the vacant space, and carries off all impurities.

Where no sewers exist, the hospital has generally a cesspool. If the building exists near a river, the refuse could be discharged into the latter; but this should be avoided, because it renders the river offensive. Cesspools ought to be water-tight, with an overflow-pipe; fœtid emanations are avoided by syphon-pipes. Cesspools are emptied of their contents as often as is necessary. Generally some means are used for deodorising them: the best plan is to have layers of charcoal at the bottom. Another device is to carry the refuse into tubs, which can be removed; and they might have double bottoms—the upper one containing numerous perforations, so that the fluid and solid excreta are separated.[1]

5. *Plan of Building—Shape of Hospital.*

Hospitals are built on different plans, and it is not necessary that they should be all constructed on one uniform plan. Although more than one plan is admissible, there is no doubt that recently one system of construction finds more favour with the public than all the others—viz. the Pavilion plan. Some authorities in hospital matters still uphold the Corridor system; and the desire to produce something new causes architects occasionally to build on plans deviating from the common ones. Sanitary principles alone should influence us in the selection of the plan.

I must first mention that some buildings are constructed on no system or plan whatever. We find in many instances private houses converted into hospitals;[2] in other cases they have been formerly palaces,[3] convents,[4] or, worst of all, barracks.[5] It was not rare formerly to take buildings for hospitals which were unfit for anything else. This may be economical, but the hospital can never be healthy. If you throw two rooms into one by taking down the partition wall, you generally get a ward of irregular shape, with recesses and corners, which are difficult to ventilate. The plainest sheds are preferable to them, and to magnificent palaces, if they are only constructed on proper principles.

Of all systems those are the worst where there is the least of air and light. Those hospitals which stand round closed courts offer consequently the worst conditions of health. How it happened that

[1] A novel plan for draining a town is that adopted at the Hague. Air-pumps are used to extract the air at certain places, and the refuse rushes to occupy the vacuum, as soon as the valves, which prevent this, are removed.

[2] Samaritan Free Hospital. [3] Dresden. [4] Rome.

[5] Indian Hospitals, some German military hospitals.

so many buildings[1] were constructed on this plan I think may be easily explained. In the first place, many of the institutions were in connection with convents, which generally were built after this manner; it was possible to accommodate a great number of patients in such hospitals, and as one court was added to another, the expenses were less than for separate or semi-detached buildings. Besides, this style of construction always found friends in the sunny south, where they like to exclude light and air; and it was afterwards imitated in other countries.

If the wards of such buildings have opposite windows, they are certainly less dark, and more easily ventilated than where a corridor runs along the whole of the inner side. This is convenient for the servants and nurses, but not to be recommended for the patients.

I do not consider the dangers resulting from connecting passages imaginary, because it is well known at present that contagious matters spread in a horizontal direction. (*See* p. 14.) Interposed glass doors do not sufficiently break the communication, but interfere with ventilation (especially where the latter is effected by windows at both ends of the corridor). Under some circumstances the evils of the Corridor plan may be reduced to narrow limits—for instance, where the hospital is small, the corridors being short and well ventilated (Westminster Hospital).

Between the plan of closed courts and that one where the wards receive as much light and air as is possible there are many others, which I will mention briefly, because they are illustrated in the second part of this work.

The plan of a circular building[2] is as bad as the closed quadrangle. A better one is where one side of the court is open.[3] There the air is less stagnant, because the wind can sweep through from one direction. The wings and centre may form one long block; this is better still.[4] They may assume the shape of the letter H,[5] where the administrative part is in the centre, having the wards for males on one side, and those for females on the other. The hospital may be built in such a shape that the letter L[6] or T[7] is formed; and in both cases staircases may break the communication of the different parts forming the whole.

Several plans may be combined; but in no case can the free

[1] Salpêtrière, older portion of Guy's, Venice, Vienna.
[2] Vienna, old lunatic asylum.
[3] Manchester Royal Infirmary, Hamburgh Hospital.
[4] Bremen Hospital, Zürich Hospital.
[5] Middlesex Hosp'tal, St. George's, Leicester. [6] Sheffield, Royal Free.
[7] Montrose; Oxford, St. Mary's Hospital.

circulation of air, which is necessary to keep the hospital healthy, be more favoured than in the Pavilion plan. Here each block forms a hospital by itself, and yet is connected with the others. The dangers of hospital diseases are much abated, and the judicious separation of patients much facilitated. All the wards are light and airy; the officers and nurses are more protected from hospital diseases than under any other plan, as they do not live under the same roof with the patients excepting when on duty. The wards are large and easily superintended, and they ought to be healthy. As regards this latter point, the expectations founded on theoretical deductions have not been quite realised, at least not by one of the principal representatives of the plan—Lariboisière. Further experience will decide it satisfactorily, as many hospitals in this country have been recently built on the plan.

The pavilions should stand far apart (at least 100 feet), and as regards their position to each other much depends on the building-ground; they should not necessarily stand parallel, and need not be connected by straight corridors, but these may be curved. (Boston Free Hospital, Copenhagen Hospital, Swansea Infirmary.)

Objections to the Pavilion Style.

I have to answer a few objections to the system of separate blocks. First, some say it would not do for small hospitals; but they have only to look at the plan of the Bucks Infirmary, or Surrey County Hospital, to be undeceived in this; they contain only fifty or sixty beds, in two pavilions built in one line, but intersected by offices and the staircase.

The costliness of construction is another objection. Now, to prove the costliness, the hospital Lariboisière is always referred to, which is alleged to have been constructed with unprecedented and unjustifiable prodigality. It is quite true that the construction has cost nearly £400,000; but this is explained by the interference of the Municipal Board, which retarded the construction at the commencement, by the change of the original plan, and caused an additional expenditure of £20,000; by the quality of the soil, that made it necessary to build the whole on arches; and by the new systems of heating and ventilation, which cost nearly £20,000. The ground alone cost £125,000. There being 612 beds, the cost for one would be near £640. This is certainly very high, and I can only find a few other establishments which come near this sum: in St. Thomas's Hospital the cost of a bed was about £600; King's College Hospital is much behind (£400 per bed). If we compare this with

the expenses of other hospitals built on the same plan, we find that they can be constructed at a very moderate rate. As one instance, I may mention the Chorlton Pauper Hospital, where, according to the official report, the cost for one bed is only £66. (See *Lancet*, Oct. 13, 1866.) If it is possible to construct a workhouse infirmary after the Pavilion plan, I hardly think that any one will consider the costliness of the system so very great an objection.

It might be urged that isolated buildings are not fit for a cold climate; but then thick walls and plate-glass or double windows will remedy this; and also that the officials lose much time by the distances they have to walk in the building; but this is compensated by other advantages.

As yet, as will be seen from the description of the hospitals, the block system has not been generally adopted on the continent, where comparatively few hospitals on this plan exist.

Relative position of different parts of the Hospital, and Distribution of Patients.

Whatever plan is adopted, there are some general rules to be observed regarding the position of the different requisites and the inhabitants of the house.

First, the offices for administration, the sleeping-rooms of officials, medical men, nurses, etc., must be separated as much as possible from the wards.

It is quite enough that the said inmates of the establishment are exposed to the hospital air, and contagion by diseases during the daytime or office hours; they must, at least, be as much as possible protected when they are off duty, and at night.

Secondly, the kitchen must not be on the basement or ground floor, but quite separate, connected with the main building by a corridor. Otherwise the smell of cooking pervades the house.

The engine-room should be in a separate shed; wash-house and dead-house should be detached.

Male and female patients should be accommodated in separate parts of the hospital, divided by the principal yard; and they should not use the same day-room, as is sometimes the case.

6. *Water Supply.*

In a hospital we want good pump-water for drinking, and soft water for cleansing, washing, bathing, and cooking. Pump-water is not always of good quality; it is often impure, containing sulphate

of lime, iron, or magnesia, or acids; therefore it should be analysed by a competent person, and if not found satisfactory it should be fetched or supplied from a distance.[1] (*See* Herbert Hospital.)

Water may, moreover, become the carrier of contagion, and this should not be lost sight of. The spread of cholera at the East end of London was referred by many hygienists to the water supply. It has often been found that fever was originated by pumps which supplied water impregnated with gases and matter escaped from broken sewers. The pumps should never be close to sewers, water-closets, or churchyards.

Water must be supplied in sufficient quantity for the sick in a hospital. Fever patients drink a great deal, and want cold water, which should be fetched from the pump frequently. But pipe-water is also used, for instance, in the sculleries—hot and cold. It is therefore necessary that hot and cold cisterns are in the house, from which the pipes take the water to all the places where it is wanted. Where companies undertake to supply private houses, the hospitals are supplied by them also; but where this is not the case, the water is pumped from a well into the cistern. The water in the hot cistern is usually heated by the steam obtained from the engine or boiler in the basement, and the steam-pipes form coils at the bottom of the cistern.

The best materials for cisterns are tinplate or slate. Lead is not recommended, because the water dissolves and absorbs the metal. Zinc lining is objectionable; it is not durable, and crumples up by the heat of the sun; cement has been tried in tanks, but the water becomes hard. The cement is insoluble in pure water, but water containing acids will act on the lime which forms a small part of the cement. Rain-water, as such, does not contain any acids, but on passing through the air it readily takes up carbonic acid, which is always present, and sulphuric acid, which is frequently met with in the atmosphere above, and in the neighbourhood of large cities. As slate is too expensive for large cisterns, tin is preferable for those of larger size. It can be painted with a patent colour.

Hospital cisterns must be cleansed thoroughly from time to time, therefore they must be accessible. They should be placed as far as possible from any drains, not just above the closets. Charcoal filters are very good to keep the water pure from organic matters, but they must be frequently changed.

The pipes for distributing the water in the hospital are of lead, as they are in private houses. There is not so much objection to this as to the cisterns being coated with lead, because the water

[1] *See* Hill Hassall, Parkes, Pappenheim.

is never in the pipes for any length of time. Lead is the cheapest material, and iron or zinc would make a great difference in the cost. It is of some importance that water-pipes are placed and encased properly when the buildings are constructed. They should be secured against freezing in cold weather as much as possible; this is often neglected in this country, where the frost is usually of short duration. If the water freezes, it expands; by this a leak is caused, and the water escapes through it when it begins to thaw. The exposure of the pipes to the open air might certainly be avoided; they might run in a recess of the wall, and be partly encased by wood. But it is safer to encase them in the most exposed places with cement or felt. They must not run through walls without being encased, because they cause dampness. As they are cold, the vapour which is in the wall is condensed near them. It would not do to place them in the smoke-shafts; they must be accessible, because they may want repairing. If in hospitals the pipes are originally badly placed and exposed, it is necessary, should the weather become cold, to wrap them up with flannel or cloth, cover them with manure, or keep the water running by allowing a tap at the bottom to be partly open; should they freeze, the exposed parts must be bathed with hot water, etc.

As regards the quantity of water which should be supplied per head per day, it is difficult to state it accurately. It should be ample—about 50 or 60 gallons. The average of the water supplied per head per day in the Paris hospitals is 50 gallons. The quantity consumed in large cities per head is very variable: in Manchester it is stated to be 14 gallons; in London, 32; in Glasgow, 60; but it is said that there is no good supervision in the latter place. The present regulations for lodging-houses in the metropolis require 25 gallons. As regards hospitals we must not forget that besides baths and the usual wants, there are the drains, which it is advisable to flush frequently. Nothing is better for preventing the ill effects of noxious gases.

7. *Elevation—Number of Floors.*

There are certain reasons why we should avoid having more than two floors in a building intended for a hospital. It is well known that the air in a hospital, as in a private building, ascends from the lower to the upper floor; for instance, we find when the kitchen is in the basement, that the smell of the cooking gradually ascends to the upper stories. From this we conclude that the air of the lower wards finds its way into the upper ones in a similar manner, and this happens in a far less degree in an opposite direction, viz. from

the upper to the lower stories. It would follow from this that the air in the upper wards must be more close and less healthy than in the lower floors. In fact, it is often found, and I have noticed it frequently, that the air is sweeter in the lower floors. It is, however, not proved that the patients make a better recovery in the latter, but the views on this point are conflicting.[1] It is known that organic contagions proceed in a horizontal direction,[2] and certainly science is not far enough advanced to show by analysis that the air of one part is more pure than that of another. Much depends upon other circumstances, such as the price of the building land, etc. In places where land is comparatively cheap, the building may cover a larger space, and may have less elevation. As regards the administrative arrangements, they can be carried on most efficiently where the least number of floors exist. But if the hospital is large, the advantage of not having to ascend so many stairs is counterbalanced by the distance the medical men, attendants, etc., have to walk over to perform their duties, and lifts in a great measure overcome objections that are raised against lofty buildings. In fact, it will generally be found that the best plan is to give additional height to those parts of the building where the offices are situated, and to have fewer floors in that portion devoted to clinical patients.[3]

8. *Stairs and Passages, Lifts and Linen-shoots.*

A fine and spacious entrance hall is a great ornament to a building, but there are other reasons for having it in a hospital. The hall forms a reservoir for fresh air, which from hence finds its way into the wards. The stairs should be of stone with iron balustrades, fire-proof, and tolerably wide—first, because they are used by many persons at one time, who must have room to pass each other; and also because they must afford space for carrying up the patients.[4] The steps should not be steep, and, as carpets are too expensive, covered with matting.

A few plants in the hall and on the landings give them a more

[1] J. Simon, who found that surgical cases recovered as well in top wards as on the lower floors.—*Reports of Public Health.*

[2] Cases of smallpox in King's College Hospital.—*Med. Times*, Dec. 1866.

[3] We find one floor in the London, Glasgow Fever, and Milan Hospitals; two floors in Guildford, Vienna, Dresden; three floors in the London Hospital, Guy's, Necker, Beaujon, Lariboisière, Berlin Charité, Bethanien, Münich, Frankfurt; four floors in St. Bartholomew's, St. Mary's; five floors in Glasgow, and Adelaide Hospital, Dublin.

[4] Here I mention, *en parenthèse*, that I have sometimes seen patients carried up who groaned from pain caused by the uncomfortable chairs which the porters use in some establishments.

cheerful appearance, and impress the poor patient favourably when he first enters the hospital.

As regards passages, they should be of a convenient width (9 to 11 feet), and ventilated by end-windows; and warmed in winter-time, as will be explained in another place.

Lifts are used for raising food, medicines, clothes, etc., and their usefulness is beyond doubt. They are raised by turning a handle, in smaller buildings; water-power is sometimes used. As regards patients, lifts are necessary in consumption hospitals, but I should not consider them of paramount necessity in general hospitals; they are even not much used where they exist.

Linen-shoots of earthenware, which may be also used for the dust, are much to be recommended. As they are placed close to the wards all dirty clothes and linen can be removed easily, and at once, to a place where they can do no harm.

9. *The Sick Ward.*

The arrangements of the wards require our earnest attention. Their dimensions and the furniture they should contain must be principally considered.

We want large and small wards; the first because they are more healthy than many small ones, and the cost of their construction is comparatively less; and, moreover, supervision, attendance, and cleaning are more easy. The wards must, however, not be too large; they may by this become uncomfortable to the patients and difficult to superintend. A number of about 30 beds, sometimes a few more, sometimes a few less, is now generally considered as most satisfactory in every respect.

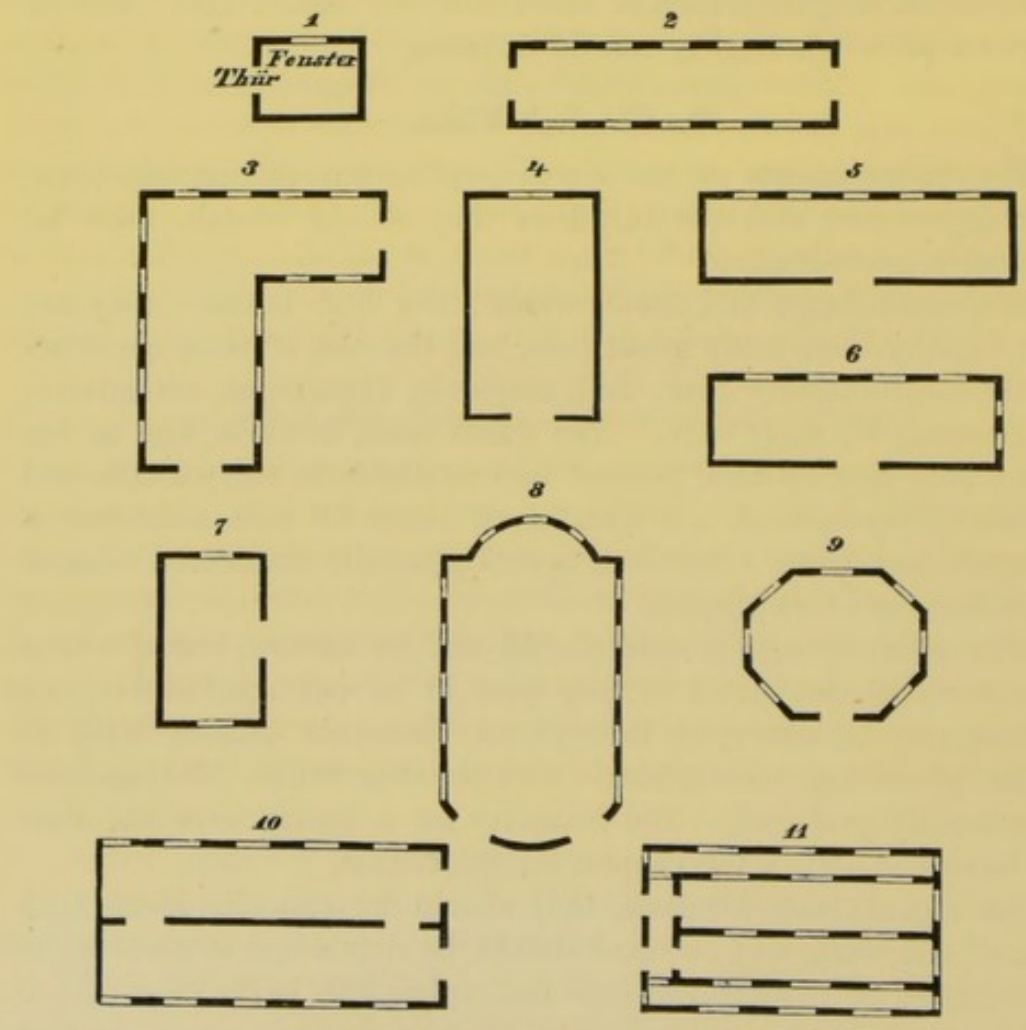
The door of such a ward should not be narrow, but of a convenient width, so that you may pass in or out comfortably, and patients can be conveyed through on brancards without being in danger of coming into collision with the door-frame. Swing-doors are generally preferred. The necessity for a louvre over the door will be considered in the chapter on ventilation.

As regards the windows, they should be opposite, along both sides of the ward, and no ward should be considered to come up to the standard of modern improvement unless this is the case. It is further advisable to construct the windows in such a manner that each bed stands between two windows; it is better that the beds should be separated by, and receive light from, two windows. It may, however, not always be convenient to have so many windows in the building, and sometimes there are larger and wider windows which allow two beds to be placed between a pair of them. The

windows should be high, extending nearly to the ceiling, so that the upper strata of foul air can easily find their way out when the windows are lowered a little. They should reach nearly to the floor, else the patients do not breathe the air unmixed with that of the ward, when the lower sash window is raised in mild weather. A distance of three feet and a half or four feet will be found convenient.

Iron frames are more durable than wood, but the frames of sash-windows are of wood, and this form of window should always be preferred for wards. The French croisées are immensely inferior to them as regards ventilation. To this I have referred more minutely in another place (p. 31).

The shape of the wards depends almost entirely upon the plan on which the hospital is constructed (*see* Fig. 1). I append a



1. Bradford Eye Hospital.
2. { Leicester Infirmary. { Glasgow Surgical Hospital.
3. Guy's Hospital.
4. Bremen, Rotterdam Hospital.
5. Manchester Royal Infirmary.
6. Bradford Infirmary.
7. Scotch Fusiliers, London.
8. Guy's Hospital, Clinical Ward.
9. Bristol General Hospital.
10. London, Bartholomew's Hospital.
11. Indian Hospital.
12. Antwerp Hospital.

Fig. 1.—Shape of Wards and Double Wards.

drawing which shows the forms of the wards of existing hospitals. The manner in which doors and windows may be placed is so evident that it can be understood without explanation.

As regards octagonal wards (Fig. 8), they are mostly for convalescents; bow-windows, as in Fig. 7, are very rare; spinal walls, by which a large ward is divided into two (Fig. 9), are objected to because the wards on this plan are not so easy to ventilate. Compound wards (Fig. 10) are the worst. They existed in the Hôtel Dieu, which is now in course of reconstruction, and in some hospitals that had been formerly barracks. The wards are dark, open into each other, and offend against every sanitary principle.[1]

The height of a ward in this country should be about 15 feet. Lofty wards generally contain pure air; but if the ceiling is too high the ward loses the dimensions of a dwelling-room. In warm climates the height should be a little more than with us. The width need not be more than 26 or 28 feet, because we want only two rows of beds. The length should correspond with, and not be more than four times the width.

As regards the walls, we sometimes find them merely whitewashed, without being plastered; this is the cheapest plan, and perhaps the most healthy. They can be plastered and whitewashed, but as plaster retains contagious matters, they must be whitewashed over at least once a year. They may be oil-painted, and the paint can be on the bare bricks, or on the plaster with which the walls are coated; in the latter instance, the painting must not be done before the plaster is perfectly dry; this may be supposed to be the case a year after it has been put on.

Lastly, the walls can be coated with cement: sometimes Keene's cement is used, which is of two different qualities; sometimes Parian cement, but this is more expensive than Keene's. As far as I can judge, they understand the use of cement better on the continent (in Münich and Paris) than they do here, for the walls there are never blotchy. It is questionable if cemented walls are the most healthy ones. (*See* Ventilation.) Cement can be either white or coloured and polished. These different ways of covering the walls can be combined.

The flooring of wards should be impervious. Firstly, because it deadens the sound of people in a ward overhead; and secondly, because it does not retain impure matters. In order to make the floors as fire-proof as possible, the beams (rails) which support them should be of iron: we need not be afraid that they will be too heavy.

The flooring may be of oak, which absorbs less water than any

[1] Circular wards are found in the Antwerp Hospital, which is not yet opened.

other kind of timber. Parqueted floors are most common on the continent; they are much to be recommended, and look exceedingly nice and clean. The blocks of wood are grooved and tongued together, and sometimes what is called keyed. The same thing is seen in wooden blocks for woodcuts. The floors are beeswaxed and polished (*see* Herbert Hospital).

To keep a wainscot or parquet floor in good condition a frotteur is wanted, who comes to repair them every three or four weeks; they are also polished by the servants every day.

Floors may be varnished with a compound of linseed oil, turpentine, and gold ochre.[1] This is the Berlin plan. These floors look dark and somewhat greenish; they are cheaper, but less durable. Old floors, which are of plain deal, can be varnished; and the process improves them much. They must, however, be frequently revarnished. In this country boiled linseed oil is generally used. Cement, or brick floors, as frequently found in warm climates, should not find favour with us (*see* Oxford, Stevens'); they occasion colds and are not comfortable, especially in cold weather. This objection does not apply to corridors. They may have tiled floors.

10. *Small Wards.*

They are necessary in a hospital, for there are irritable patients who do not feel comfortable in a large ward; there are those who do not find the distribution of meals and the visits and medical rounds a matter of diversion, but are annoyed by it, and thus their recovery is retarded. Nervous patients and convalescents from fever prefer to be alone and quiet. Contagious patients must be separated from the others. Those who suffer from delirium or mania cannot be left in a large ward with other patients, and sufferers from cancer or gangrene are quite unbearable to their fellow-patients. Persons who belong to the better class of society, but have become hospital inmates by accident, feel thankful if they are removed to a side ward, where they are alone, or only with one or two others.

Small wards should, therefore, exist in general hospitals,[2] and pavilion hospitals should not be without them. As a general rule, one small ward can be annexed to a large one on each floor, and in some pavilions matters may be arranged differently, by cutting off more space for small wards.

[1] *See* Newcastle Infirmary.

[2] *See* University College Hospital; Glasgow Infirmary; Rudolphstiftung.

11. *Water-closets.*

In England we rarely find a hospital without water-closets, but on the continent latrines are still common. We should insist that no new building contains the latter. The water-closets should be always well placed, in no way whatever but against the outer wall, in order that the drains do not pass under the building; the best means for ventilating them are self-acting windows. They should be kept scrupulously clean, and anything which promotes this, such as glazed tiles, or white paint, is to be recommended. It is important that the basins should be large (in France they are comparatively small), and that there should be a good stream of water for flushing them. I formerly thought enamelled iron preferable to earthenware, on account of its cheapness and durability, but I have observed that the enamel comes off, and therefore earthenware is preferable. It can be as well adapted to the seat as iron. A well-made basin of this material lasts, on an average, about fifteen years. Mr. Jennings' closet *à syphon* answers every purpose:[1] the double sheet of water impedes the return of gases. I need hardly mention those inferior apparatus where the basin has a rim to let in a convenient *couvercle*, or where the seat-cover fits air-tight. They are still in use in some establishments.

As there are no better means for banishing disagreeable smells from hospitals than the water-closets, the expense should never be an obstacle to their adoption for a new building. But there are other objections raised against them, and they have even been abolished where they were used (Zürich).. In places where it is very cold in winter time the freezing of the water-pipes is a great nuisance; and there is some difficulty in protecting them from the frost, if it lasts a considerable time. Nevertheless, the inconvenience caused by the bursting of the pipes and the flooding of parts of the building if unavoidable, should be endured, rather than abolish the water-closets.

As regards self-acting closets, I have found them so often defective that I think the others preferable. All water-closets should have lobbies. The closets can be warmed by admitting air through gratings in the flooring and hot-water pipes placed under the boards; but where I found means of warming, they were in the lobbies (at Beaujon, Guildford, Herbert Hospital). There is some difficulty in keeping the lobbies warm, as the closets must have the windows open, and it may be urged that there is no better prevention for bad smells than a low temperature. Clinical wards, however, and consumption hos-

[1] They are free from all machinery. No wires, cranks, levers, regulators to get out of order—the basin, valve-rest, and trap being complete and in one piece.

pitals should have some means of warming the lobbies, in order to prevent the patients from catching cold. For small hospitals a fire-place will be the best; for large ones water-pipes may be used.

12. *On Lavatories.*

They should be found in hospitals, infirmaries, and dispensaries.

The basins should be of glazed earthenware; enamelled iron is less to be recommended, as the enamel comes off in the course of time. Basins drained through a small plughole have many objections. The water runs off slowly, the chain is liable to break, and the plug is sometimes found sticking to the hole.

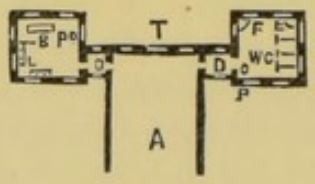
The best are tilt-up basins on Jennings' principle.[1] As the contents, after use, are thrown direct from the basin by tilting it, the drains are well flushed, and this is important from a sanitary point of view.

Hot and cold water should be laid on to the lavatories. It is more convenient to have a knob, by pressing which with the finger the water is allowed to rush into the basin, than to have a handle or cock which must be turned.

The slab should be of marble or slate, and there should be means of warming the place in winter time.

The woodcut shows the proper arrangement of water-closets, baths, and lavatories in a pavilion hospital. The rooms are separated from the ward by passages ventilated by opposite windows.

A. Ward, 28 feet wide.
B. Bath.
L. Lavatories.
D. Ventilated passages.



P. Hot-water pipes.
E. Urinal.
F. Sink.
T. Terrace.

Fig. 2.

13. *Ward Furniture.*

Of course the principal article of furniture is the bed on which the patient rests. I do not think that in a newly-constructed hospital the beds are likely to be placed otherwise than with the head against the wall, so that the patients have plenty of light; but it is important to bring before our minds the reasons why any other position would be objectionable. If the bed is placed along the wall,[2] it is generally very close to it, and this is a bad arrangement; the

[1] Leeds New Infirmary.

[2] Zürich Hospital.

bed should be removed about 12 inches from the wall; the latter might be damp, or there might be a draught from the window. If the beds are along the wall, it is more difficult for the nurses to superintend them, and for medical men to examine and sound the patients. The number of beds depends upon the size of the ward; twenty-six or twenty-eight is a good number for a large ward.

The best material for the bedsteads is iron, because it is more durable than wood, and less apt to harbour vermin; a light-blue or green paint, although more expensive than a darker tone, should be preferred, because it looks much more cheerful. The bedsteads may stand on castors in the medical wards, but not in the surgical. They must neither be too high nor too low; certainly not lower than in most London hospitals, else they would be very inconvenient to medical men and nurses. Dr. Uytterhoven mentions that he and his colleagues attended for whole days to the wounded during the July fights in Brussels (1830); that the beds were very low, and they had to stoop constantly, in consequence of which they were hardly able to keep upright when walking.

On the other hand, it is inconvenient to the patients if the beds are too high, because they find it difficult to get out. The usual length of a bed is six feet, or nearly so, and the width three.

Each bed is numbered, having a head-shelf (of tin) for this purpose, behind which a towel is suspended. The journal is placed over the patient's head. I do not think there is any great difference between sacking or iron bottoms; but the former are more generally used. There should also be a foot-board.[1] (It is usually found on the continent.)

The best mattress is a spring mattress, the springs being covered with horsehair at least two inches thick (*sommiers élastiques*);[2] but this is more expensive than any other arrangement: the springs can be protected from rusting by varnish. The surgical wards require other mattresses, with hard bottoms, water-beds, and various special contrivances. Horsehair is a better material for mattresses than wool, because it is more comfortable, keeps cleaner, and can be purified and disinfected by steam at a moderate cost.

Blankets are in general use. Feather beds are costly, unnecessary, and retain contagious matter.

Over the bed there should be a rope with a hand-grasp, near it a chair and side-table, with, if possible, a marble top, the requisite utensils of earthenware. Instead of curtains, which interfere with ventilation and supervision, low screens, not higher than four or five

[1] Bradford Infirmary; City of London Hospital for Diseases of the Chest.
[2] Lariboisière; Glasgow.

feet, should be used whenever they are needed; their colour should be dark-green.

In the middle of the room there should be a long table, with a marble top, for holding all the necessary things. A sideboard, and a few easy-chairs, complete the furniture.

14. *On Lighting of the Wards.*

Many authorities still object to lighting sick wards by gas, as it vitiates the air of the room; they add that wards need not be well lighted, and that oil lamps give sufficient light for the purpose. I would recommend gas, especially where it is provided by gas companies, as it is cleaner, cheaper, and gives less trouble to the servants. Oil lamps often smoke, their smoke being composed of carbon, carbonic acid, and carburetted hydrogen—very unhealthy gases. In this country an Act of Parliament exists which binds the companies to supply gas pure and free from sulphurous compounds. To prevent all danger to the sick we have but to ventilate the gas globes (Argand's gas lamps); this may be done by a pipe ascending from the top of the globe to the ceiling, and communicating with the foul-air shaft; the air entering the globe carries off all poisonous products with it, and flowing upwards is removed from the wards, producing a continuous draught.[1]

It is absurd to contend that, because the gas supply might be accidentally cut off, oil lamps are to be recommended.

Should such an untoward event happen, the wards could be lighted by candles.

15. *Day and Dining Rooms.*

They are useful, and should be of convenient size. There should be one for males and another for females. They serve as common dining-rooms for convalescents and light cases; and patients who conduct themselves properly may sit there and read, or otherwise pass away the time. A nurse should superintend them, and printed rules respecting the patients who use them be suspended on the walls. In this country complaints are rare about the convalescents, but in France they seem to be of a more lively disposition, and more inclined to all kinds of tricks, for which the meeting of a larger number of them offers a good opportunity.

[1] Herbert Hospital; Chorlton Union Infirmary; Rudolphstiftung.

16. *Baths*

are of two kinds—viz. movable and fixed baths. The first run on castors, and are brought into the wards from the lobbies, or wherever they are kept, to be used by patients who cannot leave their beds for the bath-room. They are made of zinc or copper; the latter is preferable, but more expensive. The baths are brought filled to the bedside, and afterwards emptied in the place where they were filled. The water should run off from an opening at the bottom, into the sink, which by this means is flushed.

Each ward should have a bath-room attached to it, where the bath is fixed in the flooring. The room should have means for warming and for letting out the steam. We find the bath made of zinc or enamelled iron; the former is less durable than the latter. Marble baths are very rare in hospitals (Zürich); glazed tiles are very convenient. Glazed, polished cement is expensive. There is nothing that answers better than enamelled earthenware.[1] I have been informed that some sensitive patients do not like it; but I think baths of this description should be more generally used. They are cheap, durable, always look clean and tidy, and the water keeps warm in them. Each bath should be encased in wood; all bath-rooms should have impervious floors and the lower part of the walls tiled.

Common bath-rooms are as yet rare in English hospitals, whereas general hospitals on the continent are seldom without them. The number of baths varies with that of the inmates; but one bath for every twenty-five inmates would not be too many. The partitions between the single baths should be of enamelled slate. To prevent draughts we should have double doors and lobbies, and double windows are convenient, because they freeze less in cold weather.

Medicated baths should be near the common ones. Douche (ascending and descending), shower baths, Russian or Turkish baths, with tiled floors and comfortable anterooms, should also be found, on improved principles, in a general hospital.[2] There should also be a hot plate to warm the linen.

17. *On Warming of Hospitals.*

The warming of hospital wards varies according to the habits of the country. We find the German stove in the hospitals of Russia

[1] Bradford; Leeds; Colney Hatch.

[2] I need scarcely mention the Japanese baths, which I recently found recommended in the *Medical Times* for small hospitals. The water is warmed by a metal box, open at the top, in which live coals are placed. But what becomes of the noxious gases is not explained.

and North Germany, the chimney in those of Britain and America, and various kinds of calorifères in France and Italy. Recently, many wards have been provided with hot-water pipes for warming, whilst into some others hot air is forced.

The German stove is made of clay and clay tiles; the latter are white, or of various colours, and the stoves may be made either an ornament to the room, or the reverse of it. As hospitals do not usually spend so much money on these stoves as is the case in private houses, we do not always find them models of beauty in the first-named establishments. If large, they interfere somewhat with the ventilation, the air becoming stagnant in the recesses where they stand, or in the space between them and the wall; and they take up cubic space which is lost to the patients. On the other hand, they seem indispensable in cold climates (north of the 54th degree), because by no other means are the wards heated so thoroughly, clay having the peculiarity of retaining heat a considerable time, and throwing it out gradually. The stoves form a large surface, from which the heat continually radiates. The fuel which the stoves require (wood or peat) is cheap in the countries where they are used, and is not required in large quantities, because it is consumed slowly. The smoke, before it passes on to the smoke-pipe, warms the clay of the stove, and, in order not to let it escape too rapidly, registers are used.

I here take occasion to oppose one way of building stoves, *i.e.* through the walls dividing the wards from the corridors (Berlin Charité). It seems economical to have one stove for two apartments, but neither the ward nor the corridor can benefit by the arrangement, because so much surface heat is lost where the wall intersects the stove. Iron stoves are less expensive than German stoves, and occupy less space; but they do not heat the ward so gradually, nor for so long a time. Where you want to heat quickly, but only for a short period, you may use them. They may get red-hot, and then the products of combustion may pass through the walls of them, especially carbonic oxide gas, which acts as a poison if only $1\frac{1}{2}$ vol. is breathed in a thousand of air. The heated cast-iron further acts on the organic dust which moves along with the air-current, and causes bad smells, by decomposing it; besides, the air of the room gets too dry. The air, in order to recover its right hygrometric proportions, detracts vapour from less hygroscopic bodies, and this is the reason why we do not feel at ease in dry heat. It has therefore been tried to counteract this evil by putting vessels filled with water on the stoves; part of the water gets transformed into vapour and fills the room, but when the air of the ward gets colder, the vapour

is again condensed to water. A better remedy is to heat the iron stove slowly. For this purpose the fuel is put in moderately, but frequently, but this is not convenient in hospitals, where labour is costly. Some of the iron stoves are furrowed, to offer a larger surface for the heat which radiates from them.

Clay and iron stoves have been combined, especially by putting a clay (chamotte) lining within an iron stove.

The remodelled fire-grates [1] contain brick grates in an iron stove. The grate is of fire-brick, and the bottom partly solid, to check the consumption of fuel. The air is supplied from behind the grate and thrown over the fire; the smoke finds its way into a chimney which has no register. Behind the grate is an air-chamber communicating with the outer air, and the air, after becoming hot, passes into the room by a shaft cut out of the wall, and through a louvre placed at such a height from the floor that the patients cannot interfere with it. Where the stove is not close to the wall, but in the middle of the room, it is somewhat differently arranged, and the flue is descending. The objection against the stoves is that they sometimes smoke, but I think this is very rare. They are certainly expensive; some I have seen cost £30,[2] but they save a great quantity of fuel, and they ventilate the rooms.

The French calorifères are on a similar principle; they are mostly iron stoves surrounded by a brick mantle, and the air in the intermediate space is heated, but generally from the basement. The air enters near the floor, and ascends through upper apertures to the ceiling, and in this way some ventilation is produced.

The objections to chimneys are well known; the waste of fuel is considerable, as the greater part of the heat goes up the chimney. It is stated that only one-eighth goes into the room. Furthermore, the heat is unequal—viz. very great near the fire, and very inconsiderable at a distance. You often find an inconvenient draught close to the floor, so that you do not like to place your feet on it. Sometimes the smoke is blown into the room by the wind blowing down the chimney.

In favour of chimneys, it may be asserted that the wards need not be very warm, as the patients lie in bed, that they make the rooms look cheerful, and that they are very good means of ventilation, and keep the air sweet.

We find hospital wards and corridors rarely heated by steam circulating in pipes, because this has been found dangerous. The pipes have been accidentally broken, and the buildings damaged

[1] Report on Barracks.

[2] Herbert Hospital; London Fever Hospital, New ward.

considerably. Although I do not know a case where fire happened in a hospital from overheated flues, yet I think there is more danger from fire by this than by any other means of heating. Another inconvenience is that the pipes get cold immediately the fire under the boiler is out.[1]

Heating by hot air means that air is admitted which has become hot by passing over hot plates, or through an apparatus at a distance from the room or ward. It is either admitted by extracting the foul air, or by forcing it in (Van Hecke). But the air is generally dry, and is for this reason unhealthy.

Hot-water pipes are a very common means of heating buildings. This plan has not been introduced into hospitals more than thirty years. We find two different systems, as described under "Lariboisière," the most simple one being where no steam is used.

Both systems answer very well, as they easily warm the wards to 65° Fahr. and the cost of fuel is small. The Paris administration reckon that if they had open fire-grates, and the expenses for coals, instead of their calorifères, it would cost them £400,000 more than at present for warming the hospitals. On the other hand, the construction of the systems is expensive; the stoves are no ornaments to the wards, and the pipes sometimes burst.

If they are heated moderately they never smell, but if excessively, the air gets dry and close-smelling. The latter must be partly owing to the dust on the pipes becoming decomposed; and this is the reason why they should be uncovered, however unsightly they look.

Whatever may be the means for warming the wards, the passages cannot be heated by a better system than by hot-water pipes, and they should be placed near the ceiling.

The reader will find more detailed accounts of the heating of hospitals in the second part. Double fireplaces are mentioned under Cambridge Hospital; heating by chimneys and hot-water pipes combined under Bradford General Hospital and Lincoln County Hospital; by fireplaces and hot air combined under Brompton Hospital; heating by low-pressure hot-water circulation under Lariboisière and Friedrichshain Hospital, Berlin; stoves with air-chambers are referred to under St. Thomas Hospital; steam pipes in general wards under Boston City Hospital, Moabit Hospital; steam pipes in corridors under Leeds and Edinburgh Infirmaries; the injection of air heated by passing over hot-water pipes or apparatus is mentioned under Altona Military Hospital, Bonn, Geneva, Copenhagen Hospital, etc.; thermo-hydric stoves under New Pauper Infirmary, Marylebone.

[1] *See* Moabit Hospital, Berlin, where the danger of explosion is stated to be prevented by copper pipes being interposed between the iron ones and valves.

18. *On Ventilation.*

The necessity of ventilating sick wards is now generally admitted, and yet the reasons why we should pay special attention to the subject cannot be too often repeated. Every one connected with hospitals, including nurses and attendants, should bear in mind that man poisons the air by his own exhalations. The unpleasantness we experience when we meet and remain with a number of other persons in a room is only owing in a slight degree to that dangerous vitiation of the air which led in some cases to most calamitous results. Need I say that I allude to the horrible tale, often quoted, of the Black Hole of Calcutta, and to the fearful mortality on board Coolie ships?

It is proved that in such cases air does not contain the necessary proportion of oxygen; that is to say, of the principle of breath and life, but carbonic acid in its stead, and that it is loaded with vapour. As the sick do not only exhale carbonic acid and vapour, but other noxious matters, there is every reason to consider the best means for preventing the vitiation of the air in the wards.

The importance of the subject renders it necessary to describe the various systems of ventilation, in order to arrive at a sound conclusion. Even those who do not approve of them should be well acquainted with their construction, if only to pay a tribute to the ingenuity of the human mind.

Lately much has been said on natural and artificial ventilation, and people are divided in opinion as to the value of each. But I believe that it should be the object of those, whose advice might be asked, to find a proper combination of the two systems suiting the special case.

I will mention first some of the most simple means or contrivances for ventilation. They all have for their object either to admit fresh or let out vitiated air; they are intended for inlets or outlets. Arnott's valves are for outlets good in principle, and not without effect in private rooms; but I have found them useless in hospitals, as they soon get rusty, and do not act.[1] Sherringham's ventilator is an inlet placed in the wall, and can be shut at will. Watson invented a square tube, divided down the centre; Mackinell recommended two tubes, one within the other. Both the latter inventions answer the double purpose of inlets and outlets. Muir's ventilating square tube (principally inlet) has a box with louvres (London Hospital) at the top, and is much used for public buildings, churches, offices, town-halls, etc. Tobins's tubes are a recent addition to these

[1] They were used at Ipswich Hospital, St. George's, London, and Sheffield.

contrivances. They may be seen at St. George's Hospital and at St. Mary's, London. In the latter they are said to work well, as they were constructed by the inventor. They may not always answer the purpose, especially when too narrow. They come up to a height of six feet in the ward and communicate with the outer air. They should have a diameter of five or six inches. They are made of zinc. Canvas bags may be fixed on the shaft to prevent dust and smoke-blacks to come in with the fresh air. These and other contrivances, also cowls, are exhibited at Parkes' Museum for Hygiene.

In some cases these inventions may be useful; but, on the other hand, they are unsafe, because, when intended for inlets, they become outlets, and *vice versâ*. It is impossible to take into account all the changes and currents of the atmosphere, and, besides, a ward is not a closed room, but has doors and windows, which are sometimes opened. If a door is opened you have a draught to it; and supposing you have an eduction channel, or outlet for vitiated air, you cause by that draught the vitiated air to return into the room. A large fire draws the air inwards in the same manner. It might be answered that valves can prevent any occurrence of the kind, but then I know from my visits to hospitals that valves do not answer the purpose in more than half the number of cases where they are used. They generally become rusty, and even though at first working well cease to act after a short time. Some of the valves are intended to be movable by the slightest air-current, weights being introduced for that purpose; but the result is not satisfactory. The ropes and weights are there, but if you pull them they do not act. In fact, I am much disposed to consider slanting openings, without any valves whatever, and communicating with the atmosphere without anything interposed, or air-bricks, far more harmless than any other contrivance.

The so-called artificial systems are based on two principles, and therefore belong to one or the other of the two before-mentioned divisions. The principle of those of the first class is the extraction or suction of impure air from the wards (*systèmes d'aspiration*). In those of the second class air is forced in by mechanical means.

Ad. 1. The system of ventilation-fires is the oldest. It is in use in mines, the Houses of Parliament, and some hospitals (St. Mary's formerly; Gonzaga's). The heat of the fire causes the air to become lighter, and ascend. The air beyond the direct action of the fire follows to take the place of that portion removed, this being due to the atmospheric pressure. In this way a continued draught is

instituted, and as the fire can be placed in such a position that no air but that from the ward moves in the required direction, the wards are emptied of the foul air. In the meantime pure air enters from the outside by openings made for the purpose. Two conditions are essential for the working of the system:—First, that the fire is kept up so that the air in the air-shaft remains at a high temperature; secondly, that as much fresh air enters as is extracted. If the quantity of air which we want to extract is large, the air in the air-shaft must be heated to a high degree to cause a sufficient draught; this can be done by a large fire, the expenses for supporting which are considerable; or the same result may be obtained by having a wide air-shaft, and wide canals of eduction, which are objectional on architectural grounds.

There has been a controversy about the place where we should have the fire, some recommending the basement, others the higher floors of the building. When it is in the basement the draught is stronger, because the whole height of the air-shaft operates in drawing the air out. The draught is equal to the difference between the heated air of the shaft and an equal column of normal air; the higher the heated-air column the stronger the draught. On the other hand, some of the power of it is lost by the distance of the fire from the wards. If the fire is on the upper floor, this distance is less. The shorter the air-shaft, the more quickly the air gets cool in it. Should the fire flag, the longer it is, the less liable is the air to change its temperature, and cold air blown down the shaft makes less difference.

The least objectionable arrangement would be, if it is required to ventilate by fires, to draw the air of the lower floors to one furnace, and that of the top floors to another.

Where the wards are heated by open fires, it is a good plan to lead the smoke into the air-shaft, by which the temperature in it is raised. It is necessary to have the air-shaft much higher than the highest part of the building, at least ten feet above that part, so that the foul air cannot easily be blown back into the wards. Weather-boards are placed in the air-shaft near its top, and rain-tubes to let off the water.

Another means to promote ventilation is by a hot-water reservoir placed near the roof of the hospital, and to which all the foul-air channels lead from the wards. (*See* Lariboisière.) The space round the reservoir or tank is enclosed by a mantle, and all the foul air passes through it. The hot water makes the air lighter and thinner in the same way as a fire does, and so the draught is caused. This system is more expensive than the first, but it serves for heating at

the same time. In the summer it is of so little use that the air channels are shut up. The difficulty is to keep the water of a high temperature, without which the draught is not strong enough; and it is certainly some time before the water is sufficiently heated.

Ad. 2. The mechanical ventilator is used to propel or force air into the wards. If set in motion by the hand or by the wind, it is of no effect whatever; it can only be properly moved by steam power.

The fans in use at present have two, four, or six plates, which are attached to a central axis, and they may be either straight or bent to an angle. The axis rotates with great speed, which can be accelerated or diminished, and the engineer should be thoroughly acquainted with the objects in view.

In winter time the air which is forced into the wards must be warmed, and so we generally find some means by which this is effected. In some instances the air is warmed at a distance from the wards, in others it is warmed in them. Recently it has been recommended to pass it through an apparatus just outside the wards (Vorwaermer); or it might pass through a stove in the ward. It has been found more difficult to ventilate satisfactorily with warm air than was at first expected. As the system Farcot-Laurens is expensive, Van Hecke's was introduced in two Paris hospitals (*see* Beaujon Hospital, Altona Military Hospital). I consider it unhealthy; the air is too dry, although it passes over a water surface, and smells close.

On Natural Ventilation in Hospitals.

The term "natural ventilation" is of recent origin, and implies that no artificial means as described above are used. We rely for this kind of ventilation on chimney-fires in winter time, and on doors and windows; but, in so far as their construction is—if not artificial—yet in some way scientific, and requires a certain ingenuity, the term natural is not quite logical. I use the term as it is generally understood. A means of natural ventilation which is rarely alluded to is that by the brick walls. The amount of air which enters a hospital ward through a brick wall, supposing it not to be impervious, is considerable. Pettenkofer has been able to blow out a burning candle through a brick wall; and there is no doubt that the change of the outer temperature in a room, the windows and doors of which are closed, is partly owing to the permeability of the building material. Lastly, air enters through the chinks of doors and windows, unless they are pasted over; and that

the quantity of air is considerable may be easily perceived by placing the hand or face against the chinks. It is not at all certain that the patients are benefited by making walls, doors, and windows impervious to air. But as regards the walls, we do so in order to keep them free from impregnation with organic matter.

As for doors, we either find movable glass-panes at the upper, or square apertures at the lower part,[1] or brattices or louvres in them, or the two latter in the wall above them. Large louvres, say five feet by three, over the entrance door, are valuable aids to ventilation when the air in the hall or staircase is sweet; and they might be kept more or less open continually, even during the night.

As regards the windows,[2] I mentioned already that the French croisées are inferior to sash-windows (p. 16). There is one sort of croisées where the "battants" can be kept fixed in any desired position by means of rods; but I found them very rarely used. Sometimes you find one pane of the window (generally an upper one) revolving or opening inwards, or the whole upper part, say one-sixth of the window, opening on an incline inwards, the lower part being croisées.[3] I need scarcely mention the circular ventilators which are placed in an upper window-pane (Windräder); they are not much used now.

The sash-window is suspended by weights in such a manner that it slides in a vertical direction, and keeps its place in whatever position you leave it. You can therefore cause an air-current, weak or strong, just as you please, by leaving it more or less open; whereas the common croisée window, when opened, lets the air rush in in a larger quantity than is desirable. The sash-window can be combined with a pane at the top or bottom, revolving inwards. Louvres can be placed in windows in the same way as in doors. To keep windows which open inwards in a desired position, ropes are used or levers and toothed wheels.

Windows can have three or four compartments, and these may represent the above-mentioned construction in different combinations. Sometimes all the compartments revolve inwards; sometimes the two upper ones. Windows can be of thick plate-glass, or double, and the latter have narrow or wide spaces between them. This space can be used to let the air enter and reduce the celerity of its current.[4] Windows may be coloured, made semi-transparent, perforated

[1] Zürich Hospital; Hanover Military Hospital.

[2] For windows in Lunatic Asylums, see under that head.

[3] In Winterthur in a new hospital you find double windows, the upper ones being sash the lower ones croisées. The sash-windows are fastened to each other and can be moved in a vertical direction, so that they may be lowered between the panes of the lower ones as far as it pleases you.

[4] St. Mary's Hospital.

(punched), or be composed of small brattices. The two latter kinds are more suitable for offices than hospitals. Perforated zinc plates, the whole width of the window and five or six inches high, are capital means for ventilation; they are generally placed at the top of the window, and where there is a sash they are in front of it, so that they let the air in when the window is partly lowered. The current of air is diminished, and yet a considerable quantity admitted.

It is, however, not always desirable that we should be obliged to lower the sash, because the air enters between the upper and lower compartments of the window as well as through the open space at the top. Therefore the zinc plates might be inside the window-frame, and yet separate from the upper sash, and they might be double, one sliding over the apertures of the other.

To prevent patients shutting a window, I suggest a simple contrivance. Let a piece of wood, about three inches long, be fastened by a hinge to the frame, so that it drops when the sash is lowered; the nurse having a long rod with a hook at the end to raise it when she shuts the window. The frame to have a groove, serving as a receptacle for this piece of wood.

If it is desired to let air enter between two sashes, and nowhere else, we raise the lower one and place a board on the lower border to close the open space. It is easy to make the windows of the water-closets self-acting, so that they open when you leave and shut when you enter.

Open chimney fires are considered useful as a means of natural ventilation on account of the strong current of air caused by the fire. A large fire causes heated air to ascend to the ceiling; it gradually spreads to the opposite side of the room, or nearly so, then descends and returns near the floor in the direction of the chimney. This has been demonstrated by experiments, numerous scraps of paper being suspended in the air from the ceiling of a room, to show the direction of the current. Where more than one chimney is required, they must be at some distance from each other, so that they do not draw one upon the other, and the fires must be about equal in size and power. If the chimneys are surrounded with air-chambers they are even more useful, especially in cold weather.

The remodelled fire-grates are quite as efficient for ventilation as chimneys, if not more so.

Testing the System of Ventilation.

Besides the senses, which supply a test always ready, there are some other means for ascertaining the sufficiency of ventilation.

To test the quantity of air admitted into or extracted from a ward we have the anemometer, a little instrument which has four sails or wings. These wings are easily moved by the draught, and from the number of turns in a minute we ascertain the quantity of air that has passed the anemometer.

To test the quality we have to analyse the air to see how much carbonic acid and water it contains. For the first purpose Pettenkofer's test is the best.[1] The air is shaken with lime-water of known strength (generally 1·1 to 1·3 grm. of lime to a litre), and the quantity of lime remaining in solution is found by testing with acid. Pettenkofer recommends a solution which contains at 64 degrees Fahrenheit 2·250 grm. of crystallised oxalic acid in a litre: 1 cc. saturates 0·001 grm. of lime. The point of neutralisation you find by turmeric paper, on which you let fall a drop of the fluid; the peripheric portion of the drop turns to a brownish colour, if only a small portion of the lime is left in solution. For if only a drop of lime-water is mixed with 12·15 cc. water, the fluid, treated in the stated manner, shows basic reaction, although by immersing the turmeric paper it cannot be seen.

To make the experiment, take a glass bottle with well-fitting stopper, and containing about 6 litres of the air of the locality in question. Add 45 cc. of lime-water, and shake the bottle repeatedly in the course of half an hour, so that the carbonic acid becomes absorbed. The turbid lime-water is poured into a small glass to settle. Then take 30 cc. of the clear fluid to test with oxalic acid. From the quantity of the acid multiplied with 1·5 (as you took of the original 45 cc. only 30), you find the free lime, which has not combined with the carbonic acid, and by the difference the lime bound to the carbonic acid; by this the weight of the carbonic acid; and then easily the volumes, as 1000 cc. at 32 deg. Fahr. and 760 mm. B.P. are equal to 1·9677 grm. If the air contains ten times as much carbonic acid as is found in atmospheric air, we have to take 12·15 cc. or more of lime-water to a litre.

We test the hygroscopic quality of the air by the hygrometer; that of Saussure is generally used. It consists in a hair drawn through a frame. The hair is acted upon by the moisture, and moves a hand on a dial as it becomes longer or shorter.

For an exact investigation we must know for each degree of the hygrometer what would be the weight of the water contained in a space equal to that of a centimetre of air at 66 deg. Fahr.

Another way to find out the quantity of water is by letting the air which we examine pass through pumice-stone, which absorbs the water, and weigh it before the experiment and after.

[1] Fehling, in Liebig's *Handwörterbuch*.

Lastly, we may test the hygrometric condition of the air by dry and wet bulbs.

Organic matters suspended in the air of hospital wards may be determined by a solution of permanganate of potash. The test is valuable, although it indicates only the oxidisable part of the organic matter.

On Cubic Space of Sick Wards, and the amount of Fresh Air desirable to be supplied by Ventilation to each Inmate.

Before we decide on any plan of ventilation, we should know the amount of cubic space it is intended to allow the patients. We find the space small in overcrowded wards, and the best ventilation would not prevent some of the evil consequences thereof. The lowest possible estimate of space in which a healthy man could live for twenty-four hours, with no other means of ventilation than the accessory ones—viz. the chinks of the doors and windows, is 30 cub. met. (about 1050 feet). If it is less, the air becomes unfit for respiration. As regards sick people no experiments have been made, but there is no doubt that they require more space than healthy ones.

In existing hospitals, the cubic space varies from 600 to 2500 feet; but no recent establishment of any pretence affords less than 1200, which amount, in the opinion of many surgeons and hospital physicians, is sufficient under ordinary circumstances.

Fever patients, clinical cases, women in childbirth, and persons who have been operated upon, are considered to require a larger amount of cubic space than others; and for syphilitic or eye patients, for aged people, or children, a less space is sufficient.

Those establishments which allow ample cubic space afford, undoubtedly, better conditions for recovery than others; but there must be certain limits to the space allotted to a single patient, on account of the expenses accruing to the hospital.

The surface area a patient should have can be more easily determined than the cubic space. As the large wards of a hospital are generally 28 or 30 feet wide, and as a bed must have a clear space of at least 3 feet on both sides, or 6 feet across, it follows that the surface space must be 6×14 ($= 84$) square feet as a minimum.

As regards the amount of air to be supplied by a good ventilation, medical men are often requested by architects to express their opinion on the subject, but there is much uncertainty about the point, notwithstanding the most careful investigations.

We may first try to solve the question by scientific deductions.

In the first instance, we must know the composition of pure air. It is after Schödler :—

20·815 oxygen.
79·185 nitrogen.
0·0006 carbonic acid.

Poumet does not consider air impure which contains from ·0002 to ·0003 of carbonic acid. As for hygrometric properties, the air ought to contain, after D'Arcet, one-half vapour at 66 deg. of temperature, this being 7 grm. of water in a cub. met. Some philosophers have stated it to be 6·43 grm. The ammonia, sulphuretted hydrogen, and other substances present in small quantities in the air we leave out of the question.

We cannot call the air pure when it has lost its normal proportions of carbonic acid and watery vapour. It is now our object to find out, from the increase of carbonic acid in a room where a number of people are collected, how much air is to be provided by ventilation to make up for this vitiation, and restore the air to its normal condition.

Deduction from the Proportion of Carbonic Acid.

Carbonic acid is exhaled from the lungs and the skin of a living being. A man in good health is said by Pappenheim to exhale as the greatest quantum in an hour 50 grm., equal to about 25 litres (5½ gallons), at 32 deg. Fahr., and 760 mm. atmospheric pressure; Andral, Gavarret, Valentin, Brunner, state about 21 litres; Scharling, 18·5.

Supposing now 20 litres to be right, we have 480 litres of carbonic acid in 24 hours at 32 deg.; when the person is in a temperature of 66 deg. they expand to 510 litres.

But not all the oxygen of the air is used by the process of respiration; only a part of it disappears, and is replaced by nearly the same quantity of carbonic acid; the exhaled air contains 4 per cent of carbonic acid, or, after Vierordt, 4·33 (*Physiologie des Athmens*). So that 510 litres of carbonic acid exhaled by an adult must be diffused through a quantum of 12·750 litres of air which only contain 4 per cent of carbonic acid. This would be the quantum supposing we did not re-inhale the exhaled air.

As this is unavoidable, we have to add a new quantity of air in order to restore the normal proportion—that is to say, of ·0002 or ·0003 of carbonic acid.

If the new air were free from carbonic acid, we should have the right proportion by increasing 12·750 litres to 255·000; but as the new air contains from 4 to 5 ten-thousandths, the 255·000 contain 25 ten-thousandths, which, however, is satisfactory.

To satisfy the wants of respiration, we have to supply to an adult 255 c. m. of air in 24 hours, or 10 c. m. 625 litres per hour.

Deduction from the Proportion of Watery Vapour.

Many philosophers have made researches on the quantity of water lost by the body during a certain time, say an hour.

Barral compared the water contained in solid and liquid food consumed with the solid and fluid secretions, and found by the difference the loss through lungs and skin. A man, twenty-nine years of age, consumed, in eating and drinking, 1998 grm. of water, and exhaled 1177 grm. by alvine excretion and urine; therefore 821 grm. were lost by exhalation from lungs and skin. In January the same consumed 1842 grm., and gave off in the same way as above 1032; difference, 870 grm.

The medium was 875 grm., to which, after Barral, the water has to be added, which is formed by the hydrogen of the solid food combining with the oxygen of the stomach or air. This, however, we cannot take into consideration.

Sanctorius, Dodart, Rye, F. Home, Robertson, Lining, W. Stark, and others, tried to find out the loss of water by direct experiments.

I have to refer to the experiments of Séguin, continued during eleven months,[1] which he made on himself and others. He placed himself in a bag for three or four hours in such a way that only his mouth was left uncovered; he was weighed before and after the experiment, and at different times, and so found the loss from the skin; the exhalation from the lungs was considered to be half that of the skin; and the whole found to be about 1000 gr. per hour. Dumas did not differ much from him.

Valentin[2] considers the loss from the lungs and from the skin to be in another relation, viz. 5 to 9, and both altogether higher than Séguin (1400). Donders[3] says that the total amount exhaled from the lungs and skin during 24 hours may be estimated at 1 kilog. of water, and of this $\frac{7}{10}$ are exhaled from the skin, and $\frac{3}{10}$ from the lungs.

Considering that the temperature of the examined persons and the humidity of the atmosphere may have varied to a great extent

[1] *Mémoire de l'Académie*, 1790; et *Ann. de Chimie*, t. 90.

[2] *Allg. Physiologie.*

[3] *Spec. Physiol.*, 1856, p. 433.

in the different experiments, the results obtained are not so very discordant.

We may with some reason assume the hygrometric loss of an adult as 1000 grs.

Now with Péclet we assume that one c. m. of air, which is half saturated with water, contains at a temperature of 32 degs. 7 grs. of water, therefore about 140 c. m. would be necessary to absorb 1000 gr.; hence we have to provide 6 c. m. of air per bed per hour.

We therefore have deduced the necessity of supplying 11 c. m. to neutralise the vitiation of air by carbonic acid, and 6 c. m. to neutralise the vitiation caused by exhalation of watery vapour. But as the newly supplied air is only half saturated with water, it might absorb some humidity exhaled by the patients without becoming unhealthy.

It is, however, not to be overlooked that our premises may be wrong. We have considered an air healthy with 2 or 3 thousandths of carbonic acid. Others only concede 1 thousandth (Pettenkofer, Guérin), and many disagree with Péclet, stating the humidity to be less than 7 grs.

But a system of ventilation supplying 17 or 20 c. m. per hour, if satisfactory for healthy people, would not be so for the sick, because they[1] vitiate the air by many other exhalations. Although we do not know much about the nature of miasmata, we are entitled to believe that they can be removed by air currents.

Taking into consideration all the impurities caused from spittoons, bedding, poultices, infusions, bathing, etc., Poumet thinks the sick require about double the quantity of air that would be considered necessary for healthy people; this would be 30 or 40 c. m. per bed per hour. But 40 c. m. will be insufficient when patients suffer from gangrene or typhoid fever, especially when the temperature is high. A much larger supply is then desirable, the amount of which I scarcely can state in figures.

The uncertainty on the point is considerable. It has been found in Lariboisière that 60 cubic metres (2100 feet) per patient per hour were generally necessary to keep the air sweet (on the male side), and Pettenkofer is not disposed to consider this quantity excessive.

Remarks on the Different Systems of Ventilation.

No artificial system can replace natural ventilation. The quantity of pure air which we admit through open doors and windows far exceeds any quantity obtainable by artificial means. This has been

[1] *See* Stromeyer, *Ventilation bei Typhuskranken.*

found by anemometric experiments from the celerity with which the air moves through windows. But care should be taken in sick wards that the openings are not so numerous as to expose the patients to draughts,[1] or to reduce the atmosphere of the wards to a low temperature. Nurses should be properly enlightened on this point.

There are circumstances under which artificial ventilation cannot be dispensed with. In rainy or very cold weather windows and doors are kept shut, especially those of clinical wards, in consumption hospitals, etc. The openings for the admission of fresh air are not sufficient, and in winter-time it is desirable to admit warm air, and cool air in summer-time.

It becomes, therefore, our business to combine judiciously natural and artificial ventilation. In hospitals built on the pavilion plan it is possible to make different arrangements for clinical and other wards. If we have only to supply fresh air without causing draughts to 50 or 60 patients confined in two wards on one side of the building, this is much less difficult than to plan a uniform system for 200 or 300. I suppose the ward I have to ventilate contains 28 patients, and that it is provided with two patent stoves in the centre, and six openings on each side which contain perforated zinc plates, half the number of which may be kept open in cold weather; in addition there is a trap-door in the ceiling, which is opened for short periods. I should then wish to have also the means of forcing in fresh air—cool in summer, warmed in winter—by passing through the water stoves outside the ward and the stoves in the centre. There is no other means for doing this than a fan, and the air from the garden might be used, although purer could be obtained at a greater distance. It is possible to force in at least 2000 cubic feet of air per bed per hour, that is, 120,000 cubic feet in two hours. The time when fresh air is most wanted is in the early morning and late at night, therefore during this time the fan ought to operate. As explained in another place, there is no danger from compression of the air of the ward, and there can be none from the dryness of it. Besides some of the zinc plates admit fresh air which the air forced in does not prevent.

I venture to embody my views on ventilation in these few sentences.

1. Ventilation by doors and windows cannot at any time be dispensed with in hospitals.

2. Hospitals may rely on ventilation by windows and doors in summer-time, but if an artificial system is to be instituted, none but that by forcing in the air is efficient in summer.

[1] *See* Chorlton and Leicester Infirmaries.

3. In winter-time some of the artificial systems may operate with advantage, and cannot be dispensed with in clinical wards or consumption or fever hospitals during the cold season.

4. No channels for withdrawing air should be formed, unless a continuous draught is caused in them by heat. A ventilating fire is a more powerful agent for this than a hot cistern, and for the lower floors it is better to have the fire in the basement. If there is a second or third floor the fire should be as near them as possible and not in the basement.

5. Where hot-water pipes or stoves are used for warming, the outer air may pass over or through them into the wards by channels communicating with the atmosphere; where there are only chimneys, they may be surrounded by an air-chamber to the same purpose. Such an arrangement is indispensable with the new improved fire-grates.

6. Open chimney fires are capital aids to ventilation, and can be combined with every other system.

7. The construction of the windows is most important, and should be considered well whenever a new hospital is erected. It is not necessary that they should be on a uniform plan. No large entrance door should be without a large louvre above.

8. Water-closets may be sufficiently ventilated by self-acting windows; if outlet channels are instituted, they should lead into the smoke shaft.

9. I suggest that two zinc plates or tablets be placed in the upper part of or above some of the windows, in order to break the air-current, the inner plate sliding over the other, so that the apertures may be closed. The nurse to keep a rod for this purpose.

19. *Wash-house—Laundry.*

In most hospitals the washing is "done at home"—viz. in a house connected with the building. In London, however, many hospitals are without a laundry—viz. London, King's College, Bartholomew's, Westminster, and the Consumption hospitals: on the other hand, very large laundries are found in connection with workhouses—for instance, the City of London. The proceedings in this country and on the continent are somewhat different, a description of some apparatuses will be found in the descriptive part. In France, Germany, Belgium, and on the continent in general, the dirty linen is first put in cold water, and rinsed when taken out, by which the matters soluble in water come out of it; it is next put into steam boilers (*see* Berlin Charité), which contain a certain

amount of hot ley (to 100 parts of water about four parts of soda), or, hot ley is filtered through the linen by machinery (*see* hospital "Lariboisière"). After this comes the washing in soap and water, generally by hand, and the proceeding is finished by rinsing (often by machinery or hydraulic press) and drying. In England they *begin* with the washing in soap and water;[1] then they rinse the linen, put it in the steam boiler with soda for a considerably longer time than they do in Germany, and afterwards rinse and dry.

As far as I can judge, the continental process is preferable, because the linen gets whiter, and the cost is less. In this country in general the price for washing is about 25 per cent higher than in France. That the continental proceeding may be suitable for the continent only, and the English for England alone, on account of the difference in the hardness of the water in each country, as Miss Nightingale suggests, I beg to doubt. First, the difference is not so great as has been stated; secondly, it can be removed by artificial softening processes.[2] But the principal reason is that the continental process is more in harmony with scientific rules. The most important part of the proceeding is the washing by hand, for which the linen is gradually prepared: what can be done by water alone is done first; what steam and hot ley can do follows; and then there is little left for the most expensive part of the business, that of the hands. To dispense altogether with hand-work has not been found advisable.

I hardly think that even in very small hospitals washing should be done without steam: where this cannot be had, it is better put out. The advantages of using steam, compared with the mode of washing in households, consists in saving coals or wood, soap, hands, because the hand-work is reduced to a third; and time, because the whole is done three or four times quicker. Lastly, stronger solutions of potash are unnecessary, and soda ley is less injurious to linen. Some compounds, for instance, of turpentine, soap, and muriate of ammonia, are recommended for use, instead of ley; and they are very useful, but unnecessary where steam can be had. A little ammonia is all that is wanted.

The drying is done in the open air, or, on horses moving on rails, by hot air. (*See* improvements under Charité Hospital.) The air

[1] *See* Guy's Hospital, Bradford Infirmary, London Fever Hospital.

[2] The value of soft water can be hardly over-estimated. Organic impurities can be more easily got rid of by filtering. To make the water soft we have to eliminate the lime it contains; this is difficult. The less lime the water contains the less soap gets lost, the fat of the soap combining with the lime.

German housewives carefully collect the rain-water in tubs, which receive all the water from the roofs through rain-gauges.

can be heated by hot-water or steam pipes, or German stoves, in the basement beneath the drying-room. The said horses or frames (*tiroirs*) are about four feet high, and have several ledges, generally five; they are frequently made of galvanised iron. The architect must take care that the vapour is properly educted.

The neat packing of the clean linen in separate airy rooms, and in well-aired and numbered frameworks, as accomplished by the sisters in French hospitals, I am not the first to approve of, and recommend for imitation.

The things used by patients with contagious diseases have to be washed and boiled separately, in separate tubs, and at a higher temperature than the others, additional care being taken that the officials avoid infection.

20. *Disinfection.*

Whatever linen or wearing apparel is suspected of being infected with contagious matters must be disinfected. Anything worn by patients with cutaneous diseases—as itch, smallpox, or cholera, typhus, etc., belongs to this class. There are two principal means of disinfection—viz. a very high temperature and sulphurous vapours. The former is more expensive than the latter, which requires a very simple proceeding. I saw the former process in use when I visited some London prisons, and in different German hospitals; the second is used much in Paris. A temperature of 212 degrees Fahr. obtained by steam vapour destroys every kind of organic or inorganic contagion. When dry heat (hot air) is used, the temperature must be a little (20 per cent) higher to destroy bacteria. (*See* University College Hospital; Moabit Hospital, Berlin; London Fever Hospital.)

21. *Kitchen.*

The kitchen is an important, but much neglected, part of a general hospital. The arrangement of a large hotel kitchen does not form a bad model for imitation. Although patients do not require refined fare, but merely wholesome food, yet few of the improved means for cooking or varying the diet should be absent. Those patients who suffer from indigestion want light, digestible, and specially-prepared dishes.

Cooking by steam is a most economical proceeding, and steamers should always be used for vegetables and soup-meat.

Roasting requires to be done before the fire. Gas-stoves are expensive, and cannot be much recommended. Stoves for cooking made dishes on charcoal fires are required for the officials. The

continental system is to have ranges of brick with holes, covered with concentric rings of iron (*Kochloch*). Brick holds the heat better than iron. To have a large range in the centre of the kitchen is much better than to have fires at the side; there is more space for cooking, and the steam is less troublesome. Descending flues seem to answer exceedingly well. Chops and steaks especially should be cooked on grates with a downward draught; this prevents their becoming smoky or blackened (*see* Brompton Hospital). Where a kitchen chimney is found, it should be properly constructed; I am informed that the best plan is to have the shaft surrounded by a mantle, there being a capital draught in the intermediate space, always supposing that fresh air enters plentifully from the other side.

As regards the steamers, they may be ranged round the wall, or close to it. I always found the covers suspended by ropes, with balance weights (invisible).

The scullery should be close to the kitchen, and well lighted. Both must be of a convenient height and size.

22. *The Dispensary.*

It should be situated in the administrative block, not too close to the wards: especially that part which contains the laboratory. Offensive smells must not find their way into the wards, and the noise caused by the use of the mortar must not disturb the patients.

The dispensing room should not be in a dark place, but have large windows through which plenty of light falls into it; nor should it be damp. Cleanliness and quick dispensing are promoted by ample light, and a plentiful supply of hot and cold water. Rain-water and condensed steam are of much use in the dispensary (*see* Brompton Hospital), and steam or gas is useful for decoctions. A somewhat novel but simple contrivance for obtaining water in small quantities, and without using a tap, is this:—A tube is suspended from a stone jar placed at some height from the floor, and a burette at the farther end. The dispensing table should be in the centre, and covered with metal (as in public-houses), the floor of tiles, the lavatory with tilt-basin, as explained in another place (p. 20); and the sink should be large and deep in a corner. Poisonous drugs stand, of course, in a separate place, and are in bottles or jars of a peculiar shape. The cod-liver oil should be in an enamelled slate tank, where a great quantity is used, or in stone barrels with brass cocks, where a smaller supply is required. The dispensing windows should project a little into the waiting lobby; have sliding shutters (better downwards than upwards) of about two feet square, and a

rail in front; so that only one person can stand before the window. The drug stores may be partly kept in a cellar, to which access is obtained by a ladder, partly in an adjoining room.

23. *Libraries.*

We find two kinds of libraries in the hospitals, one for the medical officers and pupils, the others for the patients.

Wherever schools of medicine are in connexion with the institutions libraries are also found, at least in this country. They are usually within an easy distance of the museum, and much frequented by the students, therefore undoubtedly useful.

Libraries for the patients are rare on the continent as well as here. They are a great boon to them, and might be easily instituted where they do not exist. As one of the medical officers superintends the medical collection of books, so one of the officials should take charge of the common library. In English institutions the chaplain is the proper person for this office. There is not much trouble connected with it, as the patients interchange the books between themselves. But once a week all the books might be returned. A separate fund could be easily raised for the purpose, and the current expenses are insignificant.

24. *Ice-pit.*

The want of ice is most felt during very hot weather, and when it can only be kept underground. The pit should be formed in a spot as dry and shady as possible. The air must be secluded from it; and in order to prevent it entering when the entrance door is opened, it should be constructed with double doors and a lobby between; the inner door not to be opened until the outer one is closed.

The shape of the pit should be conical, the smaller part of the cone at the bottom; the top may have a diameter of 15 feet, and the depth should be 18 or 20. A smaller pit covered by a grate should be made beneath, to drain the water formed by the melting of the ice.

The walls of the pit should be covered with wood or bricks, and where the earth is very hard, with straw. The roof should be composed of wood, tiles, or straw, or a combination of these substances, the lower margin buried in the earth, or if there is a low wall it should be surrounded by an outer earth wall.

Double walls with clay between them are needed when the ground is damp, and sometimes drains. The entrance should always be from the north.

25. *Dead-house.*

It should be removed from the view of patients and visitors, and have a separate exit, that cannot be seen from the hospital, so that funerals are not noticed. The *post-mortem* rooms must be spacious, especially where a large school is attached to the institution. The rooms and amphitheatre properly arranged as regards light, drains, lavatory, etc.; and a private room should be found for the professor.

I would suggest the use of tables covered with galvanised iron.

26. *Tramways.*

These are found in some hospitals in the *souterrain* (*Rudolph-stiftung, Kiel*). They serve to convey food or other things placed on small carriages. They are also used for carrying hot-water dishes, cloth, medicine, or the patients themselves.

I may mention in this place the tramways on the tables of the microscopical rooms of one hospital (Berlin). The microscopes are moved on wheels without being disturbed.

27. *Storage.*

Provisions, beer, wine, heating materials, furniture, especially bed furniture, utensils, dress things, and linen, want storing in various ways in a hospital. In the second part of this work details relating to this matter are given under Hamburg Hospital. The French storing of linen may serve as a model.

28. *On improving existing Hospitals.*

It is possible in a hospital which contains too great a number of small or double wards to throw several into one by removing partition walls (*see* Manchester Infirmary); it is also possible in corridor hospitals, where windows are on one side only, to improve ventilation by judiciously placing apertures opposite the windows. (*See* Manchester Royal Infirmary.)

Where the number of baths is insufficient, it can be increased. Bath-rooms which contain no means for warming may have a small Gurney's stove placed in them, the window if not double can be made double; should the room have no window, a slanting aperture can be managed near the ceiling (as an outlet for the steam).

Common bath-rooms can easily be attached to a hospital in a separate shed; they must contain vapour-bath and douche, and be

placed near the engine-house. Enamelled earthenware baths should be preferred.

Lavatories where they are not found can be instituted, and those with tilt-up basins should be preferred (*see* Lavatories). A defective sink can be replaced by an improved one.

Water-closets when badly placed should be removed, and new ones built out of the main building at a convenient place. It is sometimes possible to institute the means for warming them described at another place.

Perforated zinc plates can be placed in front of upper sash win-windows.

Low kitchens can be improved by carrying the ceiling higher or the floor lower, but where both cannot be done and a new kitchen cannot be built, it is still possible to obviate the principal nuisance of steam and smoke by placing a range with descending flues in the centre, the fireplace to be blocked.

A dark dispensary should be transferred to a well-lighted room. Gas burners ought to be connected with ventilating tubes, as in the Herbert Hospital and new Leeds Infirmary.

Hospital patients should wear a dress provided by the hospital. A woollen stuff is the best material.

Patients' libraries can be instituted, and should be under the care of the clergyman.

I should think that it will be in many instances possible to institute foul-linen shoots where they do not exist, as lifts have been frequently added where they were not found before.

The out-patients' department might be improved in some hospitals. As regards the waiting-rooms, males and females should not sit together; a simple iron rail might divide the room into two compartments. There should be separate doors for ingress and egress of patients.

Day and dining rooms might be added where they do not exist.

Hospital carriages should be provided—especially for fever cases.

29. *List of some of the Useful Implements, Improved Utensils and Machines which might be provided for the Hospital.*

Hall, Garden.

Hexagonal hall lantern, with stained glass; cast-iron bronzed umbrella stand; patent chair (*à balance*) to carry patients up the stairs; speaking tubes, or telegraph; garden engines (Burton's, 39 Oxford Street).

Wards.

Bed-pans and urinals of earthenware (Coxeter); water-beds; machines for a reclining (half-sitting) position; bed-warmers, bed-trays; locker-tables; atomiser for disinfecting fluid (Condy's). The cheapest are two brass, or, better, glass tubes, placed in a rectangle; if one is placed in the mouth and blown into, the other communicating with the fluid, a fine spray is caused. The tubes can be separate or movable on each other. Barometer, thermometer, anemometer (Casella), manometer.

Wire flower-stands for convalescent room.

Baths.

Enamelled earthenware (Rufford, Stourbridge pottery); suspending shower-bath, oval nursery basin, on three-legged table, with castors and loose frame; vaginal douche; galvanised cast-iron box fixed close to the ceiling, with india-rubber tube, having an ivory end-piece.

Kitchen.

Bainmarie, with copper pans; travellers, with hot-water dish, fixed hot plate; hot-water dishes for meat, with cavity for the gravy; wooden meat-screen, lined with tin; wrought-iron dripping-pan and stand; tin boxes for the lifts; white enamelled plate-slabs for meat stores; ditto tanks for milk; fly-proof meat safes; knife-cleaner.

Laundry.

For large hospitals, Bouillon's apparatus for "arrosage" (*see* Lariboisière); for small ones, Bradford's patent machines (mangling is better done by a separate machine); travellers for wet cloths.

Carriages, Stables.

Large hospitals should have a carriage and horses for the director or treasurer, patients' carriage, and fever carriage. The latter conveyances should be long enough to place the patient in a horizontal position on an air-tight mattress, which is slipped in and out on a frame. The carriage should be well ventilated by opposite lattices and small louvres in the central portion.

II.—ON THE ADMINISTRATION OF HOSPITALS AND CHARITABLE INSTITUTIONS.

1. *On Centralisation and Self-Government.*

HOWEVER convinced one may be that a system of centralisation as it exists in Paris [1] for the relief of the sick poor has great advantages, it does not necessarily follow that this system should be introduced everywhere. It is, however, desirable that people in this country should not object to become thoroughly acquainted with the usages of other countries, in order to appropriate as much of that which is useful as they possibly can. Many English ways of managing certain matters might be introduced with advantage on the continent, and a certain competition to be the most perfect in these affairs can only have beneficial results.

I have not to deal here with pauperism; but I consider a good system of medical relief for the sick poor an important agent to prevent the spread of pauperism. That much in this direction has to be done in this metropolis no one denies at the present time, when the existing system of medical relief is undergoing a complete change.[2] What may be done under existing circumstances, the following observations, I hope, will explain in some degree to the reader.

I begin with the hospitals. In Paris they are all Government institutions, whereas in London they are private and (three hospitals and the asylums excepted) not supported by Government, but by voluntary contributions. They may be well constructed and managed in both places; but there is one great difference resulting from the English mode which cannot be passed over in silence. The subscribers to private institutions expect certain rights and equivalents, especially that of recommending patients for admittance. Now this excludes general admission as a rule, however frequent the exceptions may be. Therefore the persons for whom we erect the hospitals—viz. the sick poor, are deprived of their legitimate rights. Those who most require admission are not the class known to governors.

[1] L'Administration Générale de l'Assistance Publique is a board appointed by Government. At the head is a director. All the hospitals, hospices, lunatic asylums, institutions for medical and other relief, convalescent institutions, etc., are under this board. A bureau central is in the centre of Paris. Patients who wish to be admitted into a hospital apply for a ticket, and are sent to an institution where there are vacant beds. Only a few hospitals at a distance from this office are allowed to dispense with this formality. But every applicant is admitted.

[2] *See* Fever and Smallpox Hospitals in London.

To be afflicted with sickness should be the only valid and sufficient reason on which a poor person is entitled to admission. If the patients are admitted by letter, those often become inmates of the hospital who are much better out of it, and those are not admitted who live in wretched lodgings. In the country, you often find the hospitals filled with trivial cases, especially in the first half of the year, when the governors are well provided with letters; the poor, who suffer from the most acute and serious diseases, are treated at their homes, where the conditions for recovery may be marred by want of the necessary cubic space, nursing, and proper food. Even in London delay and difficulties arise when a sick and poor person wants to be admitted, as letters are only given out on one day in the week. It might be said, that for those who cannot be received into the general hospitals the workhouse infirmaries are open. The latter, however, are not yet so perfect in their arrangements as hospitals, and as they serve principally to receive those who fall ill among the persons living in the workhouse, they are also small, containing generally about 100 or 200 beds.

The hospitals in German cities are either Government, municipal, or free institutions. The municipality often avail themselves of institutions with the management of which they have nothing to do; this is simply done by farming beds, and generally less than 2s. 6d. per day per head is paid. Although this is also done in London (for instance, the Jewish board of guardians farm wards in the London Hospital, and the Unions farm beds in the Smallpox Hospital), yet it is very rare.[1] In Scotland and Ireland it occurs more frequently, and may be suggested to boards of guardians as a good means to prevent overcrowding of workhouse infirmaries.

All this, however, is superfluous under a system of centralisation (as in Paris), where means are soon found to satisfy the wants of the sick and needy; for instance, should an epidemic like cholera break out, buildings are quickly transformed into temporary hospitals.[2]

It further must strike every one, that centralisation works more cheaply than self-government; only to mention a few points:—A great deal of money is wasted in advertising and public dinners, without which the institutions cannot get subscribers. But this might be said to be somewhat counterbalanced by the gratuitous services of managers and medical officers.

It is better for special hospitals to be free institutions, with the exception of lock hospitals. The latter are almost as necessary in

[1] On pay-wards and pay-hospitals, known on the continent under the name of "*maisons de santé*," see in second part under London.

[2] *See* also St. Petersburg temporary dispensaries.

certain localities (seafaring towns) as military ones for soldiers. Female lock hospitals should be founded and supported by Government. A great deal of misery to mankind might be prevented by such institutions being founded by the State in places where they do not as yet exist.

As regards dispensaries, those which are free institutions are of a different character from those that are under Government control; the committees of the first should strive to keep them in a state of the greatest possible perfection. There should be a staff of able medical officers, and the visiting of the sick poor should receive especial attention. Quick and trustworthy dispensers should be engaged, etc. Some of these dispensaries are very useful, by attending midwifery cases.

It may be said of both hospitals and dispensaries, managed and supported as they generally are in this metropolis, that besides the blessings they confer on the sick poor, they promote good feeling and harmony between different classes of society.

2. *Who should be at the head of a Hospital?*

The existing institutions are governed and administered in different ways. The supreme authority may rest with one director or two, or with a number of gentlemen who form a committee. Now if there is one man at the head, it seems very natural that he should be a medical man. We may reasonably suppose that he knows better how to satisfy the wants of patients than one who has not been in constant intercourse with them. Other medical men are more likely to submit to his authority than to that of one standing outside the profession. Knowing from his own experience as a resident medical officer or *interne* the minor details of management, he would be the right person to watch and superintend the subordinate officers. On the other hand it is contended that medical men in general are bad business or administrative men; and that others, therefore, should be preferred who possess this qualification in a greater degree. That two directors should exist (as in the Berlin Charité) is rather an exceptional state of things owing to peculiar circumstances. In some German hospitals and in many French provincial and Irish charities a head sister reigns supreme; in Italy a monk belonging to the order that founded the establishment sometimes acts as director. In England, as a rule, the management is in the hands of a committee, and this arrangement has some advantages. They transact business in a proper manner, usually follow the advice of their medical officers, who have been elected by them, afford means of

social intercourse, and give an opportunity to the members to manage important affairs.

3. *Hospitals as a means for Medical Education.*

On the continent the hospitals are to a great extent looked upon as a means for medical instruction without detriment to the patients, and the number of *internes* or resident officers is comparatively much greater[1] than in England. It is only lately that in this country a medical man is not considered to be in possession of satisfactory scientific attainments unless he has acquired his knowledge in a similar manner.[2] But the majority, at present, are still satisfied with the opportunity of learning the art and science of medicine afforded by assistanceship to a practitioner. The hospital authorities will find it necessary to accommodate themselves to the changed system of education, and afford an opportunity to a greater number of improving their knowledge by residing in the establishment. A short residence in a hospital at the commencement of the medical career is of great importance and value; the student becomes an exact observer from the beginning, and many commence the study of a speciality in which they afterwards excel, at this period of their practical education.

The staff of hospital physicians and surgeons should be recruited from late resident medical officers, and they should also have the preference when an appointment is to be filled up in workhouse infirmaries.

4. *On Written or Printed Rules for the Officials.*

Any one whose duty it becomes to make or assist in making rules for a new establishment respecting the management, duties of honorary or other officers attached to it, etc., will be enabled to do so by studying the numerous reports and written regulations of existing charities. He may not find it without interest to compare the rules of English and continental institutions.

No one connected with a hospital ought to forget that it principally exists for the patients: it is not founded or supported to flatter the vanity of committee-men, to give a director an opportunity for ruling tyrannically over his subordinates, or to set up a medical man in practice. The grand object is charity: to attain it all must work together harmoniously, and the best rules would be useless should common-sense and good-will be wanting.

[1] *See* Lariboisière, Vienna General Hospital. [2] *See* Leeds Infirmary.

5. *Dress of Patients.*

On the continent every hospital inmate, some paying patients excepted, wears the dress of the establishment, not his own; but the English system is to let the patients bring their clothes into the wards, where they have the right to keep them until they leave the institution. They have generally to pay even for their washing. It is a fact that patients sometimes cannot be admitted because their dress is too filthy, and are refused admittance for this reason.[1] Now this is wrong; but there are other objections to the English system. The boxes in which the clothes must be kept occupy a considerable cubic space, and are sometimes very large; I have seen them fill the greater part of the space underneath the bed, about 20 cubic feet.[2] There is no certainty that unclean things do not get into the wards, and sometimes the boxes are unsightly. The other plan does not give rise to any such inconvenience, but it is expensive. It has the advantage that patients can be recognised by their dress, and are therefore under much better control. It is easy to let the patient change his clothes before he is admitted into the ward. There may be separate chambers for undressing, and the things are kept stacked, numbered, and ticketed. The hospital dress is put on after the patient has had a bath, his own is returned to him when he leaves the hospital convalescent or relieved, or when he is permitted to walk outside the hospital.

The dress of hospital patients must be of a suitable material, that will bear washing and keep them warm. A woollen stuff is the best: the principal article is a gown, almost fit for either sex; the colour need not be quite dark, nor need all patients have dresses of the same colour, but there should not be many different dresses; the underclothing is of flannel. The whole dress may be provided for less than a pound; of course this system involves other expenses, those of keeping extra servants, supplying more baths, etc.

We need not fear that the patients would object much to the system. Of course they would grumble a little the first time, as they did in the institution where I saw it adopted,[3] but they soon got used to it.

All those institutions that are endowed or rich enough to introduce the continental plan should not hesitate to do so, and include it among the modern improvements.

[1] A diabetic patient informed me at the dispensary that he did not succeed in his application for admittance to a metropolitan general hospital on account of his dress.

[2] City of London Hospital for Diseases of the Chest.

[3] Bradford Eye Hospital.

6. *On Hospital Statistics.*

Whatever opinion one may have on the value of hospital statistics, I certainly do not think it desirable to take careful notes on unimportant cases. What is the use of knowing the number of cases of scabies, or obstruction of the bowels, of acne or orchitis, and similar diseases during the year, with the sex, age, etc., stated? It is quite another thing to follow up zymotic diseases, lung disorders, or certain grave operations, and compile the materials for comparison between different hospitals and countries. But the rage for statistics must not lead us so far that we inflict on ourselves the disadvantages of bureaucratic institutions. The difficulty is to do enough, and yet not to do too much. Statistics are a recent science, and when cultivated properly may lead to good results.

As there is no central administration for the hospitals of this metropolis, the only way to come to a practical result is by a commission of medical men.[1] They should agree upon a limited number of diseases, which they advise to tabulate in the interest of medical science and sanitary improvements. It would, however, be necessary to tabulate the patients of the workhouse infirmaries and special hospitals as well, and to know the number of incurables. All this should be done as much on the plan of other countries as possible.

7. *On the Diet of Hospital Patients.*

There cannot be much difficulty in making rules for the diet in a newly-built hospital. There are usually four different diets, and much depends upon the custom of the place and country. It is well known that a great difference exists between continental and English cooking. We find by looking at the diet-tables that the supply of meat is somewhat different even in the same country, and in some institutions rather scanty. It is not advisable to replace the meat by weak broth or soups, and it should always be borne in mind how much the progress of recovery depends upon substantial and digestible food. It is true that patients who are not satisfied with their portion ask for extra diet and get it; but the diet should never be on too limited a scale.

The example of liberality given by most of the London hospitals has not been without its due influence on the dietary regulations of continental hospitals, and it would certainly be a retrogressive

[1] The Association of Registrars of Hospitals in London is a step in the right direction.

		Meat. * Cooked. † Uncooked.	Bread.	Potatoes.	Tea, Coffee, or Cocoa.	Butter.	Milk.	Gruel, Pottage, etc.	Beer.	Soup or Broth.	Cheese.	Pudding or Vegetables.
Metropolitan	Royal Free	10 ozs.*	12 ozs.	8 ozs.	1½ pint	—	½ pint	1 pint	Extra	—	—	—
	University College	8 ozs. alternate days	1 lb.	8 ozs.	—	—	¼ pint	1 pint	—	1 pint alternate days	—	—
	St. Mary's	4 ozs.†	12 ozs.	8 ozs.	2 pints	¾ oz.	3 ozs.	—	Extra	—	—	—
	Middlesex	6 ozs.*	12 ozs.	8 ozs.	—	—	½ pint	1 pint alternately	Extra	1 pint alternately	—	—
	Guy's	4 ozs.†	12 ozs.	8 ozs.	—	1 oz.	—	ad lib.	½ pint	½ pint alternately	—	½ lb. alternately
	Westminster	4 ozs.†	10 ozs.	12 ozs.	—	—	—	2 pints	Extra	—	—	—
English	Liverpool Southern	6 ozs. or lobscouse	ad lib.	ad lib.	2 pints	—	—	—	Extra	ad lib. alternate days	—	—
	Bradford	6 ozs. alternately	ad lib.	ad lib.	1 pint	ad lib.	1 pint	1 pint	Extra	1 pint alternately	—	—
	Bristol General Hospital	4 ozs.	12 ozs.	4 ozs.	1½ pint	—	½ pint	1 pint (or bread and milk)	Extra	—	—	—
	,, Royal Infirmary	6 ozs	12 ozs.	6 ozs.	—	—	¼ pint	—	—	—	—	—
	Exeter	4 ozs.	14 ozs.	8 ozs.	Extra	About ½ oz.	Porridge	—	1 pint	1 pint	—	—
	Lincoln	6 ozs. alternately	ad lib.	ad lib.	2 pints	1¼ oz.	1 pint ad lib.	—	Extra	1 pint alternate days	—	—
	Hereford	4 ozs. alternate days	1 lb.	ad lib.	1 pint (or broth), tea 2 ozs. a week	6 ozs. weekly	ad lib.	1 pint	1 pint	ad lib. alternate days	1 oz.	—
	Gloucester	4 ozs. alternate days	17 ozs.	6 ozs.	Extra	—	1 pint alternately	1 pint alternately	½ pint	1 pint alternately	1 oz.	—
	Norwich	6 ozs. alternate days	14 ozs.	ad lib.	2 pints	¾ or 1½ oz. alternately	ad lib.	—	1 pint	1 pint alternately	2 ozs. alternately	10 ozs. alternate days
	Portsmouth	6 ozs.	14 ozs.	8 ozs.	2 pints	1 oz.	ad lib.	—	Extra	—	—	—
Scotch	Aberdeen	In soup	10 ozs.	In soup	½ pint	—	1 pint	½ pint	Extra	1 pint	—	—
	Dundee	4 ozs.	1½ lb.	—	2 pints	—	—	—	—	1 pint	—	—
	Dumfries	8 ozs.*	4 to 6 ozs.	Some with the smaller quantity of bread.	—	—	1½ p.=6 gills	12 gills	—	1 quart	—	—
Irish	Dr. Stevens's	8 ozs.	1 lb.	—	2 pints	—	—	—	—	1 pint	—	—
	Adelaide	12 ozs.	18 ozs.	—	2 pints	—	—	—	—	—	—	—
Paris		soup meat, 12 ozs.	14 ozs.	14 ozs.	½ pint	—	⅔ pint, or claret, 3 oz.	½ to ¾ pint	—	½ to ¾ pint	—	18 ozs. vegetables
Berlin		4 ozs.	18 ozs. rye bread	12 ozs.	¾ pint	—	—	1½ pint	—	—	—	15 ozs.

measure if the diet was restricted here in any way. It is not out of place for a high-standing hospital physician to judge himself if the quality of the food which is supplied to his patients is good by tasting it. Patients do not always like to complain that the milk, beef-tea, bread, or other articles are not good.

I append some diet-tables of this and other countries (on page 53).

8. *Cleanliness.*

A special mattress-room is very convenient in hospitals, where the mattresses are taken to pieces and made up again. The ticks are washed and remade; the hair should not be put in loosely, but stuffed in properly, and the thread passed across. This takes some time; a woman is nearly two days over it, and therefore it is often neglected; but it is of great importance, and should be done.

It is not advisable to have this done out of the hospital; it is not fair, in the first instance, to subject tradespeople to infection; secondly, it is not economical, because they charge very high for it; and thirdly, a greater part of the material gets lost to the hospital, as I have several times been informed that the mattresses have less weight when sent back, and often an inferior article is substituted for the horse-hair.

It is of importance that all the parts of the hospital should always be in the greatest possible state of cleanliness. Great is the difference between different institutions and different countries in this respect; but it becomes members of the medical profession to have always in mind the welfare of their patients, and therefore to see that nothing is neglected as regards cleanliness. This includes that the patients themselves are kept clean in their persons, and also that their dress and bed things and the dishes or implements they use are tidy.

9. *On the Payment of Medical Officers.*

Physicians or surgeons attached to continental hospitals or institutions of a similar kind receive a salary for their services, which, however, is generally small (*see* Lariboisière hospital). The most celebrated medical men in Paris, Berlin, Vienna, and other cities, do not decline to take it, nor do they lose caste by it.

As a rule, these officers are honorary in this country, the colonies, and America; but poor-law medical officers everywhere receive a salary. As regards London, the endowed hospitals and a few dispensaries pay salaries to their physicians and surgeons; where medical

schools are connected with the charity, the common fund obtained from the pupils' fees is generally divided between the head physicians and surgeons, but all the other gentlemen derive no pecuniary benefit from, nor is direct patronage connected with, their offices. It is, however, impossible that under the present system the committees of these institutions can find means to pay medical men, and this is the reason why they offer cheerfully their gratuitous services. We find the committees of some institutions place at the disposal of their officers small sums in order to defray their travelling expenses. Occasionally we read in the papers of the presentation of a purse as a testimonial to a medical officer.

It follows from the circumstance that they are honorary that the medical officers are not bound to give notice of leaving, but do so by courtesy only; and that they are not bound to supply reports to the committees. This would be otherwise were they to receive salaries.

10. *Nursing in Hospitals.*

There has been much attention paid to this subject lately, and the system of nursing is becoming improved in this country. In English hospitals we generally find a paid matron and night and day nurses. The latter are trained in different parts of the country; for instance, in Bath, Lincoln, Bristol, etc. Lately Protestant religious orders (I think there are three at present in existence) have begun to take charge of the nursing,[1] but the common nurses are always lay nurses. In France, however, the whole system of nursing nearly is in the hands of religious orders. All the nurses (*religieuses*) are nuns, superintended by sisters called *sœurs surveillantes;* male attendants are employed as little as possible. In Italy, where nuns do the same work, the male sex is also represented by monks, and to a greater extent than elsewhere. In Germany sisters of charity begin to be more generally admitted: one celebrated training institution is at Kaiserswerth (Diaconissen-Anstalt), but male nurses and married couples are frequently employed. In Russia we find, besides the latter, sisters of mercy in some establishments, especially in children's hospitals.

As regards the sex, I think males less desirable, except in military hospitals. In private life we always prefer females as nurses to males, because it is more in their nature to attend kindly to sick people. In hospitals male patients do not object to female nurses, but females very much to male attendants. Females understand all those little things which contribute to make a ward comfortable and

[1] University College, King's College, Charing Cross Hospitals.

cheerful. They are more patient and vigilant,[1] and devote themselves with more earnestness to their arduous duties than men.

The next question which arises is, should orders be preferred to lay nurses? The question has been principally discussed in France, where the medical men complained frequently that they had not enough authority over the *sœurs* and *religieuses*. The latter did not always comply with the orders about diet or other things; and complaints made to the superiors had only the effect of removing the refractory nurse to another ward, where she acted in the same manner. In London, where the orders have lately begun their activity, similar conflicts of the different authorities have occurred, and will not be absent (such happened at King's College with the chaplain); but I am informed that the medical officers are generally very well satisfied with the system, and they consider it an improvement. In Germany I know the Protestant orders are highly valued, and so I am inclined to think that hospitals in this country need not be afraid of handing over the nursing to a Protestant order. One condition is, however, essential, and that is, that they refrain from proselytism. As regards the patients, they do not object to religious nurses.

Ladies have tried their hand as amateur nurses, but I believe they are a failure. Their well-meant efforts are not always crowned with success. To mention one instance: the soldiers in the Herbert Hospital (Woolwich) did not like their lady nurses, and nineteen out of twenty called for their old ignorant nurses. These ladies are too much above the station of the sick in hospitals, and however willing to do the meanest services, are not so fit for them as other nurses.

Unpaid pauper nurses are the worst of all. I have seen them, and generally found them weak in body and mind. But worse than this, they have been found purloining articles of food, and helping themselves to brandy, gin, and other extra diet of the patients. Some of them have even acted with unpardonable cruelty to children and lunatics, and horrifying accounts about it have been published by the press. They are certainly as useless as they are ignorant, and do not know how to help themselves when anything unforeseen happens.

All nurses who do not belong to an order ought to be paid, and their wages should be a little higher than that of domestic servants, because they run the risk of infection. Their dress should be plain, of dark or darkish colour, certainly not scarlet (as formerly in Reading); a clean white apron is very neat and handy.

[1] When I was a resident medical officer at the Charité Hospital (Berlin), I had to visit the fever-wards (Wachsäle) late at night, and sometimes found the male attendants sleeping. One used to stretch himself down before the door that he might be awakened by the noise of the turning of the handle.

It is important that nurses should sleep as far from the wards as possible;[1] and their comfort in general should not be neglected. Scrubbing is not nurses' work, but ought to be done by servants. Nurses should be boarded, have their washing done, and in fact every care taken off their shoulders but that for the patients.

A separate class of night nurses is still found in English hospitals. I consider this an evil (*see* Glasgow Fever Hospital). To take persons of inferior qualification and pay them less wages for night service may be economical, but it should not be done. Patients want as good attendance at night as during the day time. Besides, the continual change of nurses is objectionable. All nurses should live in the house, and have the night-watch by rotation. All should be engaged by the same authority, be it a matron, an inspector, or house-governor. They should be in every way fit for their office as regards sobriety, state of health, etc.

It need scarcely be said that nurses must perform their duties in a noiseless and pleasing way, be kind-hearted, attentive to the patients, and satisfy the medical officers. Their dismissal may be immediate, in case of serious offence, evident neglect, or inhumanity; but generally they are discharged by notice according to agreement, just like domestic servants.

The number of nurses varies according to the means of the charity and the helplessness of the patients. Too many would be as undesirable as too few; one would be in the other's way. I should not recommend what was done in the Commercial Street Cholera Hospital: each patient had his or her lady nurse. In French hospitals and in Vienna, where the number of nurses is not so variable as in England, one nurse has to superintend about ten beds, to attend to the comfort of the patients, and that they receive their food. They certainly should not have more under their care, because it has been found sometimes that they are hardly able to fulfil their duties under the circumstances.

No rules and regulations can make good nurses. They learn their duties and must be educated (trained, as it is termed) in hospitals. This is one of the ways by which these institutions do good service to society.

[1] Extra waste of oxygen during the day is compensated by large absorption of it during the following night. Pettenkofer states the amount absorbed per night at 67 per cent, and only 33 per cent per day.

III.—ON SPECIAL HOSPITALS.

THERE is no city in the world where they flourish in such number as in London. What I am going to observe about the matter will therefore principally have reference to this metropolis. With few exceptions the special institutions are of recent origin, and the time is not very remote when scarcely any existed. Those who have the greatest claim on public support are older than the others. Many years ago it was found incompatible, not only in this country but on the continent too, with the interests of a general hospital to harbour certain cases of contagious disease inside the walls. Incurables, too, were excluded from many institutions, but the regulations were not so strictly observed. Syphilitic patients were not admitted into some hospitals on religious grounds, and therefore the promoters of separate institutions (Lock hospitals) found favour with the public. The privilege belonging to the governors of making illiberal rules with regard to admission afforded ample opportunity for those whose purposes it suited to promote special establishments. Lately the number has increased in such an alarming manner that it is high time that public notice should be called to the matter.

No doubt many things can be said in favour of special hospitals; and I may be allowed to consider both sides of the question, and afterwards decide in some manner which institutions most deserve public support.

Some special hospitals are as much needed as general ones—viz. smallpox or orthopædic hospitals; some are most useful—for instance, convalescent hospitals; and some have a claim on our support as means of medical education, such as eye infirmaries. As public generosity is ready to come to the assistance of those poor who are afflicted with special diseases, why should it not be engaged in this direction? Besides, the special hospitals relieve the general ones of a number of tedious cases which they do not care to admit. The public, even though there are special institutions, can yet avail themselves for almost any case of the general hospitals.

But as soon as the special establishments multiply in such a manner that for almost every disease one is called into life, they become a nuisance and an absurdity. The means of the subscribing public, which is limited, become squandered in a disadvantageous manner, the celebrated medical schools are robbed of many cases which would afford valuable instruction, and a number of small

establishments are founded, which cannot be under proper public control. The principal advantage is derived by those who have a certain interest of their own for promoting their institution.

I now come to submit the merits and usefulness of them separately to the judgment of the reader.

1. *Convalescent Hospitals.*

Usually one-third or nearly so of the patients of a general hospital are convalescents. The day rooms are useful for removing them temporarily from the wards; and in a larger hospital it is even easy to send a large number of convalescents from the clinical wards to those for lighter cases, but even here they must soon make room for others. This is the reason why they are discharged and become out-patients sooner than is safe, at least in most hospitals in large cities where many wait to be admitted. The consequence is that the patients have a relapse of their disease or make a very slow recovery. They go back to their comfortless unwholesome lodgings, which perhaps are at a great distance from the hospital, to which they have to come for advice as out-patients. They want something more than proper physic; they want good air, proper nourishment and attendance, being in a state of weakness or debility. Take the cases of rheumatic or other fever which have to be discharged from the general hospital according to the rules, or because room is scarce after they have been there six or eight weeks. Can it be expected that they will readily recover their strength when living in badly-ventilated places, and on food unfit for their enfeebled constitution? Send them to a climate which suits their state of health, and they will soon experience a remarkable change for the better. Send them to the country or the seaside, for the same reason that private patients are sent there. Of course, not every hospital can have an institution in the country attached to it, nor is this necessary. There is one Metropolitan hospital (Charing Cross) which has a sea-side establishment of its own; another (St. George's) will have one at a not very distant period; but there are others to which patients are sent from various institutions, viz. the Margate Infirmary, the Convalescent Institution at Walton-on-the-Thames, at Southport, at Bothwell near Glasgow. Dispensaries and poor-law boards might become subscribers to such establishments; there are many localities nearer London where they might be established, such as Tunbridge Wells, Hampstead Heath, or Kew. And they should certainly, as Miss Nightingale suggests, be as like a home as possible: we do not want so many nurses, nor such strict superin-

tendence as in hospitals, nor are there the same objections to small wards. But as regards the construction I would hardly recommend the plan of cottages. It must necessarily reduce the number of those who can be benefited by this establishment, because no other plan is so expensive. And why should we select cottages? We may accommodate the convalescent patients comfortably enough without them. It is scarcely necessary to suggest a plan of building; but I should think that two pavilions in a line might be safely adopted, or two such blocks communicating by a corridor, as in the military hospital of Vincennes, but on a smaller scale. The dormitories may contain four or six beds; water-closets and drainage must be arranged exactly on the same principles as in hospitals, and all modern improvements, unless they cause too great an outlay, should be found in kitchen and wash-house. Care is to be taken that the grounds are kept in a cheerful state, and invalid carriages must be at the disposal of the inmates requiring them.

It is highly desirable that adult convalescents should be sent into the country; it is also necessary that a children's hospital be connected with a country institution. It is a great boon to the inhabitants of these islands, that they can send their young ones to the seaside. Wherever one lives, the sea is within easy reach by railway, and Londoners especially are not a little indebted to the seaside sojourns for the preservation of the health of their families. If the sea air is serviceable to them in general, it is a necessity when they are in a state of weakness by disease. It is true that children can be easily accommodated with lodgings in the country or seaside places, and this is done every day; but hospitals offer a better guarantee for proper medical attendance.

As regards continental countries, the necessity of having country establishments is not overlooked in France; in Germany the numerous mineral spas are used as health-resorts for children no less than for adults. The little patients are specially sent to the mother of lye spas (Kösen, Kreuznach, Rehme, Ischl, etc.), and the communities pay for them (Armenbad).

2. *Lying-In Hospitals.*

The principles on which these hospitals were formerly constructed and managed were bad in themselves and bad in their results. At the time when Tenon wrote his memorable book, at the Hôtel Dieu, women when actually in labour had frequently to divide their bed with two or three others. In other continental cities the large lying-in hospitals were overcrowded. There is no doubt in the

minds of medical men that the ravages of puerperal fever would never have been so fearful, if the sanitary principles of the present time had always been acted upon. There are some who still deny that this dangerous disease is infectious, but I do not belong to that number. I must refrain at this place to support my opinion by facts; but I may safely assert that in constructing lying-in hospitals the disease in question must be specially considered.

Some physicians have advised the total suppression of lying-in infirmaries, because the mortality of women delivered at their homes is said to be less than of even well-managed institutions. I am inclined to believe that there is a great deal of truth in the assertions of those who describe the hospitals as dangerous. But the statistics to which they refer are most unsatisfactory. I do not consider females exempt from all danger at their own homes. Puerperal fever, although originated and more fatal in hospitals, is well known in private practice. It occasionally happens that one practitioner loses a great many of his patients by it. For instance, a number of years ago the fever made its appearance in a small place in Lancashire—I forget the name—and the doctor was unfortunately considered the means of propagating it. He and his assistant had to give up midwifery practice, and the female patients fared better under another practitioner. (See *Medical Times*, Dec. 1866.)

The necessities of a great many persons militate against the total suppression of the infirmaries in large towns. A large class of females cannot be delivered at home; such as servants, single women, and females deserted by their husbands. It is the general opinion abroad that few females in London are confined in hospitals, but it seems to be overlooked that many are received in workhouse infirmaries, to stay there over their delivery; and this is just the class mentioned. The number of beds of the lying-in wards of the forty London workhouses is nearly three hundred.

It has further to be considered that some lying-in hospitals ought to exist as means of clinical instruction. Some of the existing institutions are of great value, from the opportunities they afford to the professors to teach and to the pupils to learn the principles of midwifery.

Supposing it necessary to have lying-in hospitals, we have to consider their dimensions. It might be almost sufficient, if I draw the reader's attention to the bare fact that at the present time the large institutions of the kind in Paris and Petersburg are suppressed, or on the point of being vacated. Statistics, as far as my humble knowledge does, are not so convincing that small establishments have a much lower death-rate than larger ones. But common-sense, and

the sad experience of former times alluded to above, lead us to give the preference to small lying-in establishments. In 1866 the opinions of the best authorities in Germany (Virchow, Hecker, Oppolzer, and many others) were collected on this and other points respecting such hospitals, and small ones were recommended almost unanimously.

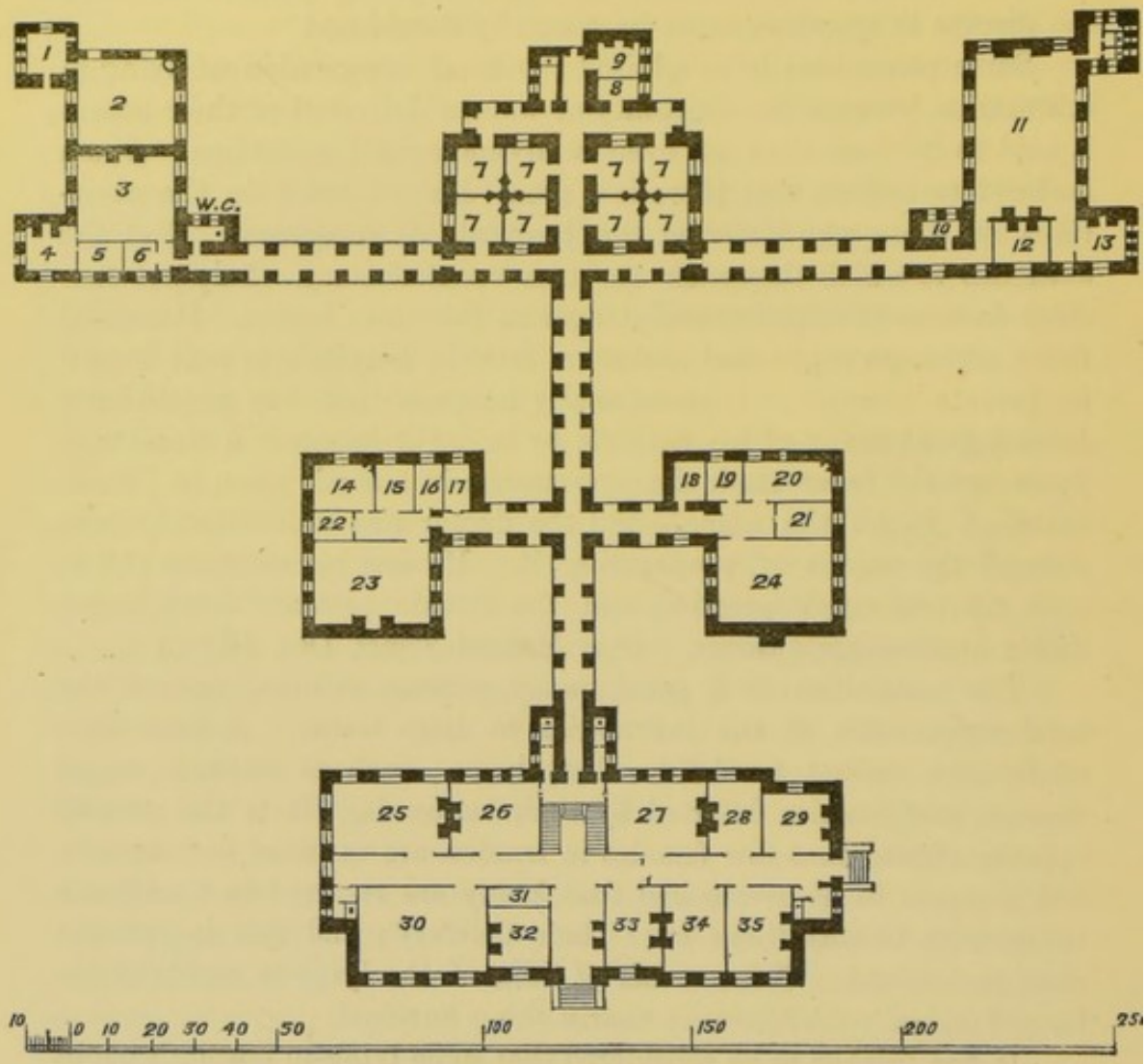


Fig. 3.—Plan of a Lying-In Hospital.

1. Laundry.
2. Wash-house.
3. Ward for puerperal fever.
4. Nurse.
5. Scullery.
6. Stores.
7. Cells.
8. Scullery.
9. Nurse.
10. Scullery.
11. Convalescents.
12. Nurse.
13. Bath, Lavatory.
14. Isolation Room.
15. Scullery.
16. Bath.
17, 18. Water-closets.
19. Stores.
20. Dining-room.
21. Scullery or Closets.
23. Infirmary.
24. Kitchen.
25. Students and Pupils.
26. Confinement Room.
27. Board Room.
28, 29, } Clinical Dire
33, 34, 35. } tors' Rooms
30. Amphitheatre.
31. Ambulance.
32. Porter.

Two blocks may be omitted by giving the front building a higher elevation, and the wash-house could eventual be left out.

I should think that about forty beds would supply the wants of a population of 500,000 inhabitants, as the greater part can be treated as out-patients. It would be desirable to have the building

removed from noisy thoroughfares, and in a healthy situation, surrounded by gardens.

It is most likely that those buildings will answer the purpose best which are constructed on a mixed plan—half-block, half-corridor plan. The common dormitories and larger rooms, containing twelve beds and twelve cribs each, should have opposite windows; but as many small rooms are required, these must open into corridors.

The sick wards should be in a separate infirmary, and patients attacked by smallpox, measles, or scarlet fever, should be removed to a separate shed built for the purpose.

The ward where the persons are actually in labour must be separate from, and not too close to the dormitories of the females attending their delivery. Those who have been delivered are transferred to their cells, which afford ample cubic space. Here they should be kept nine days, unless they fall ill; in which case they are removed to the sick-ward. But should a patient be attacked by puerperal fever, she must be separated from other patients.

After staying nine days in their cells, the females should become inmates of the common convalescent ward. Those who are weak after illness should as soon as possible be removed to a convalescent institution. As one cell could accommodate about forty patients per year, ten would be sufficient for 400 females delivered at the institution. (*See* plan on p. 62.)

An establishment constructed on these principles would combine the advantage of a hospital with those of a private room.

The principle on which females are admitted should be liberal—more in the Irish than in the English way. Married women prefer to be delivered at their homes; those who would be thankful for admittance are unmarried, and they are just excluded by the regulations of London lying-in charities. The result is, they often fall into bad hands, as they dislike to apply to the workhouses.

As I am going to explain in another place, the assistance given by the London parishes to these poor creatures is not quite satisfactory, because the medical officers have too much on hand to give them the necessary attention. The loss of life, I am sure, would be less, if this state of things were ameliorated.

On Preventing Measures as regards Puerperal Fever.

In one city (Berlin) the regular transfer of all the patients from one house to another is adopted. In Dublin (Rotundo Hospital) as many beds are untenanted as are occupied; in Paris[1] the ad-

[1] The debates on the subject in the Surgical Society of Paris, in which Trélat,

ministration had the wards divided by double glass partitions, but recently they have gone further, and recommend single bedrooms. On whatever plan the hospital is constructed and managed, there should be the means of transferring any suspicious case at once to a separate building.

It is important that the younger members of the medical profession — viz. the house-surgeons and medical officers who attend upon the patients should be well instructed as regards the symptoms and nature (so far as science goes) of the puerperal disease, well aware of its spreading by infection, of the necessity of using none but well-cleaned instruments, and to wash their hands thoroughly after every examination. The nurses must be trained, and understand the importance of keeping the patients and rooms clean. They must be careful not to overlook any change in the state of the females under their supervision, and the visiting physicians must take prompt measures when needed.

With every care based on past experience and judicious principles, it may and will happen that this dreadful malady will make its appearance, just as cholera or other epidemic diseases beyond human control.

Appendix.

Institutions for Training Midwives.

Prussia.

These institutions are called Hebammen-Institute. The director of an institution is a medical man, and generally a professor of mid-

Le Fort, and Tardieu were principally engaged, led to the adoption of the following conclusions :—

"1. It has been proved by statistics that the ravages of puerperal fever in lying-in hospitals are greater now than formerly. This can only be referred to the hospital atmosphere ; therefore the infirmaries and hospitals should be reduced in extent, and assistance provided to the poor at their houses.

"2. Puerperal fever is infectious, and therefore hospitals constructed on the best principles may become the scene of great calamities.

"3. Besides the usual sanitary measures which are recommended for hospitals, special precautions should be observed in lying-in institutions.

"4. To avoid importation of the disease strict cleanliness should be observed. Empty wards should be thoroughly cleaned ; not only the walls whitewashed, but the beds purified, etc.

"5. To avoid the spread of the disease, the healthy should be removed from the ward where any have been attacked to small rooms for one, or at the most four beds.

"6. The attacked should be removed to a separate building.

"7. If, nevertheless, the remaining females get the fever, the whole building must be emptied.

"8. In cities where lying-in hospitals cannot be dispensed with they must be small."—*Gazette des Hôpitaux*, No. 67, 1866.

wifery. He gives lectures to those who are admitted as pupils, and this is done almost every day as long as the course lasts—viz. four months. The midwives live in the house, and are under the superintendence of a head midwife, who lectures, and also repeats the lecture of the master. The midwives attend midwifery cases in rotation, and are admitted to the post-mortem rooms.

Those who are deficient in the elementary science of writing, etc., receive special instruction, for which purpose a teacher attends.

After they have gone through their course, they are admitted to an examination. Those who pass it get a license, and are appointed, if they wish it, by the Government as approved midwives for a district.[1] The persons who are admitted to the midwifery schools are generally sent by the communes or municipalities of country places; and, according to an Act passed in 1861, they are often recommended and elected by the ladies of the place. They usually return to the place where they come from.

The training is much facilitated by a book which every midwife is bound to study—the *Hebammenbuch*.[2] It contains the principles of the art and science of midwifery in a popular manner, and many useful hints respecting the conduct of midwives in practice. They are bound to send for a doctor in irregular cases, and not permitted to operate where a practitioner can be fetched in time. It is, indeed, rare that they overstep the limits of propriety and interfere with medical advice.

Austria.

In Austria these institutions work in a similar manner. They are connected with the universities, and that of the Allgemeine Krankenhaus, in Vienna, has the greatest number of pupils. (Gebärclinik.) The director is generally a professor of midwifery at the university. The course the midwives have to attend is of longer duration than in Prussia. They have to pass an examination before being appointed. The expenses of their education are usually paid by the municipalities who afterwards require their services.

France.

The principal institution for training midwives is the Maternité de Paris; free courses of lectures are, however, given at the univer-

[1] Otherwise they are free to settle where they like.

[2] *Hebammenbuch für den Preuss. Staat*, edited by a committee, but written by the late Dr. Jos. H. Schmidt; in my opinion one of the most useful books ever published.

sity. The Maternité is intended for training midwives for the whole of France; but some are educated in the provinces. They also are taught how to vaccinate children, and the course of training lasts one year. The pupils are boarded and lodged in the institution, and the communes bear the expense (600 fr.).

Russia.

Midwives are trained in the lying-in hospitals of Petersburg and Moscow; the course lasts three years. At the end of this time they have to pass an examination to get a license. They also learn to vaccinate. They are appointed by Government for a certain district, and one class, called Crown-midwives, are better off as regards emoluments than the others: they receive a fixed salary as soon as they have passed their examination.

The regulations respecting character are almost the same in the various countries named; but those regarding the age of pupils to be admitted are different.

There are other things arranged differently; but the most striking one is, that the time the course of training lasts is so variable. Should institutions of the kind be founded in this country, this point would have to be considered. Where the number of practitioners who attend to midwifery cases is large, as in Paris, it may, of course, be supposed that the midwives attend regular cases only, and medical men are always at hand should anything happen. At present, comparatively few midwives only receive a practical training at Queen Charlotte's and a few other hospitals. The Ladies' Medical College, of which I know but little, is not only intended for training the pupils to become useful midwives, but they receive a general medical education or, at least, one respecting diseases of women and children. It may not be intended to call into life a class of female doctors, who do more mischief than good; but I must confess, that from the prescriptions which I have had occasion to read, I cannot augur well for the benefit conferred upon the female part of the community by these half-learned doctors. What is wanted in a large city like London is that useful but humble class of midwives who, being well qualified, are able to act as occasional substitutes for practitioners.

3. *Children's Hospitals.*

If the sick children of the poor were well lodged and attended at home, there would be no reason to remove them. A mother's care cannot be replaced. But, unhappily, the children do not often

dwell in places where they have a fair chance of recovery from diseases. Now, to admit them into the wards of a general hospital could not be recommended. These wards satisfy the wants of adults but not children. A few cribs are found; but often the children are put into the bed for a full-grown person. They are not even supplied with proper spoons or tumblers that they are able to handle. There are other things to consider—for instance, that the children see many things which are not fit for their view. In many hospitals children are received into separate wards. This is much better, but not satisfactory in every respect. Under these circumstances they are better cared for; but they can hardly have their own separate playground, which is essential to them; and the out-patients' department is not separate. Therefore children's hospitals were founded in large cities like London, Berlin, Paris, or Vienna. But no one can deny that these institutions, however useful, have their own dangers. The eruptive fevers—measles, smallpox, scarlatina—cannot be excluded; first, because many children are sent to the hospital before the diagnosis is clear; secondly, because these cases cannot be treated at home. Those children who have no eruptive fever are endangered, and even those who recover from one may catch another fever. Therefore a children's hospital ought to be constructed as much as possible on the principles of a general hospital as regards separation of contagious diseases. One or two separation wards must be found, with a separate entrance; and they ought to have even a separate medical officer, who does not attend to the other patients.

The construction of the hospital offers few difficulties, as the number of patients must not be large. The larger the number, the higher the death-rate. A small children's hospital can be constructed without endangering the patients, and, by connecting an out-patients' department with it, afford relief to numerous sick children. The cubic space children require is a little less than for adults. Beds, utensils, baths, must suit their age, and the latter be on an extensive scale, to be used by out-patients as well. A large playground should be attached. Cleanliness is of as much importance in a children's as in a general hospital; and continuous attention must be paid to the water-closets.

Children's sick nurses must be trained, and for this purpose the hospital is the best means. They must have a gift of observation, by which they are able to supply the attending physicians with useful information about the little patients.

The diet and supply of good milk are of importance, and require the special care of the resident medical officers.

No patient ought to be kept longer in the establishment than is absolutely necessary.

4. *Hospitals for Incurables.*

For this metropolis only three establishments called Hospitals for Incurables exist. One is situated near Putney Heath; it is a recently-constructed building (1851), and creates a favourable impression by its exterior; but it affords a retreat only to a limited number of inmates—about 190. They are elected for life by the governors of the hospital, and do not belong to the poorest class. The great mass of incurable poor find a refuge in the workhouses.

In France some of the *maisons de retraite* are at the disposal of this class of the sick poor. The hospitals for incurables (*Les Incurables*) are quite different from the above-named institution, and must be considered under the heading "Workhouses," to which they are similar.

A cancer hospital is an establishment for a certain class of incurables, as the name implies. I do not think that there are more than three in existence (London, Liverpool, Manchester), and they could be dispensed with. They are not found in Germany, where the name alone would be sufficient to deter any patient from applying for admission.

Numerous establishments exist in Germany for the incurable poor; but I do not know of any for incurables alone; and it is the same in Italy, with few exceptions.

5. *Hospitals for Consumption and Diseases of the Chest.*

The fact that four hospitals for diseases of the chest are found in London, supported by voluntary contributions, seems to prove that they are a necessity. It was a matter of serious doubt when they were formed, if they were necessary, and would find favour with the public. As the applications for admission are so numerous that they can hardly be granted, we may be satisfied about the latter point. But on that account it does not at all follow that special hospitals for consumption should be built in all large cities. In London many hospitals do not admit incurables; and the visiting of poor patients is not carried on so efficiently as, for instance, in continental cities. The London parish medical officers and their (I am sorry to say) unqualified assistants have to attend to a district far too large for their strength; and only in some parts of the town dispensaries make it their business to come to their aid.

Therefore many poor persons afflicted with consumption are glad to find a temporary asylum in a hospital where they enjoy a proper diet and medical attendance, and are removed from the noise and bustle of their unhealthy lodgings.

It might be urged against the special hospitals for consumption that it can hardly be conducive to a favourable progress of the malady for the patients to have constantly before their eyes the sufferings of their fellow-patients, and often the fatal termination of the disease. We take great care in private life not even to mention such a contingency as death in presence of invalids. But, singularly enough, phthisical sufferers hope against hope, and do not despair even when they have such plain facts before their view. There is another difficulty, that of keeping the air in the wards sweet, especially where the worst cases are. To ventilate by opening the windows is often out of the question; and it is well known that artificial ventilation can only to some extent make up for this.

I have further to mention that the expenditure is always considerable, as a large number of nurses, expensive medicines, and nourishing diet are required.

All this has to be considered should the erection of a new consumption hospital be proposed; and I draw attention to it without in the least denying the services rendered by existing charities to the public.

Whether building consumption hospitals should be discontinued for the reason that recently the vacillary tuberculoseos has been discovered, and therefore phthisis is to be ranged under the infectious diseases, is a question which is not easily answered. People who believe that phthisis is catching, as they do in southern countries—Italy, for instance—will certainly oppose, now more than ever, the living of a number of patients with chest diseases under one roof. The fact that at the Brompton Hospital, London, the nurses did not become phthisical, adduced against the transmissibility of the disease by Mr. Edwards, for a long time resident medical officer at the institution, would not be of great weight if we suppose that the vacilli are not dangerous to people with sound lungs, but principally to those who suffer from catarrh or inflammation of the organ.

6. *Eye Hospitals.*

Ophthalmic surgeons are unanimously of opinion that a separation of eye patients from surgical cases is necessary. The success of operations on the eye is endangered if the patient is subjected to the influence of a "traumatic atmosphere."

Some are not satisfied with separate wards, but insist upon special hospitals. It mostly depends on local circumstances if a separate building is desirable. It is quite possible in a new institution to build an eye ward, fulfilling all the conditions for the favourable recovery of the patients. The latter may judiciously be accommodated in a separate block (Guy's Hospital). But if a new eye ward has to be founded in an old building, where the space is limited, the difficulties may often become insuperable. The number of beds and extent of the building depends so much upon the reputation and celebrity of the head surgeon that no rules for it can be laid down. But as the greater number are out-patients, the accommodation is specially limited. We find, however, at Turin,[1] an eye hospital with 300 beds.

The construction of an eye ward offers no difficulties. As light and sun are to be excluded, it should face the north; it must be easy to darken it, therefore the windows are high up, and have curtains and blinds (Venetian if possible), and some of them sliding shutters.[2] Small wards are preferred for this class of patients. Operative cases ought to have separate rooms, especially cataract patients, who must be kept exceedingly quiet. I need scarcely mention that each patient must have his or her own basin, towel, sponge, etc. A light operating room and a small dark chamber for examination with the ophthalmoscope should adjoin the ward. It is well to make arrangements for eye douche when the hospital is constructed. The out-patients' department is on the ground-floor. (For operating table, *see* Bradford Eye Hospital.)

7. *Fever Hospitals.*

There can almost as much be said in favour of them as against them. In countries where the general hospitals do not exclude fever patients, as on the continent of Europe, special fever hospitals do scarcely exist. But many hospitals in England do not admit these patients, and they must be accommodated somewhere. So long as the present system of admission exists, these special hospitals will be necessary. The class who cannot remain at home are servants—male and female—clerks, and sometimes foreigners. They dislike or object to be removed to workhouse infirmaries, and find the proper accommodation, treatment, and nursing in the special

[1] Graefe's Eye Hospital at Berlin had 120 beds; that of Vienna has 60; of Glasgow, 24; Halle, 50; Prague, 150; Heidelberg, 64; Moorfields (London), 40; Bradford, 18. The smallest number in Germany is found at Darmstadt (15).

[2] See Bradford Eye Hospital.

hospitals. Their friends or fellow-lodgers derive certainly a benefit from their timely removal to such institutions, as otherwise they might catch the disease.

On the other hand, any one can well understand that, as far as London is concerned, we cannot have fever hospitals all over the metropolis, and that to send fever patients long distances, even in proper conveyances, inflicts great injury on them. The state of exhaustion in which they arrive is often fearful, and the fatigue of the journey has a bad influence on the course of the disease. It has further to be stated that the recovery of patients afflicted with zymotic diseases is generally less rapid and perfect when collected together in special buildings. Pyæmic and puerperal fevers have been found to improve when the patients were removed from the wards where so many were suffering from the same disease. Medical men of considerable authority observed that their typhoid patients fared worse when a great number was kept in the same ward, and better when more widely distributed over several wards.

A special difficulty is experienced in providing nurses, as so many of them catch the fever and die, and the resident medical officers of fever hospitals are far more in danger of falling victims when performing the duties of their office than those of general hospitals. It might even be feared that the whole neighbourhood of a fever hospital becomes endangered; but fortunately this does not appear to be the case, excepting, perhaps, smallpox hospitals, from which some stoutly assert that infection spreads to the neighbourhood.

Trustworthy statistical reports are much needed to guide our opinion on the desirability of having a fever hospital in a certain locality. It sometimes happens that the hospitals are founded where they are little used afterwards.

It is desirable that in every large town those sanitary measures (respecting drainage, water-supply, etc.) be adopted, to the neglect of which the prevalence of fever and zymotic diseases in general is ascribed.

In the construction of the hospitals themselves, less care should be bestowed on arrangements pleasing to the eye than the proper supply of drinking water, good sewerage, and ventilation. Every regulation that can be made for preventing the propagation of the fever inside the building should be strictly observed, and no precautions respecting interment and disinfection neglected.

The best plan of constructing a fever hospital is the pavilion plan, as the officials connected with it must live quite separate, and

different classes of fever, such as typhoid and eruptive fever, should be under different roofs. Small wards are objectionable, as they make nursing and supervision troublesome.[1]

8. *On Lock Hospitals, Samaritan, Orthopædic, and some other Special Hospitals.*

Syphilitic patients are better separated from the others, not only on their own account, but also because they are a danger and an annoyance to the others. But it is questionable if separate hospitals are necessary, and whether separate wards could not suffice. There are large towns of about a million of inhabitants (Berlin, Vienna) where no separate hospitals exist. Although the number of the class of patients in question is large, yet few like or need be in-patients: their treatment at their own dwellings depends much upon local circumstances. In London, where the fees for proper medical attendance are comparatively high, there may be more reason for recommending lock hospitals than in Berlin or Vienna. In seafaring towns, where many foreign sailors are always found suffering from the disease, and female patients of the same description are unfortunately not rare, lock hospitals will render great service to this class and to the inhabitants; for the spread of the disease may be somewhat prevented by removing the patients in time to the hospitals.

Respecting the dimensions, no fixed law need be stated. In Paris, where other regulations for admission are followed, the lock hospitals are larger than in London. There are about 300 males in the hospital Du Midi, and more than this number can be accommodated in the female lock hospital, the Lourcine. To keep separate establishments for both sexes would not be practicable in small seafaring places.

Lock hospitals, where they exist, do not make lock-wards in general hospitals unnecessary, but some of the latter may thereby be enabled to exclude venereous diseases from admission altogether.

Lock hospitals may as well be constructed on the corridor system as on the pavilion plan. The cubic space the patients require is less, as they are not constantly in bed, and the windows can be used freely for ventilation. There should be large wards and smaller ones, as patients with gangrene, or those who have been operated upon, must be removed to private rooms. Special care should be bestowed on the common bathroom, and the opinion of medical men consulted on the subject before the hospital is con-

[1] *See* Leeds Fever Hospital, and London Fever and Smallpox Hospitals.

structed, as it is somewhat difficult to make arrangements for medicated and vapour baths, and vaginal injections (the latter in female lock hospitals) after the building is finished.

The rules for discipline should be somewhat stricter than in general hospitals, and cleanliness be insisted upon by the medical officers as much as elsewhere. Such skin diseases as itch, favus, etc., should be rarely treated as in-patients, but the efficient means for treating and curing them as out-patients might be found in connexion with lock hospitals. (*See* Hospital St. Pierre, Brussels.)

Samaritan Hospitals for Diseases of Women.

The reason why they have, under circumstances, a claim on public support is, that some persons who suffer from female complaints find it difficult and injurious to visit the dispensaries as out-patients, and others must be treated as in-patients after certain operations.

Orthopædic Hospitals.

They are a necessity on account of the particular treatment the patients have to undergo, the many bandages and appliances which must be kept in store, and because of the length of time many patients must remain for their cure, this being quite incompatible with the rules of a general hospital.

Other Special Hospitals.

Fistulæ and stone diseases might very well be treated in the surgical wards of general hospitals. Dentistry is conveniently connected with the out-patients' department of the same or with public dispensaries.

9. *On Lunatic Asylums.*

Public attention is rarely drawn to the construction of lunatic asylums, although numerous pamphlets and works exist which treat on the proper management of the insane. It seems to be desirable that modern sanitary principles should be as well acted upon in the construction and arrangement of these special institutions as in general hospitals. In France they have lately improved considerably the institutions where the insane are accommodated, a number of new country asylums having been built on the pavilion plan. This is not necessary but preferable to other plans, because it allows a stricter separation of different classes of patients—for instance, of the refractory ones and others. In Germany some institutions, closely

connected as yet with general hospitals, will be removed to special buildings. It is evident, that although serious differences exist between both classes of hospitals, yet the principles as regards cubic space, ventilation, bedding, cooking, etc., must in some manner be the same.

A site in the country is preferable, because large airing grounds must be attached to the institution, and the patients must have work as tillers of the soil or in the gardens. To connect a large farm with the asylum is a good plan, but is not likely to find much favour on the continent. The dimensions of the institutions are not restricted by the fear of hospital diseases, but only by some difficulty of management if they become too large. There would be no objection to have the buildings three or even four floors high, but the latter is not likely to be adopted, because they are situated in the country, where ground is of less value than in town. The fluid manure of the asylums should be used for the soil, the water supplied by wells, the rain water carefully collected, and steam used for domestic purposes, as in hospitals.

The construction of the windows requires particular attention. In the first place, they must not give the house the look of a prison. Unsightly iron bars can be avoided at any rate by the bars corresponding to the framework if this is of wood. But it is more simple to have iron window-frames, which prevent any attempt at escape, and louvres for ventilation; sash-windows, that can be partly opened, may be used in the convalescent wards. In that part of the building which is used as an infirmary the windows must not only be available for ventilation, but have bars to prevent escape. All the windows might have double perforated zinc plates, or tablets at the top sliding one over the other, so that more or less air can be admitted.

The largest wards may be used as day-rooms, made as cheerful as possible by painting the walls, having open fireplaces (surrounded by fire-guards), window-curtains, hearth-rugs, flower-stands, aviaries, etc. The dormitories might be to some extent single ones; too many of them make superintendence difficult: they should have a small window, and contain a bed with horsehair mattress, a chair, bedside-carpet, and allow a cubic space of about 1000 feet. This will be sufficient, because they are not occupied in the daytime. In the common dormitory, which may accommodate 50 or 60 inmates, the beds should have a space of $3\frac{1}{2}$ or 4 feet between them. Each dormitory should have a separate night attendant. I do not see the necessity for the beds being folded up; it causes a great deal of trouble and looks prison-like.

Patients who are unclean and wet their bedding (idiotic boys) should have strong wooden cribs with double bottom, the lower one containing zinc lining. Strong canvas is slipped on side-poles which fit to the side of the bed. The mattress is placed on the canvas. All urinals should be self-acting.

What separation rooms are to a hospital padded rooms are to an asylum; with this difference, that they should only be used temporarily. It is indeed rare that patients are at present secluded from others for days.

Many plans have been proposed for the construction of seclusion rooms. First as regards their situation: although they must not be too near the other patients, they must not be in dark and damp cellars (*see* Hamburg); although not very light, they must not be quite dark; one or two small windows near the ceiling would be sufficient: then they must be ventilated by perforated zinc plates in the wall and other means; where a number of them lie side by side, air may be forced in by a fan, and in winter time this air should pass over hot plates. As regards the walls some propose smooth wood, others cement which can be washed, or glazed tiles. I do not think anything is better than padded walls, as described under Colney Hatch.

The frames are too high from the floor to be removed by the patient, and the canvas if made dirty can be washed. The doors should have small shutters which can be opened for offering food to the patient, and eye-holes for allowing the attendant to observe the inmate; the doors are fastened by a small-hinged board, stemming against the outer frame: locks might be broken.

Some difficulty is experienced about the convenience. As common water-closets are objectionable, because the patient might break the handle or pan, and the self-acting closets cause a great waste of water, it has been proposed (Esse) to have a basin with a small hole, so that the hand cannot pass through, communicating with a syphon-pipe with a double curve; the water-supply to be permanent, but limited. This is said to answer well. We often find a simple vessel (of iron or gutta-percha) placed in a corner, so that it can be removed without opening the door from the corridor. I think it is only necessary to direct the attention of builders to the subject for us to be supplied with a suitable article.

If the aperture of a small basin of one of Jennings' closets was placed at the side, and the water allowed to rush in by the attendant pulling a cord outside, I think nothing more would be required.

Management of Asylums.

Much can be said for medical men being at the head of such institutions, and this is generally found to be the case on the continent. But in this country committees manage the affairs. It can be scarcely supposed that those who know nothing about the nature and treatment of insanity are able to act with judgment in every case, and in fact we find committees frequently committing acts of great inconsistency. I can prove from reports of lunatic asylums, that in one meeting a resolution is often carried which is repealed in a subsequent one. It is easy to understand that the members sometimes come to wrong conclusions based on the report of ignorant officials. The patients themselves are unfortunately not able to apply for redress if they are wronged. It might be said that the committee may avail themselves of the advice of their superintending medical officer, but they act often against it.

There should be an inspector and sub-inspectors where the number of inmates is large, and they should be bound strictly to follow the orders of the medical officer.

The medical officers should be as little as possible restricted by economical reasons, and allowed to use every available means for curing insanity; and they should be *ex officio* members of the board, without the power of voting. They should not have more than 250 patients under their care.

10. *Military Hospitals.*

They can hardly be called special hospitals, because no special class of diseases is treated in them, but they are general hospitals for a special class of inmates, and are under stricter regulations. In most respects they should be constructed on the principles laid down for civil institutions, but, in general, economy prevents this to some extent. In most countries there are only few military hospitals which can in any way rival the civil establishments. In this country improvements have lately taken place. The new regulations, for instance, require that every military general hospital should have a day—a convalescent—room, and should be properly ventilated. In Germany, as yet, most of the military hospitals are not buildings constructed for the purpose, but barracks or other public institutions. In a few cases improvements have a trial—for instance, in Vienna. In the First Army Corps Hospital we find an artificial system of ventilation. The hospitals of Vincennes and Woolwich are on improved principles.

In this country the principles of ventilation laid down by the

Royal Commission on barracks have been adopted. The wards have a chimney-fire, or remodelled firegrate, and inlets for air by openings near the ceiling, which can be closed, one between two windows; the latter are frequently tilted inwards, and the upper open space is covered by perforated zinc. The outlets are air-shafts opening near the ceiling, and placed in the corners of the room. One square inch of the aperture in the wall corresponds to fifty square inches of the ward. The upper part of the shaft, carried four feet above the roof, is protected by louvres.

Whereas the rule in civil hospitals is to have as few male nurses or servants as possible, it is just the reverse with military institutions. There are small wards to accommodate sick officers.

In an English regimental hospital the following persons find accommodation:—The governor or commander, the principal medical officer, orderly medical officer, apothecary or dispenser; purveyor or steward, paymaster or treasurer; captain of orderlies, superintendent of nurses. Under these: the assistant-apothecary, female nurses, ward-masters, ward-orderlies, cooks, waiters, etc. But neither the commander nor the senior medical officer lives in the building, but near it, having only offices there. Nor is it necessary that the dispenser or treasurer should live in the hospital.

As only few places have large garrisons in England, generally a battalion or a regiment only, the majority of military hospitals are of small size. The Royal Commission holds that for a regimental hospital 120 beds are sufficient. The hospital contains two wards on each floor, and on each side of a central staircase; there are only two floors. The closets, baths, lavatories, are at the outer end of the ward; the orderlies' and nurses' rooms are at the inner end.

The outbuildings are connected by galleries with the main portion.

Appendix. *Cottage Hospitals.*

Cottage hospitals in England exist for twenty-eight years. They are small buildings containing one or two floors over a basement. Lying in the country, they have a favourable site, and it is affirmed that hospital diseases are rare there, and that surgical patients make a better recovery than in town. They can accommodate mostly from two to ten patients, the largest has twenty-three beds. There are about 600 beds in 700 English cottage hospitals. On the continent such small establishments are rare; in Bohemia and Silesia village hospitals (Gemeindestuben) were established forty or fifty years ago, but they had not a long time of existence. Probably some of the English cottage hospitals may share the same fate, some may become enlarged and grow into larger institutions.

IV.—ON HOSPICES AND WORKHOUSE INFIRMARIES.

Hospices are almshouses or asylums for able-bodied or infirm paupers, supported by the municipality or Government. Workhouses are founded and governed by the parishes. Both claim our attention, because infirmaries are attached to them, and the latter receive those of the sick poor who find no place in the hospitals. The character of these institutions not only varies with the country, but depends especially upon the principles which were prevalent at the time of their foundation. Whereas in former times they were considered as depôts of mendicity and places of forcible detention, especially in this country, those of more recent origin have lost much of their original repulsive character, and bear testimony to the prevailing principles of humanity.

English workhouses are under the immediate control of the boards of guardians, who are elected by the ratepayers of the parish. The guardians, although in some manner subjected to a common board (Poor Law Board), possess considerable independence, and are able to do much to oppose improvements. The inmates of a workhouse belong to both sexes and every age: they are able-bodied or infirm —some incurable; and a not inconsiderable portion are insane or idiots. Of the first only the milder forms are retained; a description of some establishments is found in another place.

Although workhouses exist in Berlin, Vienna, Petersburg, and Moscow, and other large cities, some of which I have visited, yet I refrain from describing them; but I must here say a few words on those of Paris.

They are now undergoing considerable changes in order to apply the principles of modern sanitary science. We find three establishments of the kind for adults—viz. the Salpêtrière, Bicêtre, Incurables Hommes; and they provided, till lately, accommodation for more than 10,000 persons.[1] One exists for children (*les enfants assistés*). The number of inmates will be gradually reduced by removing some of them into the country, where new institutions are founded; especially one at Vesinez, the other at Issy. The latter is a large and fine building.

To suppress the hospices altogether was considered impossible by the Paris administration. There is a large number of helpless creatures who have neither friends nor shelter; there are those who suffer from chronic diseases, who cannot obtain accommodation; there are

[1] *See* under Paris.

the semi-blind and deaf, the paralytic and epileptic, and a great many others whom it would be cruel to leave to precarious private charity. The administration send some of them into the country, and assist them with money grants; and do as much as possible to prevent overcrowding in the existing institutions.

An important part of all these institutions form the infirmaries, especially in this country, where hospitals are generally unendowed, and unsupported by Government. The recent disclosures about them must be fresh in the reader's mind, so that I need not repeat the disgraceful facts made public. At present only the metropolitan workhouse infirmaries have been subjected to severe criticism, but those in the country ought not to be lost sight of. They have as much need of improvement as those in London. The wards should be properly constructed, and arranged as much as possible on improved hospital principles; and the institutions should be properly managed, as regards nursing, medical staff, diet, dispensing, etc.

Some of the existing infirmaries (Chorlton Union Infirmary) may serve as models to boards of guardians who are willing to inaugurate a new system.

V.—ON DISPENSARIES.

THE importance of public dispensaries is perhaps very underrated, because the benefits they confer upon a part of the sick population are not brought before the public in an ostentatious manner. A part of the profession and of the public are of opinion that all important cases of disease are treated in the hospitals as in-patients, and that out-patients or dispensary patients are pre-eminently light cases. In accordance with this opinion, medical students eagerly follow the lectures in clinical wards, but none attend as pupils in the out-patients' department, not considering that, in the beginning of their career, they will be more consulted respecting light cases than in such as threaten the life of the patient. The dispensary cases, however, even if light, may become serious or chronic. For medical students the chronic diseases of a dispensary would be an almost inexhaustible source of instruction; but of this, singularly enough, they are ignorant. It would not suit the dispensary, or outdoor-patient department, to admit the pupils indiscriminately and every day, but one or two days could be set apart for them each week. Dispensaries would in this way become means of education in connexion with medical schools.

The dispensaries might become annual subscribers to the nearest hospital. This would give them the right to send such patients there who cannot be attended to at the dispensary or visited by its visiting officer. The cases, if interesting and worth publishing, should be published conjointly by the dispensary and hospital physician or surgeon, each giving his part of the history and treatment of the disease. The pupils of the hospital, who attend at the dispensary, would then follow the case from its beginning to its recovery or fatal end. The hospital physician or surgeon would have reliable information upon the history of the case, and the dispensary medical officer upon its course and termination.

Case-books are not kept in many, perhaps in most dispensaries; this is to be regretted. Many patients are under treatment for years with short interruptions, and their disease may be well worth noting. This could be done by pupils attending the establishment. Eye-diseases are frequently treated at metropolitan and provincial dispensaries, and they offer valuable materials for publication. Some ophthalmic surgeons of European fame owe much of their celebrity to the observations made on out-patients; so did, for instance, the late Graefe, whose clinical wards had, I believe, at first and for some years not more than 12 beds. Nervous diseases, chorea, neuralgia, female diseases, and some others, can be studied with great advantage in dispensaries, and this should not be lost sight of by their medical officers.

On the Construction of Dispensaries.

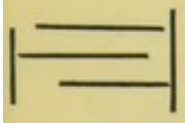
The building in which a dispensary is established ought to serve no other purpose. The ground-floor is used for the dispensing department, the waiting-room for patients, the consulting-rooms with private examination-rooms built out of them or between them, and there may be a small room for visitors. On the first floor are two committee-rooms and medical officer's sitting-room; on the second floor, dispenser's and medical officer's bedroom; and on top floor, housekeepers' rooms, who have the use of the basement as well. Patients have a separate street entrance and separate exit, if possible (Bradford, Cambridge, Leicester); therefore a corner house is the best.

Dispensing Department

must be situated in front or at the back of the building, in order that it receive ample light. The drugs are ranged on shelves round the walls, and the poisons separate; cod-liver oil should be kept in

slate tanks; the floor to be impervious; and hot and cold water supplied from taps. There should be a contrivance for boiling water on gas; and a table with metal cover in the middle of the room. A sink is in one corner, two small windows open into a dispensing lobby, and rails are in front of them, so that only one patient can pass at a time.

Waiting-Room.

It may be built in four different ways. 1. A large single room, without partitions, containing plain deal seats without backs, and a free space is left between male and female patients. 2. The room is divided in two equal parts by a partition 10 feet high running down the middle. 3. The room is divided into many compartments by high-backed seats standing thus:  The females sit behind the males. 4. There are two waiting-rooms, one for male, the other for female patients, with different entrance-doors.

The latter plan is the best where a great many patients attend at one time; but of course the most expensive as regards building and warming. No. 3 is not very convenient, as people cannot get out if once seated. The heating may be effected by hot-water pipes. Where low and plain seats are found, one superintendent can easily overlook the whole.

The waiting-room need not be very light, but occupy that portion of the building in which lighting is the most difficult. For ventilation the windows must be properly constructed, and have louvres.

The Consulting Rooms.

They are divided from the waiting-room by lobbies, and are well lighted. Patients enter by one door, and leave by another. The rooms contain a lavatory in a recess of the wall, and cupboards for instruments, case-books, microscope, and cloth-racks. A table is in the centre, a mahogany couch, for examination in horizontal position, at the side; it should not be so low as usual; some consulting and other chairs complete the furniture.

The private examination-rooms may be small, or replaced by glazed partitions or high screens.

Management of a Dispensary.

The affairs of a dispensary are managed by a committee. The members, twelve or fifteen in number, are elected annually by the

subscribers. The committee meet about every alternate month, and transact business in the usual manner. Some of the members are house visitors. The medical officers are consulting physicians, consulting surgeons, physicians and surgeons, dentist, and resident medical officer. They are appointed by the committee, who follow the advice of their medical officers for the time being. They can leave by giving a short notice. The resident medical officer is appointed for three years, after which time there is a re-election. As a rule he should not be re-elected. The resident officer visits in-patients. He should devote his whole time to the duties of the institution.[1]

The dispenser is under the special superintendence of the resident medical officer, but has to comply with the orders of the physicians and surgeons. He lives in the dispensary.

The housekeeper attends to her usual duties as regards cleaning and attendance. She applies for anything she wants in the first instance to the resident medical officer. She is engaged by the latter, but dismissed by the committee if there are complaints.

Medical officers attend at regular hours, either a physician and surgeon on the same day, but one earlier than the other, or on alternate days. They do not keep lists of the patients, but only make memoranda on interesting cases in the case-books. Each of them may have his own case-book.

Patients must behave properly, return thanks when discharged, and comply with such rules as are made regarding the medicines and drugs.

VI.—IN-DOOR RELIEF BY VISITING THE POOR AT THEIR HOMES.

No one has, so far as I know, made this matter a special subject of discussion and scrutiny, although the assistance supplied by visiting the poor is only secondary to that given by hospitals or infirmaries.

Opinions greatly differ as to the manner in which these things should be managed, and it is not uninteresting to compare this metropolis and others in this respect. From what I read, mentioned in police reports or on other occasions in the public papers, and from personal inquiries, I am led to believe that in London the

[1] *See* Reading Dispensary.

sick poor have more difficulty in getting this kind of assistance than they have elsewhere.

As regards Paris, the visiting service (*service à domicile*) was reorganised in the year 1853. It is in connexion with the Bureaux de Bienfaisance, which are under the general administration. Paris is divided into twenty districts; each has a bureau either at the mairie or at a house selected for the purpose. The mayor (for the time being) is president. There are "adjoints," a secretary, one or two assistant secretaries, one or two sisters of charity, religieuses, and midwives. The total number of medical officers attached to the twenty bureaux is 180. They receive a small salary, and see patients at the bureau, or the maison de secours belonging to it, and visit them at their homes. The sisters generally dispense medicines; they visit the poor as well, and are in some manner a check on the physicians. The sisters supply the poor with necessaries, as wood, milk, wine, etc.

In Berlin a Poor-Law Board exists. The city is divided into districts. Each has a committee and a salaried medical officer attached to it. He sees poor patients at his house, and visits them—a district contains about 15,000 or 16,000 inhabitants. The guilds also pay medical men, who have somewhat larger districts, but attend only to male patients. All members of the guilds are bound to pay a small contribution to the sick fund. (*See* also Policliniques.)

In Vienna the assistance of the sick poor at their homes is under the control of a Municipal Board (Armendeputation beim Magistrat).[1] The city is divided into the city proper and the suburbs. The city proper has six medical officers; some of the larger suburban districts have two such functionaries. The districts are generally somewhat larger than in Berlin. There is an institution called Ordinations-Institut in almost every district, but patients receive there only medical advice and medicines gratis, and are not visited. The visiting officers have, however, less work to do since these institutions were established.

In all the said cities the medical officers make regular reports to the administration.

As regards Italy, I may mention that till recently religious orders not only dispensed medicines for patients, but in some towns monks visited them and supplied physic.

The poor-law medical officers on the continent, as a rule, only prescribe the medicines, which are made up in the city by the chemists, who are paid by and give a discount to the Board, or the

[1] Oppert, *Medicin. Centralzeitung*, 1857.

medicines are dispensed by functionaries paid by the Board. A special pauper pharmacopœia usually exists.

In London the unions are divided into districts, and the medical officers are salaried for giving advice, visiting, and dispensing. Recently some have been appointed who do not dispense medicines. As regards the districts, the greatest inequality prevails. Some contain little more than 1000, others nearly 40,000 inhabitants. There are, however, many districts containing 10,000 or 15,000. Some of the metropolitan dispensaries undertake to visit the sick poor.

It seems that there are several reasons why the number of poor-law medical officers is not adequate to the work of visiting the poor. In the first place, that they lose a great deal of time by attending to the dispensing; secondly, that the distances are great, in consequence of the dwellings covering a larger area than in continental cities, where they have higher houses; thirdly, the pauperism is greater in this metropolis, and the charges for medical attendance comparatively higher, by which circumstance the number of applicants for gratuitous advice increases; lastly, the number of midwives is comparatively small, and comparatively more midwifery cases are attended to by poor-law medical officers than on the continent.

It would be a great advance and improvement if medical officers had nothing to do with dispensing, the medicines being supplied by the parish.

Moreover, a great evil has arisen in consequence of the duties being performed by deputies. Some poor-law medical officers keep their appointment for many years, even for life; but it is only in the commencement they work without assistance; in course of time the work gets into the hands of young assistants. By this younger members of the profession are prevented from obtaining an independent position, and those do the work who are not responsible.

APPENDIX.

USEFUL WEIGHTS AND MEASURES.

1 cubic foot of pure water = 1728 cubic inches (Eng.) at 60° Fahr.
1 gallon „ = 0·16 cubic feet.
„ „ „ weighs 10 lbs. (avoir d.) at 60° Fahr.
„ „ „ = 4·54 litres (French) = 160 ozs. (Eng.)

1 litre of pure water	=	0·22 gallon.
1 centilitre „	=	0·002 gallon.
1 gallon „	=	8 pints = 4 quarts.
1 pint „	=	20 ozs.
1 ounce (avoir d.) „	weighs	437·5 grains.
1 litre „	=	35·2 ozs. (Eng.)
1 quart (Prussia) „	=	2 pints.
1 kilogramme . .	=	2·20 lbs.
1 decigramme . .	=	154 grains.
1 gramme . . .	=	15·4 grains.
1 pound (avoir d.) .	=	7000 grains.
1 kilometre . .	=	3280·899 feet (Eng.)
1 metre . . .	=	3·28 feet (Eng.) = 3·489 feet (Hamburg) = 3·539 feet (Leipzig) = 3·186 feet (Prussia) = 3·163 feet (Austria) = 3·28 feet (Russia).
1 centimetre . .	=	0·328 foot.
1 square metre . .	=	10·151 quadrat feet (Prussia) = 10·764 square feet (Eng.)
1 klafter (Austria) .	=	6 feet (Austria) = 1·896484 m.
1 acre . . .	=	4046·6944 square m.

To convert metres into feet, multiply by 33, and cut off as a decimal one figure to the right. There will be an excess of about 1 foot, correctly 0·955, in the conversion of every 50 metres.

1 foot (Eng.) . .	=	1·029 foot (Prussia).
1 cubic metre . .	=	35·31 cubic feet (Eng.) = 32·345 cubic feet (Prussia).
1 litre . . .	=	61·027 cubic inches.

PART II.

DESCRIPTION OF HOSPITALS AND INFIRMARIES.

Initial Nomenclature.

Sc. generally means Scullery ; N. Nurse ; I. Ward ; St. Stairs ; L. Lift ; D. Door ; W. Window ; La. Lavatory.

AMERICAN HOSPITALS.

THEY resemble the English institutions as regards construction and administration. Although founded, almost without exception, by private charity, they often receive subsidies from the municipality or Government. The management is in the hands of committees, elected every three years by the governors ; and the medical officers are generally honorary. The hospitals are general ones, and every disease is admitted ; but small weekly payments are usually expected. The wards are warmed and ventilated by open fires, some heated by steam pipes ; and many modern improvements are found, which are a credit to the well-known ingenuity of Americans (*see* locker-tables). A lavish amount of money was spent and is being spent in some of the charitable buildings on the fittings, furniture, instruments, and medical necessaries.

During the late war 214 temporary hospitals, containing 134,000 beds, were erected in four months' time. The largest contained about 4000 patients, and it is stated that no hospital diseases were prevalent. Some buildings were badly lighted and ventilated, as the pressing necessity did not allow them to make the best arrangements. Most had only one floor, and were built of wood. Magazines and barracks were converted into hospitals, but some new buildings were erected on the pavilion plan. Besides this, floating hospitals on board ship were arranged, to follow the armies on the large rivers.

Baltimore.

The splendid John Hopkin's Hospital, Baltimore, is only half finished. It stands in 14 acres of ground, and is on the pavilion plan. An administrative block is connected by covered ways with

the other buildings. The large wards are warmed by open fireplaces and hot pipes, and ventilated by large flues into which the foul air is aspirated. There are octagonal wards in the hospital. Another seven years are supposed to pass before the hospital is finished.

Boston City Hospital

was founded in 1864. It is composed of a central building, four pavilions for patients connected with the former by curved corridors, and some outbuildings. It accommodates about 300 patients. The centre building is for administrative purposes; it has a higher elevation than the pavilions, and possesses a cupola under which an amphitheatre is arranged. Two pavilions have two floors over a basement and attics, the others have additional floors. There are large wards, 80 feet long, 27 feet wide, and 16 feet high; and small wards containing only two or six beds respectively. There are more than 30 small wards.

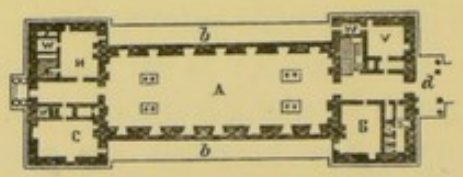


Fig. 4.—Pavilion of the Boston City Hospital, U.S., America.

A. Ward. C. Convalescent room. S. Water-closets.
B. Ward. W. Closets.
b, terraces; *v*, scullery; *d*, portico.

The large wards have 14 opposite sash-windows, and are warmed by steam, circulating in pipes. Fresh air is driven in by a fan worked by steam, and enters the wards after being warmed. There are outlets in the walls for vitiated air. The water-closets and lavatories are arranged at the small sides, and a verandah runs along a few of the lower wards. Balconies are found at the outer end of the pavilions.

The hospital has a library, an out-patient department, ophthalmic wards in the basement of one of the pavilions, and a skin department. The medical cases outweigh the surgical ones. Patients are either admitted by the medical superintendent or visited at their homes by the admitting physicians, who often refuse admission.

The management is in the hands of trustees. About twenty medical officers visit the hospital, six *internes* live in the house.

The average mortality is about 8 per cent.

Boston Free Hospital.

This building, recently constructed, is on the pavilion plan, and

the connecting corridors have the peculiarity that they form a curved line. The four larger pavilions have a length of 117 feet. They are only two floors high over a basement, and each ward accommodates fifty patients, who receive ample cubic space (1600 c. feet). The water-closets and baths are at the outer end, a nurse and separation-room at the other. Small wards are in the block (*a*), and the administration is located in the centre (*b*). (*See* next page.)

Chicago.

The general hospital is a pavilion hospital, called Marine Hospital. The large wards have 28 beds, and are ventilated by extraction of vitiated air. For this purpose shafts are found, measuring 2 feet in one direction and 3 feet in the other direction. They are heated by hot steam pipes placed at the bottom.

Dixmont.

The Western Pennsylvania Hospital, Dixmont, established 1861, has a middle block, 61 feet long, and two side-wings in a line, 345 feet long each. The middle building has four floors, the others three. In the wings about 250 patients may be accommodated. The smallest ward is 10 feet long and 8 feet wide. The corridors have a width of 12 feet, in the centre even of 17 feet, forming halls.

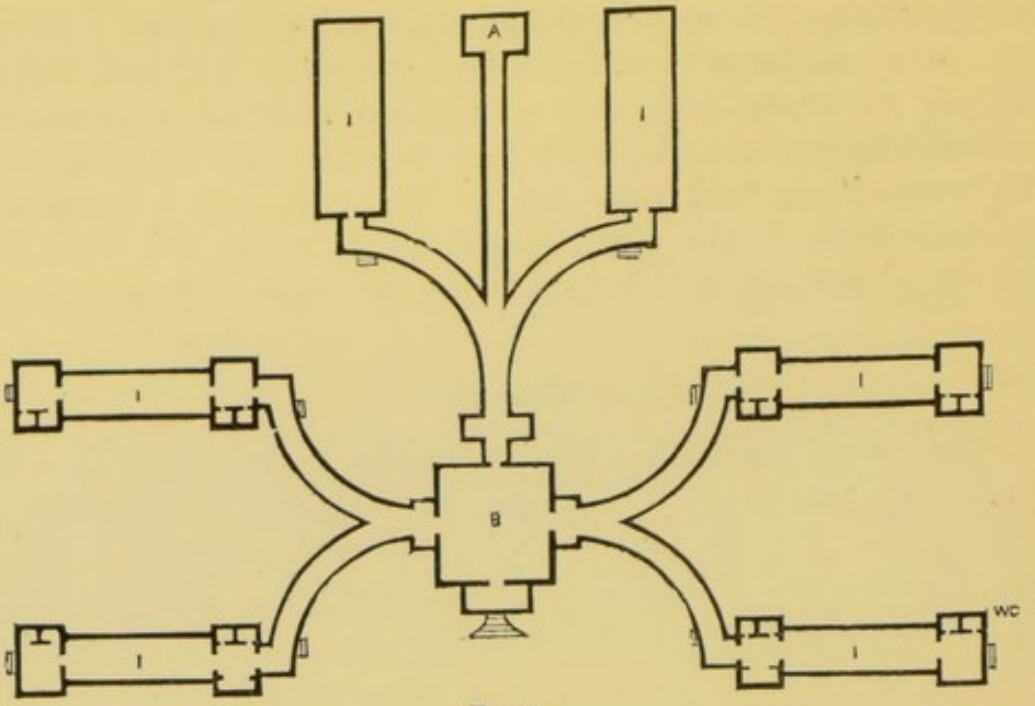
There are 12 dining-rooms, 8 sitting-rooms, 12 bath-rooms, etc. The warming is by hot air rising from a chamber where steam pipes are found. The vitiated air is withdrawn by ventilators.

Hammond Hospital, on the Chesapeake Bay, a Military Hospital built temporarily during the War,

for 780 beds. As seen by the woodcut (see next page), a number of separate blocks stand in a circle, and the administrative buildings, connected with them by galleries, are in the centre. The pavilions, one floor high, had ridge ventilation; each contained 52 beds. Thirty-six feet was the distance between two contiguous pavilions at the inner side.

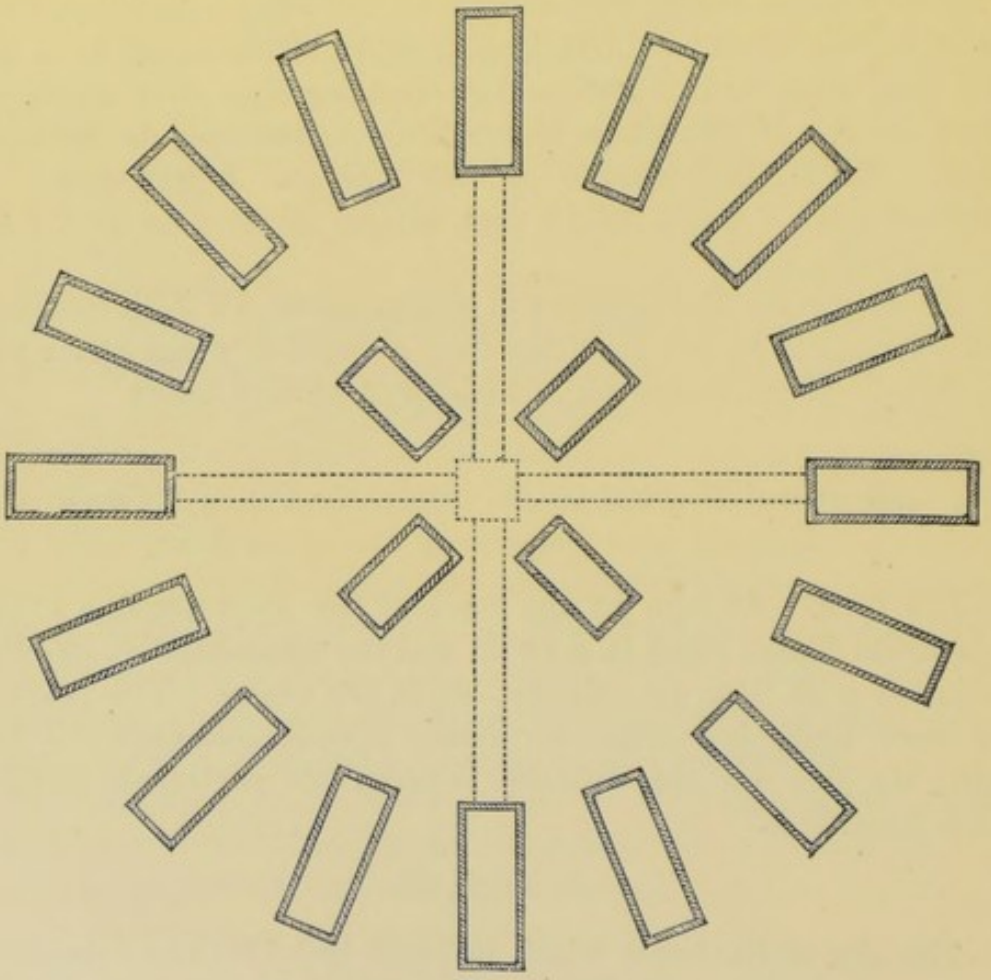
St. Louis, Mo.

The city of St. Louis, which in 1863 had 100,000 inhabitants, and three hospitals containing about 400 beds for patients, now numbers about 450,000 inhabitants, and possesses a good number



Front.

Fig. 5.—Boston Free Hospital.



Front.

Fig. 6.—Hammond Hospital.

of charitable institutions. Part of these are under control of the city, and the following is a list of them:—The female hospital, containing 225 beds; the city hospital (for males), 475 beds; the quarantine and smallpox hospital, 150 beds; the insane asylum, 400 insane; poorhouse, poor department, 350 inmates; the same, 400 insane.

There are in St. Louis fourteen hospitals besides, which are controlled by different religious denominations and others—for instance, the St. Louis Hospital, managed by sisters of charity, who have here their mother house. There is also one U. S. Marine Hospital.

During the Civil War nine hospitals were built, which could accommodate 4000 soldiers.

New York.

This capital, with more than a million of inhabitants, possesses public or state hospitals and others supported by the municipality and voluntary contributions. The former are under the New York Commissioners, four in number, appointed by the comptroller of the city, and these have their office in town. These hospitals, with other institutions under the same management, are situated on the islands of the large Hudson River (East River), Blackwell Island, Ward's Island, and Staten Island, but easily reached by the steam ferryboats plying on the river. They are the Convalescent Home, the Large Charity and the Incurables' Hospital, the Lunatic Asylum, the Smallpox Hospital, the Emigrant Hospital, and Seamen's Hospital, the latter on Staten Island. Every one who cannot afford to pay is admitted free into these charities.

One of the oldest and the largest general hospital in the city is the Bellevue Hospital. About ten years ago 900 patients could be admitted into 35 wards; but now the number is stated to be 1200. It is built on the corridor and many-storied plan, but the recent additions are one and two floored pavilions. The old part has five floors over a basement, and attics. A solarium in place of a garden is found on the top of the house, and lifts are arranged to carry patients upwards in their beds. The largest wards have a length of 50 feet, a width of 30 feet, and opposite sash-windows. The warming is by fireplaces and hot pipes. The walls are lined with marble.

The Sturges' pavilion for surgical patients (25 males and 4 females), is built almost entirely of brick and iron, only the ward-floors are of wood, the window-casings of iron. The roof is of slates, and slopes from the centre to the sides. The water-closets, baths,

and lavatories, are built in projecting parts, and have tiled floors. For warming we find fireplaces and steam pipes, for ventilation ridges in the roof and outlets leading into the large smoke-shaft. There are also ventilators on Sherringham's principle.

Two new wards, 16 beds each, one for women and the other for children, have been opened a few months ago. These wards are in a handsome pavilion erected on the hospital grounds by private munificence, and costing about 35,000 dollars. Besides accommodation for nurses, etc., in this pavilion there are rooms for operations of ovariotomy.

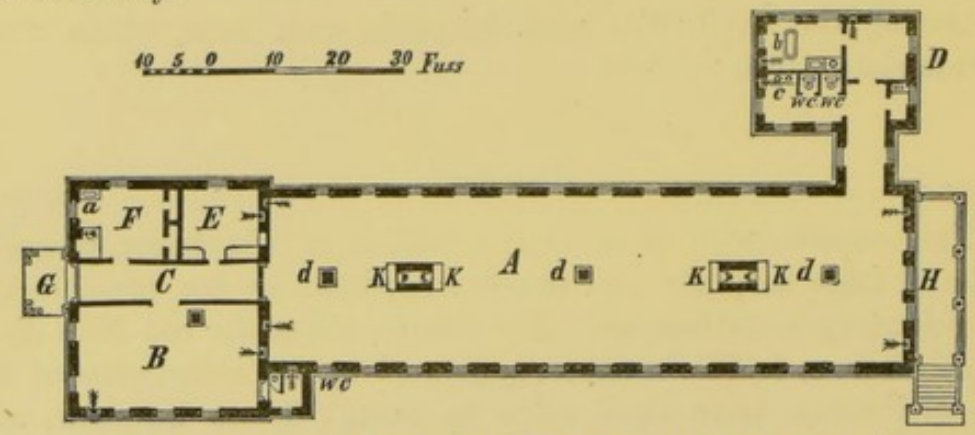


Fig. 7.—Sturges' Ward, Bellevue Hospital, New York.

A. Men's ward. D. Attendant. G. Entrance.
B. Women's ward. E. Nurse. H. Verandah.
C. Corridor. F. Ward-kitchen and dining-rooms. K. Fireplace.
a, sink; *b*, bath; *c*, lavatory; *d*, steam coils.

Of recent improvements are to be mentioned ambulance carriages and a photographic gallery.

Many patients pay by the week; seamen who cannot afford it are paid for by their consuls (four dollars a week).

The recent hospitals of New York, mostly small ones, are built on the pavilion plan, and two floors high—St. Luke's with 150 beds, St. Vincent's, Mount Sinai for Jews, a Negro Hospital, and one for foreigners; the Lennox Hospital, and an infirmary in the Second Avenue are mentioned; with the latter a female college is connected.

The Roosevelt Hospital,

for more than 200 beds, is one of the largest recent institutions. It consists of a central portion and four pavilions for patients. There are three ward-floors over a basement, and the distance between two contiguous pavilions measures 27 m. 50 c. The large wards are 32·3 m. long, 9·14 m. wide, and 4·57 m. high. The cubic space for each patient is 48½ cubic m. The warming is partly by artificial means (steam).

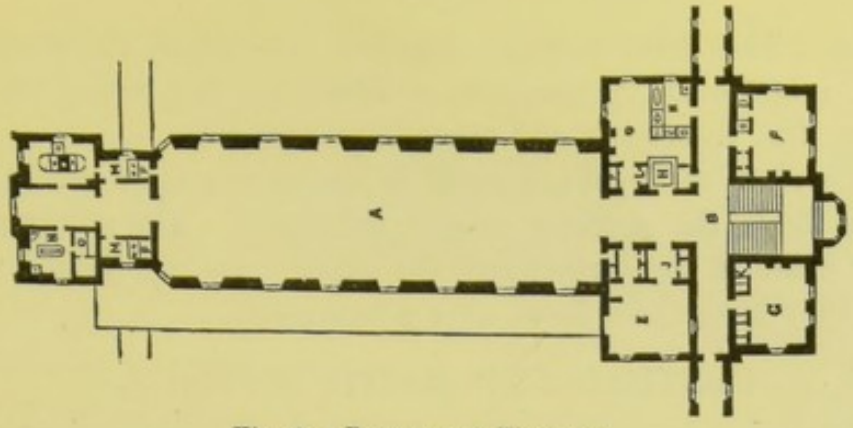


Fig. 8.—Roosevelt Hospital.

A. Ward.
B. Stairs and corridor.
D. Nurse.
E. Ward-kitchen.
F. Medical officer's room.
G. Convalescents' dining-room.
H. Lift.
I. Linen stores.
K. Utensils.
L. Closet.
M. Lavatory.
N. Bath.
O. Roman bath.
P. Air-duct.

The German Hospital,

built on the pavilion plan, was opened (part of it) 1869, and can now accommodate 150 patients, including the new women's pavilion added quite recently (March 1882).

The large wards are 106 feet long, 27 feet wide, and 16 feet high. Each patient has 1431 cubic feet of air. The cost of building was £150,000.

A committee of German gentlemen is at the head of the affairs, assisted by a Medical Board of three of the physicians. There are sixteen medical officers who visit the wards, and five who reside in the house. An out-patients' department is connected with the hospital, and twenty-one medical officers attend there.

The funds are raised by voluntary subscriptions and collections, also by patients' payments. Twelve subscription beds are paid for by twelve subscribers, who contribute 336 dollars a year each. The mortality was $8\frac{3}{4}$ per cent in 1881.

Philadelphia Temporary Hospital

was built on the pavilion plan; the connecting corridors were 14 feet broad and of considerable height. The blocks, one story high, of wood, contained large wards for 48 beds, and smaller ones of different sizes.

Asylums.

The asylum of Pennsylvania was opened in 1859 as a refuge for 250 lunatic patients. In its construction it resembles the Vincennes Military Hospital. More recently, in 1876, an asylum was opened at Indianopolis for 600 inmates. It has a central building for administrative purposes, and blocks four floors high over a

basement. They have central corridors into which the wards open and are intersected by staircases. There are day-rooms with bow-windows, lifts, tramways, and other improvements.

The asylum at Topeka, Kansas, is one of the most recent. The buildings have the corridor at one side only. The administrative block is found in the centre, and the other ones are joined to it as wings; they have three floors over a basement.

CENTRAL AND SOUTH AMERICA.

In Central and South America hospitals are comparatively scarce. Belot's Hospital, Garcini's, and Quinta del Rey, are mentioned in Habana. Five hospitals exist in Valparaiso, viz. 2 English, 2 Chilene, 1 French. Rio has a large one with verandahs.

AUSTRALIA.

The largest hospitals are in Melbourne and Sydney, but they are much smaller than in Europe; the general one in Sydney contains about 200 beds. Many hospitals exist with 12 or 15 beds. The largest number of inmates are in the asylums, one being mentioned with 500 beds.

The management generally is in the hands of committees. In Melbourne a medical school is connected with the hospital, and the municipality grants as high subsidies as are reached by the voluntary contributions. An additional building was recently under discussion.

The visiting is generally undertaken by the hospitals as regards the better classes, but district medical officers attend to the "aborigines."

A new asylum is found near Melbourne. The principal blocks are at the sides of a large court—the males on one side, the females on the other. Side courts are formed by projecting wings. In the middle of the large court an administrative block is situated, containing kitchen, water-tanks, conversation-room, etc. The work-shops are at a distance from the entrance-gates. The plan of building reminds one of Colney Hatch, many small wards opening into long passages.

The newest asylum seems to be that of Callan Park, opened in 1879; it has 100 acres of ground, and is built on the pavilion and corridor plan combined, for 616 patients, after that of Chatham, Kent, England.

BELGIUM.

New hospitals have been built or new parts added lately to old buildings, modern principles of hospital construction being adopted. At Antwerp, Gand, Liège, and Mons, such buildings may be visited.

Antwerp (Anvers).

Antwerp is the largest seafaring place of Belgium, and contains, in addition to the old general hospital in the centre, a new one not finished yet in the outskirts of the town. The latter lies in low ground (about 11 acres) and is being constructed on a novel plan, the ward-blocks being of a circular instead of an oblong shape. Otherwise the pavilion style is adopted, and the pavilions are connected by open passages which form an oblong octagonal court. Inside the chapel and administrative buildings are found, outside the wards with their appendages in turrets at the outer end. The usual outbuildings, as laundry and engine-house, are remote from the principal entrance. Close to the latter is the director's house, the priest's house, casualty-rooms, operating theatre, and mortuary, the latter with an entrance from a side street. The wards,[1] two in each tower, still in course of construction, have a diameter of 66 feet and will contain 20 beds, each standing near to the outer wall. The cubic space for each patient is about 2500 feet. The water-closets and lavatories are divided by a short passage from the wards, and these passages may be ventilated by cross draughts. Single wards and convalescent rooms are arranged at the inner side.

We believe that a circular ward may be as easily warmed, ventilated, and kept clean as an oblong one, but that the costs of construction are necessarily a little higher. Whether the patients who live in and are used to rectangular rooms will feel as comfortable in a dome or circus like ward seems questionable.

Brussels.

The administration of the hospitals, hospices, and the general system of relief to the sick poor in Brussels, is carried on in much the same manner as in Paris. There is a central board (*l'administration générale de l'assistance publique*) and a president (*en chef*), at the head of it. Besides the two principal hospitals, Brussels has a maternity institution, where midwives are trained, and *bureaux de bienfaisance*. *Religieuses* and *sœurs de charité* attend to the nursing.

Hospital St. Jean, Brussels.

The buildings forming the hospital cover a large piece of elevated ground in the town of Brussels. There are large gardens in front, but the other sides are surrounded by houses.

[1] *See* Fig. 1, No. 12. A. Ward; B. Appurtenances; C. Corridor.

The front buildings surround a square yard. The general administration of all the hospitals and hospices of Brussels has its offices here; there are also the private rooms of the director, and of the medical officers; the dispensary, library, museum, and baths, patients' clothes-room, porter's lodge, etc., in this part.

Behind it we find the pavilions for the patients—five on the left, and four on the right side; and the amphitheatre in place of the fifth. Separate are the wards for the insane, the dead, wash-house, engine, and post-mortem room. The pavilions are connected by a gallery on the ground and first floor.

The wards are 92 feet long, have opposite windows—five on each side, and one at the end, the latter opening on to a balcony. They contain 24 beds, 2 between two windows, having a space of hardly 3 feet between them; the opposite beds are at a distance of 12 feet. The ceiling is arched about 16 feet from the floor; the latrines (*a*) and a private room (*b*) are built out at the one end, and the nurses' rooms (*c*) and a kitchen (*d*) are near the common corridor.

Fig. 9.—Pavilion of Hospital St. Jean, Brussels.

There are iron stoves for warming, and eduction channels for foul air which lead into shafts opening above the roof. Of course this is an unsatisfactory arrangement, because the air often comes back into the wards. The floors are of wood and polished, the walls very plain. The grounds and gardens are much frequented by convalescent patients.

Hospital St. Pierre.

This hospital lies at the other end of the town and has 597 beds. It receives principally patients with syphilis and cutaneous diseases. There is a long building in front where offices, officials' residences, stores are found. Behind this, parallel with it and in a line lie other buildings where the patients are accommodated, three in number. They contain large wards with opposite croisées windows, are warmed by stoves, and mostly three rows of beds. New structural additions were added in a peculiar manner about ten years ago. At the back of the blocks half-moon shaped build-

ings were constructed containing passages. These give access to two pavilions whose ends diverge from each other (similar to the Alexandrow Hospital in St. Petersburg). The wards have three windows on each side and one end window, waxed floors, 16 beds, vaulted whitewashed ceiling, are warmed by open fires and stoves, and there are some ventilators in the walls. Medical wards are on the ground-floor, surgical ones on the first floor.

Patients affected with itch are subjected to a treatment of a few hours, and then discharged cured. They have a soda bath of an hour's time, are then rubbed with a strong sulphur lotion, and have another bath afterwards.

There are wooden baths, 23 in number, for their use.

Gand Hospitals. The General Hospital.

There is a new hospital added to the old one and differing from it in a curious manner. In the Middle Age there existed an old abbey of the Bernardines, still found behind the hospital, and the latter originally was a leper house in connexion with the cloister. The old part has large wards with arched ceilings and opposite windows high up from the floor. The clinical ward has 16 beds, and answers modern principles. Others, however, are of immoderate height and divided by partitions made of bricks into irregular portions. These partitions interfere with ventilation, especially where they are double, forming small passages. The light comes through high windows blind with age. The latrines are separated from, and approached by, passages from the wards. The old chapel was transformed into post-mortem rooms. Lavatories are found in an airy shed.

A fine new hall, spacious and well lighted by coloured windows, must be passed before you enter the new wards. They lie in single-storied pavilions, and have large opposite windows, and contain 28 beds. They are warmed in winter-time by hot air, which is injected by a fan. The latter made a considerable noise at the time of the visit. The openings for warm air seem to be too near to the floor. There are upper ones for withdrawing foul air. There is also a children's ward. The appendages, viz. water-closets and nurses' rooms are well placed.

There is a new Maternity added to the old one, both affording accommodation for 24 inmates. There are corridors from which the wards are entered, and it seems not to be a judicious arrangement that short passages branch off from the principal ones. There are iron stoves with air-chambers for warming. A number of babies' cots are in a large room, and they can be rocked by a string simultaneously. Midwives and students are educated at the hospital.

The well-known asylum "Hospice Guislain" lies near Gand. It is one of the 51 asylums which Belgium with about five millions of inhabitants contains. It consists of pavilions connected by open passages. The large wards have generally windows on one side only, and the latter have gratings of zinc in their lower part. Iron stoves with air-chambers are found and ventilators in the walls. Cells are situated between two half-moon shaped corridors, which may be warmed. There were about 500 inmates at the time of the visit.

Liège Hôpital de Bavière.

This manufacturing town has an old hospital dating from the seventeenth century and a new one for surgical cases. The buildings are of irregular shape. The old wards have windows high up from the floor as in Vienna, stone floors, high ceilings, and nothing above but the garret. Iron boards are fastened to the bedsteads, replacing side-tables. The beds have white curtains all round, which the patients like to close. The treasurer is a monk, the nursing is by sisters of charity. The hospital is under a commission of "hospices." Lectures are given at the hospital.

DENMARK.

There are not many hospitals in Denmark; poor-law medical officers still generally supply the medicines. The metropolis has two Military Hospitals, two old Civil Hospitals for about 400, and a new one, opened 1863, also a Maternity and a Workhouse and a new Barrack Hospital for infectious diseases at Oeresund, approached from the seaside by barges. A system of wheeling off the contents of the privies exists in most Danish hospitals.

Copenhagen Hospital

is an extensive building, which may accommodate 800 patients. It is built on the corridor plan. The main portions stand around a large rectangular yard, and six wings extend side and backwards. The wards are on three floors, and contain 10, 5, and 2 beds; they are warmed by hot air injected by a fan. The corridors are 10 feet wide and warmed in winter by hot-water pipes. There are water-closets outside the passages, also lifts, improved baths. The larger wards are 30 feet long, 24 feet wide, affording about 1100 cubic feet of air to a patient. There are about 100 small wards, and it may be questionable whether it

was judicious to split up the hospital into so many rooms. A committee is at the head, the Burgomaster and the senior physicians being members. Patients' payments cover the third part of the expenses, the rest being levied from the inhabitants. An asylum for lunatics stands detached in the grounds, but only acute cases are admitted before being removed farther off. Smallpox wards are also detached in the grounds.

ENGLISH HOSPITALS.

Although in this country some of the charitable institutions owe their origin and existence to the Government, or a board connected with it, yet the greatest number are offsprings of private benevolence, and supported by voluntary contributions. Although the various charities are unconnected with each other, yet the sick poor are generally well cared for, and as the time is not far distant when those institutions which are not in accordance with an advanced age will be improved, English institutions need not fear criticism and comparison with others.

The hospitals are generally managed by committees; the rules and regulations are of great simplicity compared with those of continental establishments, and of great similarity, although made independently of each other. The construction of some buildings—especially in the Black Country—shows great architectural ingenuity, and modern improvements are added almost daily.

By means of Samaritan funds, the care bestowed on the patients is extended beyond the period of their stay in the hospitals, and the convalescents, when they leave, are assisted with money grants, as they are unfit for immediate work. The necessity of having more convalescent institutions in the country begins to be fully realised.

That the medical officers of infirmaries supply medicines by contract is not uncommon at present, but boards of guardians and committees already appreciate the advantages of a different system.

Public dispensaries exist in greater number, and reach a higher standard of perfection in this than other countries, but the visiting of the poor at their habitations undoubtedly requires improvement.

Bath United Hospital

is partly an old, partly a new building, in the shape of the letter **T**. The wards lie behind and in front of a transverse corridor, which is heated by hot air.

The hospital contains 120 patients.

Birmingham Hospitals.

Birmingham General Hospital. It dates from the year 1779, and was originally a building with a centre and two side wings extending backwards; the former is traversed by a central corridor. But lately new wings have been added. The site is unfortunately a bad one; the building lies low, and the hospital is surrounded by manufactories, but originally it stood in the open country. It contains now about 280 beds, and the new wards are on improved principles. In some wards hot air is used for warming in addition to fireplaces. Ventilators are found in the ceilings, but the principal means of ventilation are the windows. Convalescents are sent to Seaford, Rhyl, and New Brighton.

Queen's Hospital. This is quite a recent building, and accommodates 140 patients; the large wards hold mostly 18 beds. They are warmed by open fireplaces, and there is no artificial ventilation, but openings for admitting fresh air are found in various places of the wall and ceiling. The windows are kept open even during part of the night.

The fever-house is a separate building at the back. Lectures are given at both hospitals.

Birmingham has, moreover, an Orthopædic, an Eye-Hospital (50 beds), one for children (72 beds), one for women (18 beds), one for ear diseases (20 beds), a Lying-in, and a Lock Hospital.

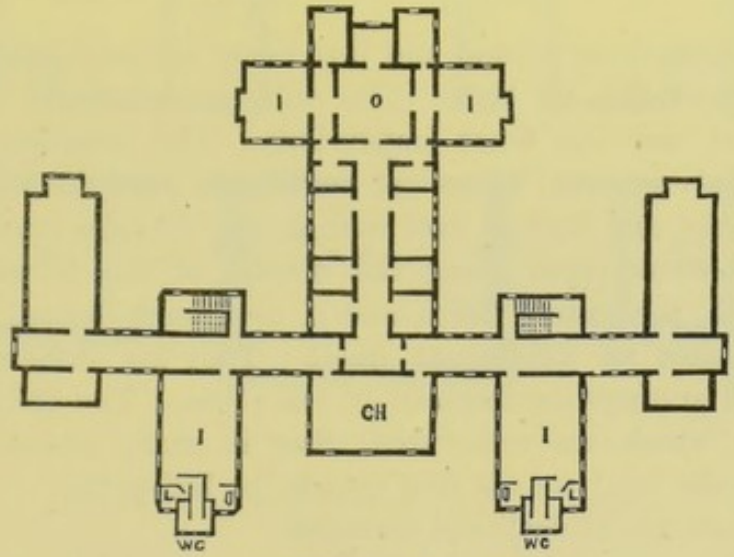
Blackburn Infirmary.

The Blackburn Infirmary is situated near Blackburn, a small town 24 miles distant from Manchester. The hospital stands on an elevated piece of ground outside the town near the railroad, and is conspicuous from a great distance. The building is not yet half finished; but is intended to form 8 pavilions and a central building. At present it accommodates 40 patients. It is constructed on a mixed plan, half-pavilion and half-corridor. The passage, which is spacious (nearly 9 feet wide), runs through the centre on both the ground and first floor, having promenades overhead. The pavilions are divided by this corridor into two unequal parts, one about 14 feet and the other 40 feet long. By this arrangement there is a space of 50 feet between the principal wards. The entrance-hall is very spacious, and warmed by hot flues, but it is not used; the hospital is entered by a side-door.

The larger wards for eight patients are very fine. They are lofty, 16 feet high, have opposite sash-windows, and the walls coated with

Parian cement. The windows extend to about 4 feet below the ceiling, and in the intermediate space are tablets of perforated zinc similar to those in railway carriages. The patients complain of cold, as there are ventilators besides in the ceilings and apertures in and near the flooring.

A cubic space of more than 1800 feet is allotted to each patient. Each has a clothes-box which forms the lower part of a chair and makes it look like a night-stool. Each ward has four fireplaces, two at each end; the closets are ventilated by open windows and gas-burners in a flue. There are a few baths of painted iron; they resemble marble, but the colour does not appear to keep well.



Scale—$\frac{1}{8}$ of an inch to a foot.

Fig. 10.—Blackburn Infirmary (First Floor).

There are nurses' rooms, lavatories (L), day-rooms, foul-linen shafts, lifts, speaking tubes, and a medical library. The necessary private rooms and common dining-rooms are arranged satisfactorily.

There is an operating-room (O) in the central part, and small wards near it; the passages leading to them are very narrow. The chapel (CH) is on the other side of the corridor.

The dispensary is light and airy. Out-patients enter by a separate door; but the consulting-room has only one door for patients to enter and go out by.

The kitchen is not in a separate building, but in the basement. Dead-house, wash-house, and engine-room are detached.

The infirmary is kept in a perfect state of cleanliness, and in many respects worth a visit by those who may be in the neighbourhood.

Bradford Infirmary.

The rising town of Bradford contains two modern institutions.

The infirmary was completely rebuilt and has now the shape of a letter H, the old part forming the centre. It has only recently been completed, although some wards were finished three years ago. It contained at the time of my visit 75 patients, but is destined to accommodate 150. The old part has a very fine corridor 9 feet wide, and the wards on the first and second floors are in front; a few wards are at the back. On the ground-floor we find offices and a fine entrance-hall, which is not used, as the entrance is by a side-door.

The end wards on ground and first floors are very light, lofty, and airy. They contain 23 beds. The walls are plastered, the ceilings whitewashed, and the floors impervious. The windows are sash-windows, and opposite; there are ventilators over the windows and in the ceilings, and louvres over each door. Besides open fireplaces we find hot-water pipes along the middle of the floors; they are covered with perforated plates, and if too much heated have been found to cause an unpleasant smell. They are difficult to clean, because the gratings are fastened to the pipes. The beds have iron foot-boards, which are removable; they in many places stand too close. At the head we see iron frames for bed-pulls.

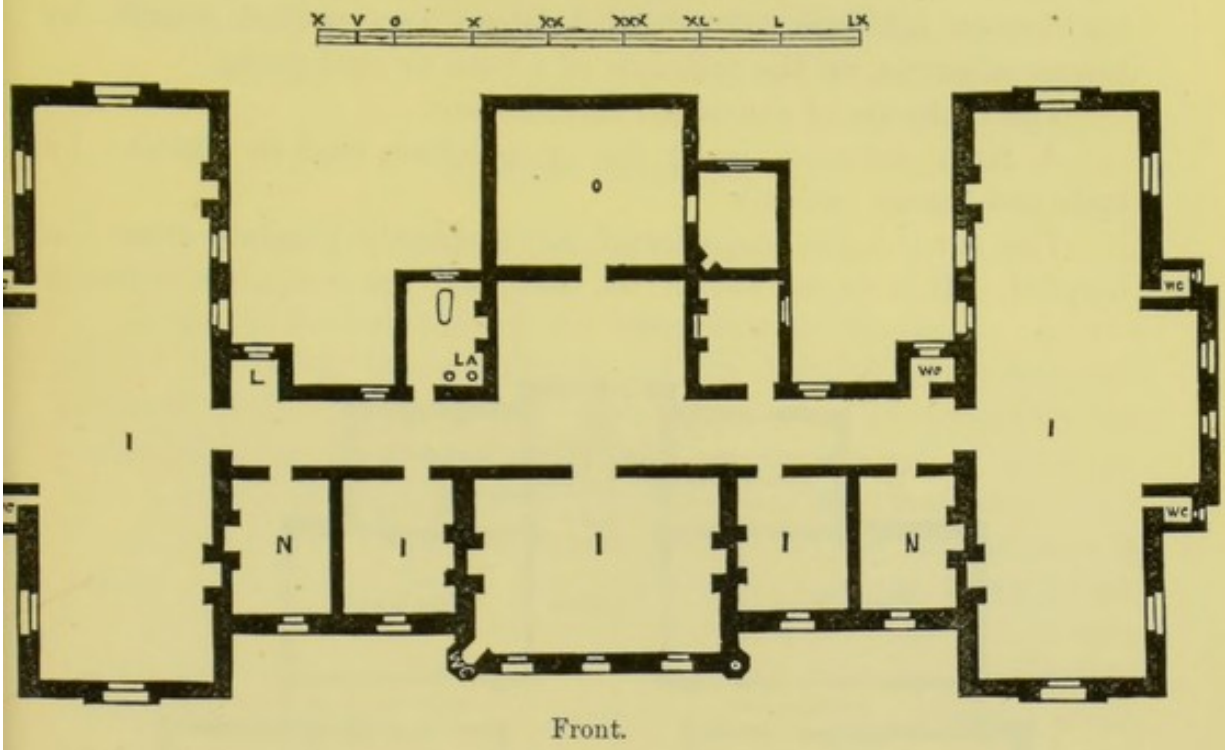
The floors are of deal, and scrubbed.

There is a large and light operating-room which receives light from above and through a side window. A patent operating-table stands in the middle. There is a spacious kitchen, which has too large a range. Vegetables are boiled by steam.

The baths are of earthenware coated with enamel. The wash-house is separate, and has some modern appliances. The proceeding is as follows: The foul linen is first put in earthenware tubs, standing round the wall, where the stains are rubbed out with soap, soda, and a little ammonia (a patent fluid was tried, but found to spoil the cloth); the cloth is then partly boiled by letting some steam into the said tubs; when taken out it is subjected to the action of a wheel[1] turned by a handle, and wrung by passing through wooden rollers. It is then dried and taken to the laundry. Here we find the usual drying ovens and mangling machines. A new dead-house was in course of construction, attached to, but not communicating with, the principal building. A nurses' room was to be built over it.

[1] Bradford's patent washing, wringing, and drying machine. Cathedral Steps, Manchester: £15, 15s.

The out-patients are seen on the ground-floor; they have a separate entrance, and there are two waiting-rooms—one for medical, the other for surgical cases. Male and female patients are *not* separated, but sit together.



Front.

Fig. 11.—Bradford Infirmary (First Floor).

The Eye and Ear Infirmary, Bradford.

This institution is of recent origin, was founded by Dr. Bronner (a German), and opened in 1857. It is remarkable by the luxury with which it is furnished, and is well arranged. It only holds 28 patients, but there is a large number of out-patients.

The plan of construction is that of a corridor hospital on a small scale; a spacious passage (9 feet wide) runs the whole length of the building. It would have been better to have placed windows instead of water-closets at the end.

We enter a fine hall, warmed (in winter-time) by hot pipes, and leaving the ground-floor for the present, we reach the first floor. Here we find wards for males on one side, and for females on the other. There are four wards, all opening into the corridor.

They afford ample cubic space to each inmate, stated in the report to be 1500 cubic feet; but I consider this a low estimate. The walls are oil-painted of various colours, generally green; the floor is of oak; the windows are on the sash principle, and can be dark-

ened by stuff and Venetian blinds. There are also sliding or hanging shutters, by which all light can be excluded. Each ward has a fireplace and a large comfortable hearth-rug. At the back of the first floor we find the operating-room, which has a large window and skylight at a considerable height. The operating-table has Graefe's contrivance for fixing the head between two padded boards, by means of screws, on the principle of a book or card-press.

The baths are of enamelled earthenware.

A large day-room is on the ground-floor, used in rotation by male and female patients.

The out-patients' department is completely separate from the hospital. It is on the left of the hall, and has a separate entrance

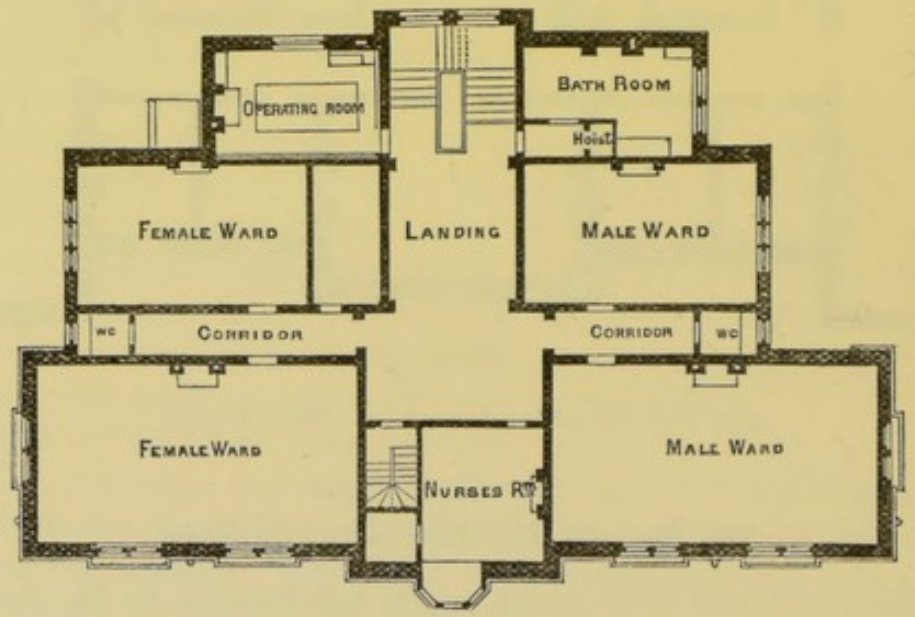


Fig. 12.—Bradford Eye Hospital (First Floor).

at the back of the building. Out-patients enter the waiting-room from a porch; they sit down on comfortable seats, but the sexes are not separated: they enter the consulting-room by one door, and leave by another, and pass on to the dispensary before they leave the house. In the consulting-room two medical officers may see patients at one time; a wooden partition about 5 feet high runs through the middle. Adjoining this room is a dark (eye) room, a cloak-room, and lavatory.

The administration is in the hands of a committee. There is no resident medical officer, but the medical men (four) attached to the institution reside near it. The house is in charge of a matron; patients are admitted by letter, and some make small payments.

Patients leave their coats or dress in the cloak-room, and are provided with coats of a dark-coloured woollen stuff. They objected at first to this novel arrangement, but are now extremely satisfied, and certainly present a better appearance than they would do in their own dress.

The cost of constructing the building was £5500.

Bristol Hospitals.

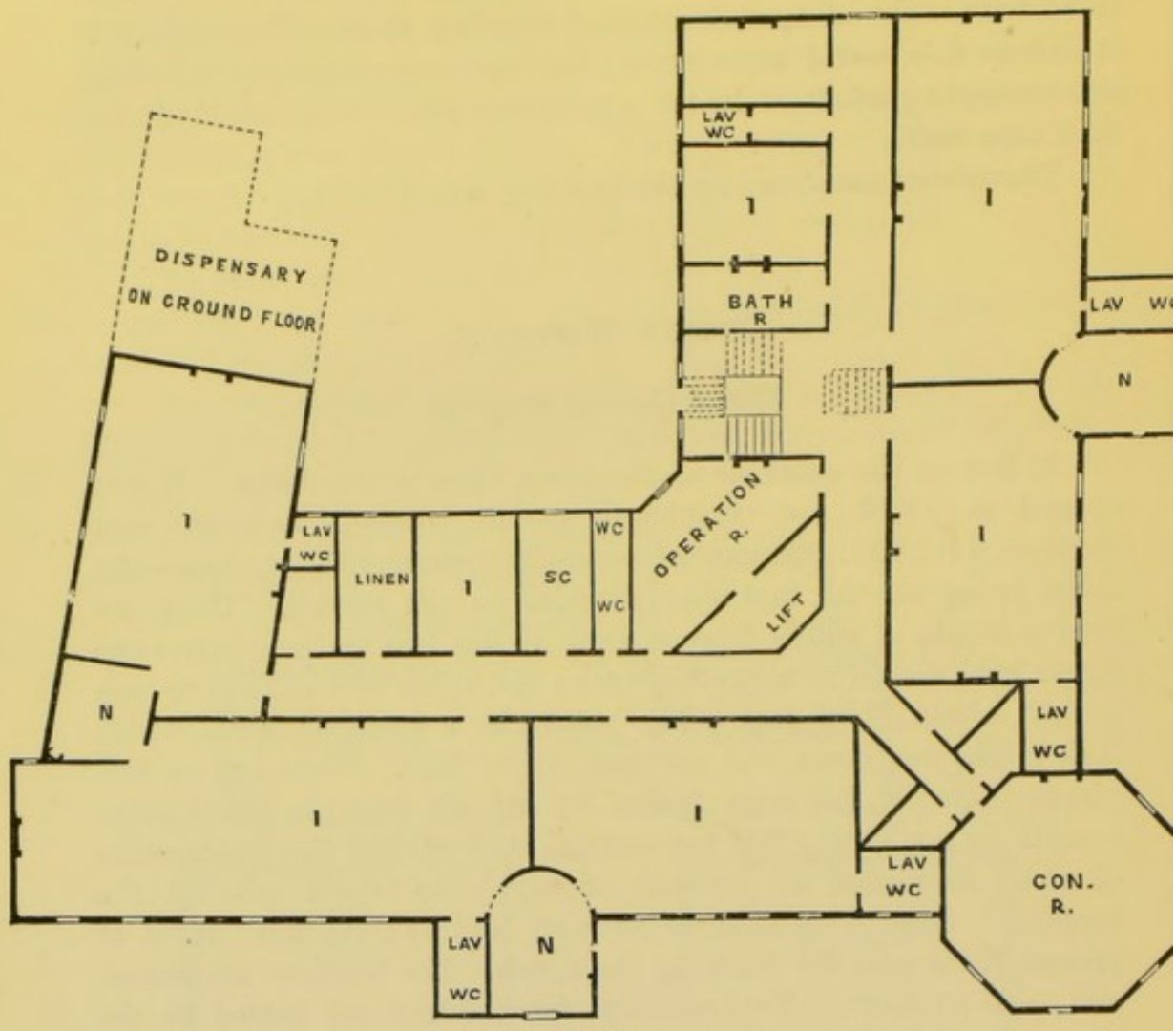
Bristol General Hospital.

It lies on the outskirts of the town, close to the docks. It was opened in 1832, but completely rebuilt (Gingell, architect), and reopened in 1853. It can accommodate about 154 patients—the males being on the first floor, females on the second. There are twelve wards, of which three are small—for two patients only—the larger hold eleven to seventeen each; the cubic feet allowed to each patient about 1100 feet. The wards have stuccoed floors, which look bright and clean, but are said to be cold. They had no fireplaces originally, but were heated by hot air from an air-chamber containing hot pipes; but the medical staff advised the construction of open fireplaces, on account of erysipelas which infected the hospital. Now it is said to be very healthy; the hot air is at present little used for warming the wards. The windows are arched, and sash-windows. Twelve cribs for children are placed in the women's wards. Convalescent rooms, lavatories, and water-closets, are in sufficient number. The hospital is visited by students. (*See* plan on page 108).

Bristol Royal Infirmary

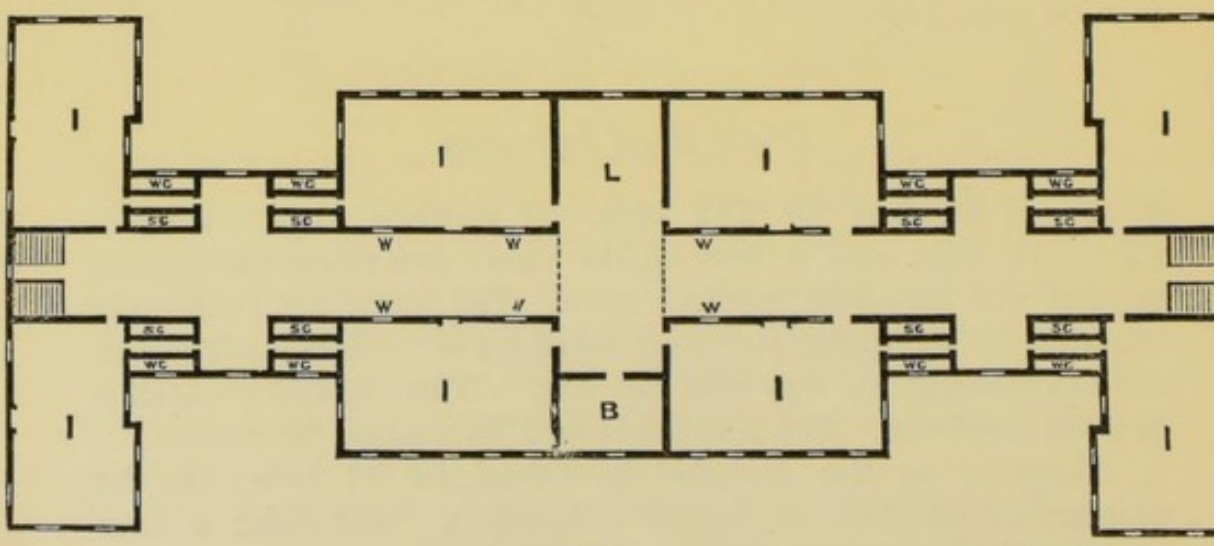
is an old building for 242 beds. It contains large wards for 12 or 15 beds, and a few smaller ones: two-thirds are usually surgical, and one-third medical cases. The wards are judiciously separated by interposed staircases, corridors, or sculleries and closets, and the passages are very wide and airy. Warming and ventilation by open fireplaces. The hospital is used for medical instruction.

There is an Eye Hospital in Bristol for 11 beds; one for women and children (8 beds); a Lying-in Institution; a Lock Hospital (16 beds).



Front.

Fig. 13.—Bristol General Hospital (Second Floor).



Front.

Fig. 14.—Bristol Royal Infirmary (First Floor).

B. Bath. L. Lift W. Window.

Bury New Hospital, Bury St. Edmunds.

This has been open sixteen years; it is constructed on the pavilion plan; contains about eighty beds. Two wards on each floor are in a line, but separated by offices, stairs, and lobbies. They have closets and bath-rooms at the farther end; 1500 cubic feet is allowed to each patient; the walls are coated with Parian cement, the floors of polished oak wood. The out-patients' department appears to be well arranged.

The nurses overlook the wards from a window in their rooms, and nothing is kept in the wards—not even medicines.

Sussex County Hospital (Brighton)

stands on high ground overlooking the sea, containing 168 beds. The wards are of different sizes—for eight, thirteen, or sixteen patients. They have windows on two or on three sides, and some open into each other; the cubic space is ample, especially in the fever wards. There are inlets and outlets for ventilation, but they are said to be a failure. The heating is by chimney fires.

There are three physicians and three surgeons, two assistant-physicians, and two assistant-surgeons; one resident officer, and two resident pupils.

Addenbrooke's Hospital, Cambridge.

The old university town of Cambridge, which boasts of many beautiful and ancient buildings, now possesses a general hospital, which is not unworthy of the other institutions.

In 1719 a hospital was founded in Cambridge by John Addenbrooke, M.D., and it was enlarged in 1814, the funds being supplied by a Cambridge bookbinder. But as it was defective in many respects, the committee saw the necessity of reconstructing it. This was done on a plan first suggested by Dr. Humphry, professor of anatomy, one of the medical officers, and executed by Mr. Digby Wyatt, the architect. The new hospital has now been open about nine months. The site could, of course, not be changed, as part of the old building was left standing. The town of Cambridge lies low, as also the hospital, the country around being flat. The ground is consequently damp; but the building is surrounded by ample gardens in front and back, and supplied with plenty of good water. The front, although not at all richly ornamented, has a very pleasing appearance, created by open verandahs and terra-cotta facings. There

is a ground and two upper floors over a basement, and projecting parts at the sides and in the centre. A part of the old hospital stands out at the back.

Entering the ground-floor we find a ward on the left, and the out-patients' department on the right side. The ward is 51 feet long, 28 feet 6 inches wide, and about 16 feet high; it contains 18 beds.

On the right side is a waiting-hall of irregular shape, to which out-patients have access by a special door. They have no separate exit, but leave by the same door.

In this hall, which is warmed by a double fireplace and hot pipes, seats are placed for the patients, and two dispensing windows open into it. Adjoining we find consulting-rooms; they are well lighted, and look comfortable. Attached to them is an operating-room.

Ascending the broad stone staircase, we come to the first floor. Here we find in the centre a male convalescent room just over the front entrance. At one side is a large female ward; at the other a male one. These wards are 79 feet long, 28 feet 9 inches wide, and 18 feet high, affording 1800 cubic feet to each patient; there is a nurses' room and scullery at one end near the stairs, and water-closets and lavatories at the farther end. The latter are built out of the main building. The wards receive light through large opposite windows, five on each side; they reach near to the ceiling, and the top compartments revolve inwards. The lower ones are sash-windows.

The walls are oil-painted, two colours: the principal one is green, but the lower part of the walls near the floor is of a reddish brown tint. I was informed that the committee could not incur the expense for Parian cement, which would have been very high. In some places I observed that the colour was blotchy, and was informed that the walls were painted before they had time to dry. As related above, the site is rather damp, and therefore it is expected that for some time it will be found difficult to keep the walls in good repair. Notwithstanding this, the wards had a most cheerful, and even imposing appearance. The bath-rooms are heated by hot pipes, and so are the corridors; there are some Roman baths with coloured tiled floors, where the temperature can be brought to 140 degrees. They have as yet not been used.

These large wards are heated by three fireplaces—one of small dimensions at the outer end, and two back to back in the middle of the ward, but a little nearer the stairs. The most noteworthy arrangement is that the smoke-pipes are contained in hollow columns of terra-cotta, four in number, which seem to support the ceiling,

and standing a few feet distant from each other, they do not interfere with superintendence or ventilation. As they are of terra-cotta (with ornamental top) they throw out some of the heat which passes through them.

The only means of ventilation are the doors, windows, and fires; and as the cubic space is ample and the hospital rarely full, it will be possible to keep the air sweet if attention is given to the subject. It is intended to prevent by some means the patients from being able to shut the windows whenever they like.

The floors of the wards are of deal, and scrubbed, but the flooring of one is lacquered as an experiment. On the second floor there are several small separation rooms.

In the old part two or three fever wards are on the first floor; they are not so lofty, and the windows are less high than those in the new building: they were not in use when I visited them. The water-closets are in the projecting portions of the building. These wards have a separate entrance. Underneath are consulting-rooms and the dispensary; the latter is well lighted.

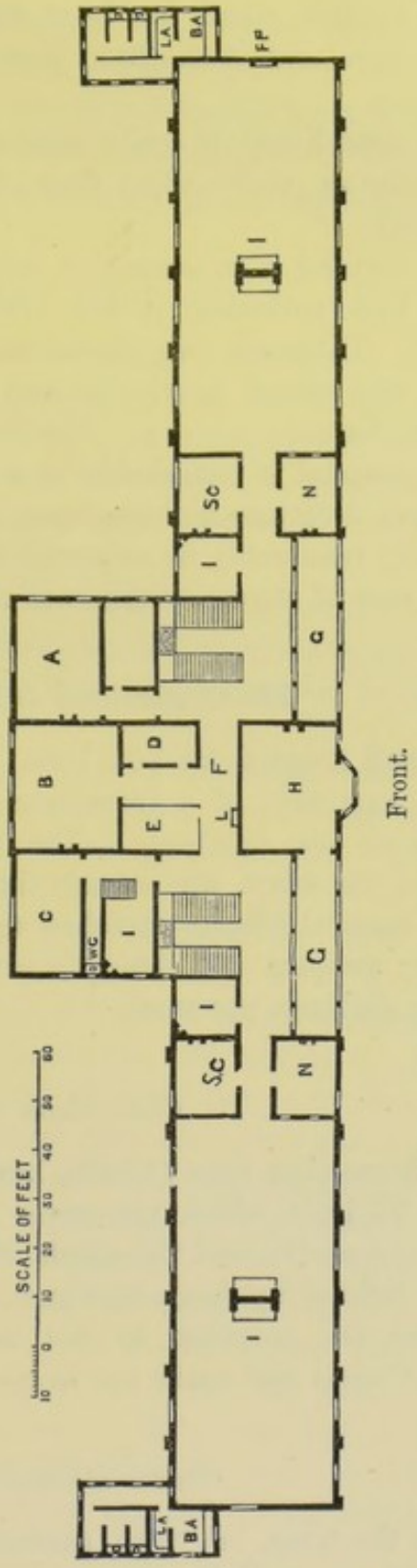


Fig. 15.—Addenbrooke's Hospital, Cambridge (First Floor).

A. Dormitories for female servants.
B. Board-room.
C. Ward for two beds.
D. Closet.
E. Open space.
F. Passage.
G. Verandahs.
L. Lift.
La. Lavatory.
Ba. Baths.
Fp. Fireplace.
Sc. Scullery.
N. Nurse.

A good large drying-room is attached to this part of the building; the wash-house is in the basement of the front building; it is small

and of little importance, as the patients have their washing done outside the hospital.

The kitchen, which has been made higher than it was formerly, is in the basement of the front part, and gas and open fires are used for cooking.

The dead-house is quite separate. The verandahs are used by the patients as promenades; they afford a good view of the surrounding country.

The hospital is in connexion with the university; it can accommodate 115 patients; it has trained nurses from St. Thomas's Hospital. There are two physicians, three surgeons, and one house-surgeon, who attend to the in and out patients. Admission is by governors' letters.

The hospital is remarkable as a happy instance of transforming an old and defective building into a new and handsome structure, which may reasonably be expected to fulfil its principal object.

The cost of reconstruction was only £14,000.

The Cumberland Infirmary, Carlisle.

A small hospital for 100 beds. The rooms or wards lie on two floors on each side of a transverse corridor, and have consequently windows on one side only. The lower corridor is heated by hot pipes, and the warm air ascends hence into the upper one. There are four medical officers attached to the institution. Admission is by letter; paupers and domestic servants are received on payment of twelve shillings per week.

Cheltenham Hospital,

built in horse-shoe form (1849), having a centre and two wings; it contains 92 beds, which are never all occupied. A corridor runs through the centre, and the wards are mostly in front of it. They are well lighted by large windows; some are warmed by hot-water pipes, and the corridors by hot air. There are four ventilating shafts. Closets and baths are in good condition.

Chester General Infirmary

is within the town, but with gardens in front and behind; it dates from 1755; it is three stories high. The ground-floor is used for offices; the patients are in the first and second floors. The buildings form a square around a court, the corridors being inside. There

are seven wards on the lower and nine on the upper floor, of irregular shape, and some badly constructed; but in most of them a sufficient cubic space is afforded to the patients; 150 may be accommodated. The hospital is warmed by hot water. There are two female lock, and separate fever-wards in a fever-house recently built near to the hospital. A house-surgeon and porter died of fever, caught, most likely, in the fever-wards. Some patients pay one shilling a day.

Chorlton Union Infirmary.

The seemingly bold undertaking of having a workhouse infirmary constructed on modern hospital principles has led to a very good result, which invites further imitation; and it must really be a great satisfaction to the board of guardians who were the promoters of it, to have proved that not all the boards resist obstinately the requirements of an advanced age.

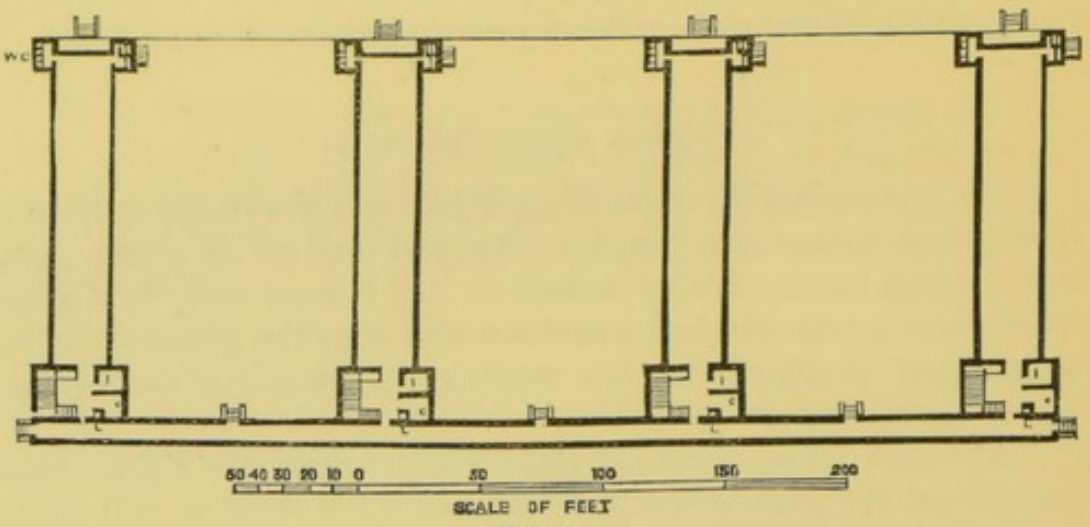
Although I may point out a few minor defects, yet I think that a glance at the plan of the building, and a few remarks, will leave no doubt in the mind of the reader that the institution in question is worthy of much praise.

The site is a good one: the building stands in the open country at a moderate distance, about six miles from Manchester, and one mile from Whittington. It is built on the pavilion plan. There are five blocks, standing 100 feet from each other, four of them completed, connected by a gallery. Each pavilion has three floors, containing a large ward for 30 patients, and a side-ward. The water-closets and baths are at one end, and the nurses' room, scullery, hoist, and stairs at the other end. The wards are 124 feet by 24, and 14 or 15 feet high. The nurse overlooks the ward from a window. The windows are opposite—eight on each side, and three end windows. They have two sash compartments and a top part which is pivoted. A small portion of the upper part is provided with a passage for air the whole width of the window, but guarded by wire-gauze. The windows extend to within a few inches below the ceiling.

The walls are only whitewashed (not plastered), and this might possibly be altered at a future time; the floors are deal. There are three large fireplaces for warming, 5 feet wide and 4 feet 6 inches high, projecting 3 feet into the ward, in order to keep off the heat from the nearest bed. They are not of an ornamental character.

The patients have a cubic space of between 1300 and 1400 feet; but there are very efficient means for ventilation—so much so, that the inmates complain of cold, and, as I was informed, sometimes

catch cold. There is a draught from the top of the windows straight down to the beds; this might be altered. The beds stand too near the windows and wall. There are eduction channels for foul air into the flues, and trap-doors in the ceilings, and gratings in the floor for admitting fresh air.



Front.

Fig. 16.—Chorlton Union Infirmary.

I. Nurse. C. Scullery. L. Lift.

The staircase is airy, of stone and iron; the water-closets have no seats, but only circular and removable rings. They are self-acting by a weight being lifted when the door is opened. There are gas-burners in the wards of simple construction, and the products of combustion educted by a tube through which the gas-pipe ascends. The iron bedsteads are strongly made; they have head and foot boards.

The kitchen of the infirmary lies between it and a large dining-hall, which latter adjoins the workhouse. Both kitchen and dining-hall are light and lofty. As regards the workhouse, I take leave to mention that I was surprised to find the beds in an old women's bedroom that I entered, standing scarcely a foot distant from each other. As the male and female day-rooms are generally crowded during day time, the cubic space of air which an inmate enjoys must be limited.

With respect to the infirmary, it contrasts most favourably with those institutions which have been the origin of so much public censure.

Middlesex County Lunatic Asylum, Colney Hatch.

This institution is one of the largest of the kind, and contained at the time of my visit about 800 male and 1400 female inmates. It occupies a large space of ground, which, including all the land attached to it, covers 138 acres. It is seven miles distant from London by the Great Northern Railway, and was considerably enlarged in 1858.

The buildings stand around rectangular courts, which are eight in number, if those are excluded which are open on one or two sides. They generally contain three stories over a basement; others have but one story. From the outside, the windows, which are narrow and of the Gothic style, have no characteristic appearance. A large chapel is in the centre; the stairs are of stone and iron. The rooms occupied by the patients are dormitories and day-rooms. The latter are, in fact, the corridors into which the former open. The dormitories are either common ones for a large number or single ones. The largest of the kind contained more than 150 beds (on the male side), and the surface area for each patient appeared hardly sufficient, to judge by the spaces left between the beds. The single rooms are 9 feet by 6, and of moderate height, affording generally a space of about 800 cubic feet. The windows are placed high in the walls. All the bedsteads are of iron covered with sacking, with woollen and horse-hair mattresses. They are folded up every morning, and the beds made every evening. There is a good supply of bedside carpets.

The day-rooms have windows on one side only. The upper part of each opens, but not in the proper manner; this, however, will be improved. Some of the windows have stained paper let in between each pane to make them look cheerful. The walls are covered with prints; the ceilings, which are mostly arched, are painted in blue and white. The day-rooms are also used as dining-rooms. The knives have blunt edges, with the exception of a cutting space two inches long, and the forks are strong enough for the purpose, but would double up if used for violence. The plates are common earthenware, and there are tin mugs for beer. The patients sit down at long tables covered with white cloths.

There are self-acting water-closets, lavatories, with plugs, taps, and slate slabs, and bath-rooms to each day-room. A Turkish bath is in a separate building. I saw enamelled zinc, copper, and glazed earthenware baths; the latter are preferred. The rooms are warmed by open fires, and in some cases by hot air, which has passed over hot-water pipes. Perforated zinc plates are occasionally let into the walls near the flooring, and there are a few ventilators near the ceil-

ing. For ventilating the dormitories small zinc plates are used, and small apertures near the ceiling; they are not sufficient. Each day-ward has a scullery and padded room attached to it. The latter rooms are differently arranged; in some cases the walls are padded all round to a height of 6 or 7 feet; or one wall near the door is left uncovered, and others have the floor padded. A mattress is sometimes substituted for the padded floor. The padding consists of cocoa-nut fibre covered by canvas, which is painted a light colour. The doors are double or padded. In the latter case they are shut, without having a lock as usual, but a small board fitting against the wall and turning on hinges. A small shutter is in the door, and an eye-hole becomes visible when the shutter is raised. There is one padded room to about a hundred patients. The rooms were untenanted at the time of my visit.

These rooms have no water-closets, but metal night-vessels, which can be taken out from the corridor. In the older portions of the building they form the lower part of the door; latterly, they are arranged at the side of the door. They have no cover. Opposite the door there is a very small window.

A book-shelf, scantily provided with books, is found in the projecting parts of the day-rooms. Curtains and blinds are not numerous. I observed with pleasure bagatelle-boards and aviaries. With respect to plants and flowers, I was informed that the time of the year did not allow them to be displayed.

Looking out of the window, I saw some of the worst cases taking exercise, which is here preferred to seclusion. The patients appeared to conduct themselves properly. The air, with the exception of that in a few wards, was tolerably sweet.

The attendants have their rooms close to or between the wards. There are, of course, additional attendants to the wards with refractory patients. Filling the windows for overlooking the wards with perforated zinc, instead of glazing them, is an improvement.

A lecture room and a theatre are attached to the institution, and a lecture on Australia was to be given the same evening. Other entertainments, as dancing, singing, and music, serve to cheer the patients.

The patients wear a woollen dress, generally of gray colour; the striped ticking was given up on the recommendation of the Commissioners of Lunacy. No strait waistcoat is found in the hospital. Convalescent patients are employed in the shops as tailors, boot-makers, painters, upholsterers, etc.; the women assist in making dresses, sheets, towels, etc.; also in the airing-grounds, farm, bake-house, wash-house, kitchen garden, and other work of the kind.

The kitchen is very large; open fires are not much used. Gas is employed for cooking pies, puddings, and small joints of meat. Vegetables are boiled by steam.

The laundry is very extensive. The linen is partially washed, and is then placed in a large dolling machine, where it is walked. There are larger wringing and mangling machines than I have seen elsewhere.

Travellers, a kind of a carriage to take the washing to the drying-stoves, are much in use. Powerful engines are employed for all the proceedings.

A farm is attached to the establishment, and under the care of a steward.

There is an infirmary separate from the lunatic wards.

Management.—The establishment is under the management of a committee; the patients are sent and paid for by the different parishes in the county of Middlesex. Two medical superintendents live within the walls; one for the females, and the other for the males. Each has an assistant. There is an apothecary and his assistant, and between 140 and 150 officials, including an inspector, steward, and matron; a chaplain visits the wards. All these functionaries have to make annual reports to the committee.

The Commissioners of Lunacy pay regular visits to the Institution, and propose improvements to the committee. Their suggestions are generally acted upon, and it is likely that many improvements now needed will be introduced in course of time.

Derbyshire General Infirmary,

founded in 1810; it can hold 175 patients, including fever and lock patients. The principal feature is a fine and large central hall which extends from the ground to the roof, and has a skylight. Round this hall a number of small wards are grouped on three floors.

Parts of the building were formerly warmed by artificial means, now open fireplaces are universal. Two Nightingale wards were added recently.

The beds had formerly curtains, the mattresses were filled with oat husks.

Some of the patients are admitted on payment of small weekly sums, others by letter.

The fever-house is of more modern construction; the wards are lofty and well ventilated; the larger ones (for 5 beds) have windows on each side.

The Devon and Exeter Hospital,

in the cathedral town of Exeter, for about 220 patients, consists of an old and new part; the latter is a wing containing three floors over a basement. On each floor are two large parallel wards for 30 patients, divided by a spinal wall, in which are several large windows. One ward is 80 feet long, the other only 70, by a nurse-room being cut off. They are 20 feet wide and 15 feet high, affording ample cubic space to each patient. The windows open on an incline.

There are open fireplaces and hot-air flues. The extraction of vitiated air is effected by air-channels, which communicate with a ventilating tower. Smoke-flues open into it, and it also contains the hot-water reservoir. The closets are separated by lobbies from the wards. The building has lifts, lavatories, sculleries, bath-rooms, hot and cold water service, etc., and is much praised as a country hospital on improved principles.

The Essex and Colchester General Hospital

stands near the London Road, in large grounds of its own; it has two floors and seven sick wards, four of which are for 20 patients; 90 can be accommodated. The walls are whitewashed, the floors can be scrubbed; the closets are in sufficient number and good condition. Corridors and wards are heated by open fireplaces, and there is no system of ventilation.

Surrey County Hospital, Guildford.

It was founded *in memoriam* of the late lamented Prince Consort, and opened in July 1866. It is situated outside the town, can accommodate 60 patients, and is built and fitted up on the most improved principles. The building stands on two acres of land.

On the ground-floor are the rooms appropriated to the resident medical officer, matron, and porter; store, linen, board, and secretary's rooms; and in the east wing are house visitors' room, surgery, dispensary, dressers' room, and waiting-rooms for out-patients, adjoining which are bath-rooms and water-closets. In the rear portion of the building are the kitchen, scullery, larder, bread room, servants' room, etc. etc. The front centre portion of the main building is carried up and down one story more than the rest of the building; the

lower portion of which serves as wine, beer, and coal cellars and pump-room, in which latter is the disinfecting closet or oven; and in the topmost story are large and airy bedrooms.

The lift extends from the basement floor to the one-pair. Over the sloping ceiling of the large and over all the other ward ceilings there is a wood floor laid, which renders the rooms warm in the winter and cool in the summer. (*See* section through ward, Fig. 17.) The wards are 92 feet long, 26 wide, and 17 feet high, affording 1800 cubic feet to each patient. The floors generally are fire-

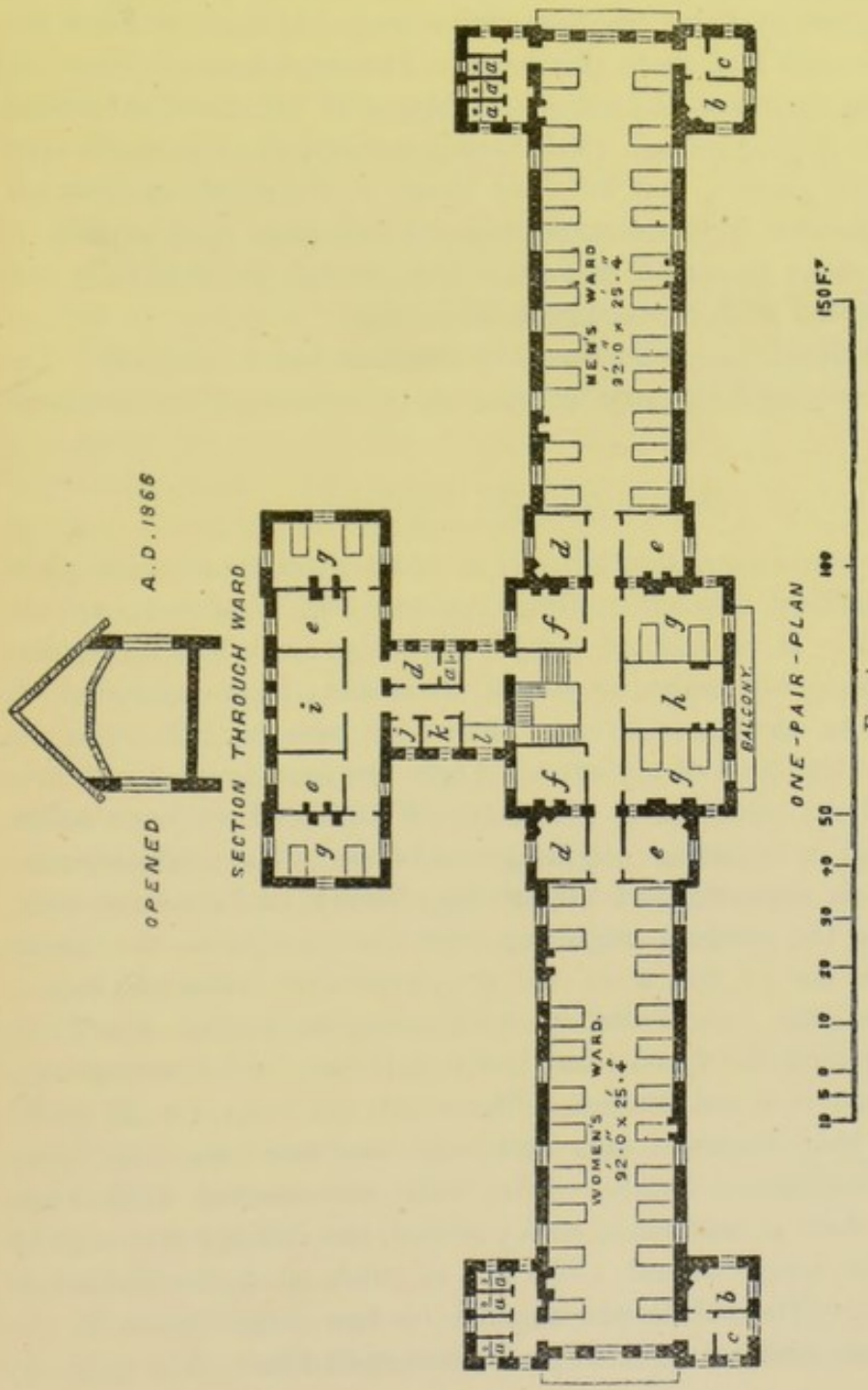


Fig. 17.—Surrey County Hospital, Guildford.

a. Water-closets, slop. | e. Nurses' rooms . 12′ 0″ × 12′ 0″ | i. Operating-room . 18′ 2″ × 14′ 9″
b. Bath-rooms . 12′ 0″ × 7′ 10½″ | f. Ophthalmic wards 14′ 0″ × 11′ 7½″ | j. Foul-linen-room . 6′ 0″ × 6′ 0″
c. Lavatories . 7′ 10½″ × 6′ 6″ | g. Special wards . 20′ 0″ × 15′ 0″ | k. Store-room . 8′ 3″ × 6′ 0″
d. Sculleries . 12′ 0″ × 10′ 7″ | h. Day-room . 20′ 0″ × 12′ 0″ | l. Lift.
Height of main wards at walls, 14′ 9″; Height of main wards in centre, 18′ 0″.

proof, on Fox and Barrett's principle. The walls are coated with Parian cement. Hot and cold water is laid on to the lavatories, bath-rooms, and sculleries, and to the slop-closets. The lavatories are fitted with a range of Jennings' patent lift-up basins. The baths are of porcelain by Rufford and Finch. The lobbies to the patients' water-closets are fitted with small stoves, but these are used only in cold weather; they are ventilated at the level of the ceiling. The windows in the wards are all glazed with plate glass, and the wards are warmed by open fires, which are also made to ventilate the wards by drawing off the foul air at the level of the ceiling. The operating room is lighted by three windows and a large skylight, and hot and cold water is also laid on to this room. The wash-house is fitted up with washing trays and the patent machinery of Mr. Bradford, whilst upstairs are drying-rooms. This building stands in the north-west corner of the ground, and the dead-house in the north-east corner. All the rain-water from the roofs is saved in a large tank capable of containing many thousand gallons. The grounds are tastefully laid out, and planted with trees, shrubs, etc.

As Guildford has no sewers, the hospital has a cesspool. The drains are ventilated by carrying pipes up to the tops of the chimneys.

Herbert Hospital, Woolwich.

This is a military hospital. It is situated on an elevated piece of ground nearly two miles from the town of Woolwich, on the Dover Road. It is built on the pavilion plan, and has an unpretending outside, but embodies almost all modern improvements. It is intended to accommodate more than 600 patients, but contained only 320 at the time of my visit. There are four double and three single pavilions, standing at a distance of 65 feet from each other, all connected by a passage on the ground-floor. The administration department is separate, and the kitchen, library, and common bath-rooms are in the portions projecting from the corridor in the centre. The passages are 12 feet wide, and are paved with coloured tiles.

The pavilions, except that for administration, contain two floors over a basement, the first-named building three. All staircases are of stone, with iron balustrades. The wards are large, for 28 or 32 beds; they have opposite sash and large end windows; the latter contain a ventilating louvre. The walls are covered with white cement, the floor is beeswaxed and polished, the ceilings are only 14 feet from the floor. About 1250 feet of cubic space is allotted to each patient. The wards are warmed by two large stoves in the centre. They contain movable grates and open fires. The quantity

of fuel consumed per day is only 80 pounds of coals. The smoke-flues run under the floors. Fresh air passes from the floor through the stoves, and is admitted into the wards through perforated plates at the top.

The patients, when asked, did not complain of cold. There are several means for ventilation besides the windows. For admitting fresh air we see an iron pipe running in the floor, underneath the windows; it is warmed by the flues from the stoves, and has perforations by which air can enter. There are apertures near the ceiling, which can be closed by drawing a balance-weight suspended before the windows. Some of the valves, however, did not act properly. The said apertures serve for admitting fresh air from an air-shaft leading to the roof. The apertures placed in the corners of the ward lead into the flues, and are intended for drawing out the foul air.

The nurses' room is near the entrance, and has a window for overlooking the ward. The scullery opposite is of narrow dimensions.

The bath-rooms at the farther end of the wards contain a bath of earthenware, and are separated by slate partitions from the other part of the room. The water-closets are on the syphon principle, the urinals self-acting; the lavatories have slate slabs and plugs. The bath-rooms and lobbies to the water-closets are warmed by hot-water pipes. The common bath-rooms contain, besides the ordinary ones, vapour and douche baths.

In the centre and in the basement is the kitchen, which is rather low. In the middle, standing free, is a remarkable rectangular range of great dimensions, where all the smoke-flues lead downwards. Close by is another long range for boiling by steam.

A fine large library is at the disposal of the convalescents, where they read and lounge. They also use the open terraces in fine weather.

The chapel overhead is spacious, and has an arched wooden ceiling. The windows contain coloured glass, the centre parts of which open by levers.

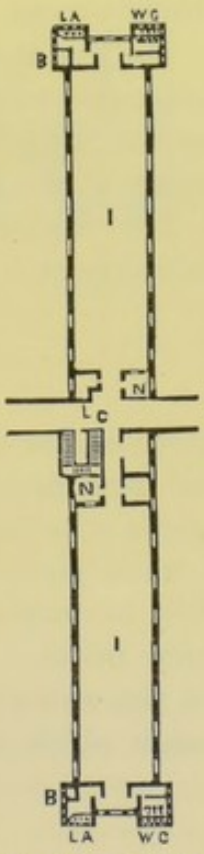


Fig. 18.—Double Pavilion of the Herbert Hospital, Woolwich (First Floor).

B. Bath. N. Nurse.
C. Corridor. T. Ward.
L. Lift.

The dispensary, being in the basement, is not light enough.

The water-cisterns are of galvanised iron. The water is obtained

from a reservoir at Shooter's Hill, supplied by a well in the neighbourhood. It is raised to the principal cistern by steam-power, and passes through charcoal filters. Some of it is softened before it is distributed to the different parts of the hospital. The water-pipes in the house were frozen in the cold weather as elsewhere.

Of useful implements, I have to mention plain bed-trays made of deal, with two side parts joined to the principal one by hinges, bed-warmers of metal to be filled with hot water, trays for the tin dishes, having double bottoms for hot water, and earthenware bed-pans. As improvements I may mention the hot closets in the scullery for warming and airing linen for the patients; the foul-linen and dust shoots of earthenware, which open by doors on the passage, one shoot serving for both purposes, although the upper openings are separate; and the letter-box for patients in the convalescent-room.

The drains are properly laid, and are ventilated by the vertical drain-pipes, which carry off the foul smell, being open at the top; they are stated to have, moreover, charcoal filters placed in zinc gratings at the top; but of this I am not certain.

The wash-house for the hospital and the gentlemen cadets' establishment is at a short distance on the opposite side.

Huddersfield Infirmary,

a hospital for about 100 patients, contains old wards, which are small and badly constructed, and a large new ward, which has opposite windows, and affords ample cubic space. It is heated by hot-water pipes, and has inlets for air, and ventilating tubes in the ceiling to draw out the vitiated air, but they are said to frequently become inlets. The water-closets are well placed at some distance from the wards; the drainage is good; it goes into an old coal-pit, through which a constant stream of water runs.

Ipswich and East Suffolk Hospital,

established 1836, rebuilt 1869, for about 100 patients. The only part of the old building left is the centre, which had an extra (third) story added, for servants' bedrooms, etc. The building is situated on the top of a hill in a charming situation overlooking the town, and surrounded by trees in about three acres of ground; each bed is to have from 1000 to 1500 feet. There are four large wards; they are 24 feet wide, 66 feet long, and 14 feet high; ten small, two convalescent wards, and two for contagious diseases. The large

wards warmed by open fireplaces in the centre with open flues. There are ventilators in the outside walls. The closets are outside the wards with cross ventilation. Parian cement is on the walls for 5 feet, the rest plaster. The wing standing at the back contains the out-patients' department on the ground-floor; top of this the chapel and the said rooms for contagious diseases. There are two physicians, five surgeons, and one house-surgeon.

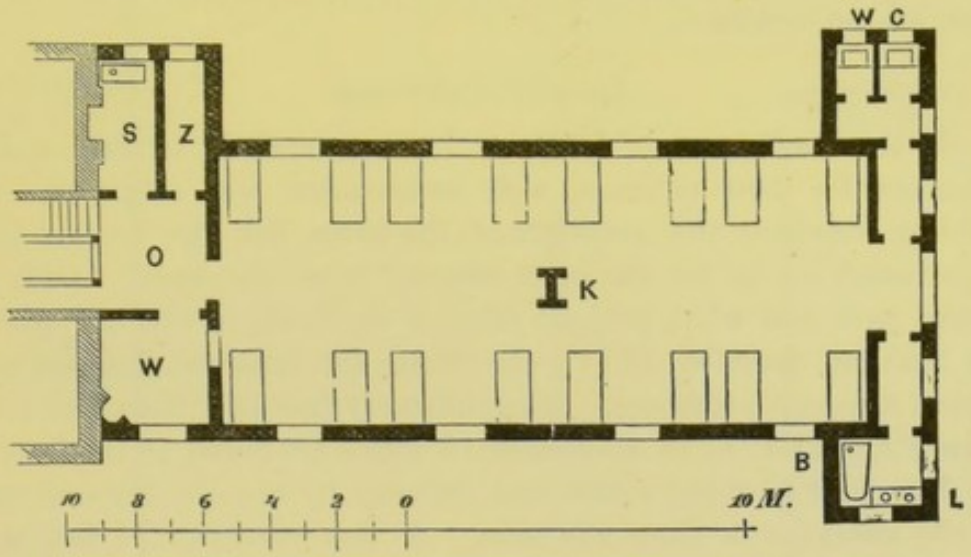


Fig. 19.—New Wing of the Ipswich and East Suffolk Hospital.

S. Scullery. Z. Cloakroom. O. Ante-room, with skylight. W. Nurse. B. Bath. L. Lavatory. K. Fireplace.

There is a new fever-house at Ipswich (1881). It has a central building containing the administrative department with three wings attached to it. Each of these is connected with the central one by open arcades.

Hull General Infirmary.

This hospital can accommodate 160 patients. It is built on the corridor plan. The principal building is three stories high, with one wing on the left. The corridor runs through the whole length of the main block, and the wards in front and behind; there are some projecting portions. The wards contain 8 or 10 beds, and when full afford only from 700 to 1100 cubic feet to a patient. The windows are sash-windows, but have transverse plates of perforated zinc at the top in front of the upper sash. There are open fireplaces, and ventilators in the ceiling or upper part of the wall. Some wards have window-spaces opening into the corridor, and two communicate with the chapel by a window.

The medical staff consists of two physicians, three surgeons, one house-surgeon, and a dispenser.

Kent and Canterbury Hospital,

established 1793, stands in the country in a favourable position but is deficient in construction. The building consists of one block, 150 feet long, 50 deep, and containing eight wards for 120 patients, on two floors. The wards are for 6, 8, and 13 patients; they do not afford sufficient cubic space, and mostly open into each other, as there are no corridors.

Leicester Infirmary.

In the small town of Leicester I was surprised to find a large infirmary for 200 patients, well constructed and arranged. The building stands at the outskirts of the town, but the houses begin to surround it; as yet the open country is at the back. Only the central part, and what projects from it in front, is the old part of the building, founded 1771; the wings (of different lengths) were opened nineteen years ago. The infirmary has 189 beds, the fever-house 32, total 221; in the former 13 wards are found, in the latter 4.

The older part has a fine hall, warmed by hot air, but not used, as the entrance is from the side. A fine corridor, 11 feet wide, larger than I have seen anywhere, runs through the centre; it is warmed by hot-water pipes. This part contains offices and private rooms, and some wards. It has three floors over a basement. The principal and larger wards are in the new wings. There are three of them, each having room for 30 patients. They are 101 feet long, 30 feet wide, and 16 feet high. They have opposite sash-windows, the top part inclining inwards, and always open throughout the wards; there are also perforated zinc plates over the windows, but they are pasted over with paper. The slides, too, by which air could be admitted near the floor, are not used. A few Arnott's valves are near the flues, but they have become rusty. There are only two fireplaces in these large wards, which in very cold weather are hardly sufficient to warm them.

The walls are coated with Parian cement, the floors of deal; the water-closets are well ventilated, and with the sculleries are at one end, the nurses' room and baths of enamelled earthenware being at the other.

Large and airy day-rooms are on the upper floor. The nurses' sleeping-rooms, in the attic of the centre part, are removed as far as possible from the patients. Large ventilating lanterns are at the top of the staircase. The kitchen is in the basement. Meat is stewed and vegetables are boiled by steam; there are also large tin boxes in which plates are carried to the lift.

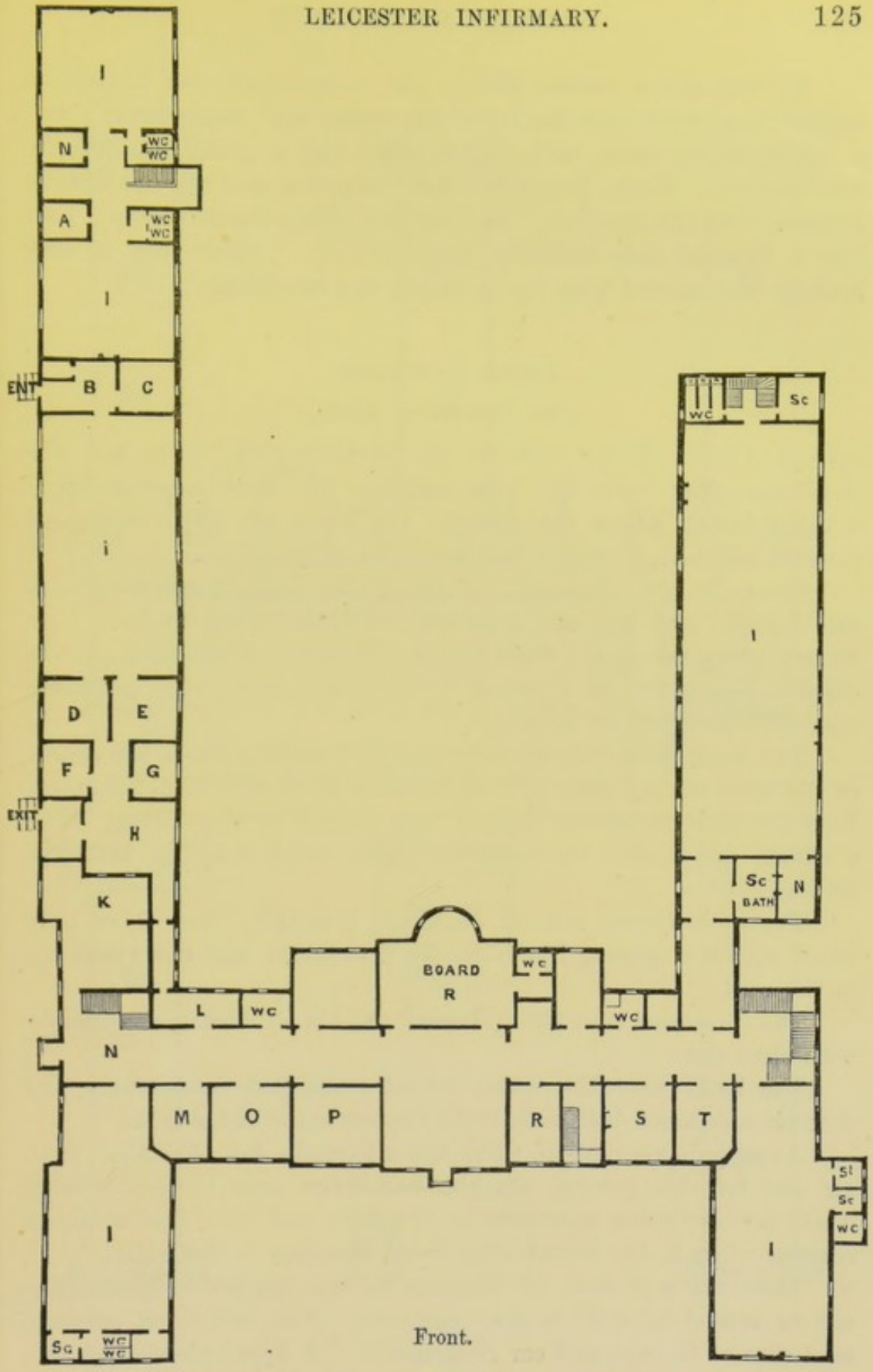


Fig. 20.—Leicester Infirmary (Ground-Floor.)

A. Baths and lavatories.
B. Out-patients (W.C. at the left).
C. Porter.
D. Physicians' room.
E. Surgeons' room.
F. G. Private examination rooms.
H. Dispensary waiting-room.
I. Waiting-hall.
K. Dispensary.
M. Surgery.
N. Nurse.
O. Pupils' sitting-room.
P Library.
R. Matron.
S. Dining-room.
T. Stores.

We find also a medical library and a small patients' library, an engine-room, where one fire heats the water, and steam-boiler; and a fine operating-room, with patent table and a glass case for the instruments. Three physicians, four surgeons, and one ophthalmic surgeon, visit the hospital. One medical officer resides there. Last year's financial disbursements were £8721. Last year a new laundry was erected with steam-engine and machinery.

Leeds Hospitals.

New Infirmary, Leeds,

opened 1869. It is built on the pavilion plan; there are five pavilions. The wards are large and fine, but there are too many wooden beams across the ceiling; the floors are impervious, and covered with oak planks, which are to be polished.

The walls are plastered and faced with Keene's cement; there are opposite and fine end windows. All the windows have iron frames; they are on the French principle in the offices and private dwelling-rooms, and of a mixed style in the wards; they generally open like doors, or tilt inwards.

Two large patent stoves (they cost £30 each) stand in the centre of the large wards; they have descending flues, and fresh air enters from the floor to become heated and ascend to the ceiling. The corridors are heated by hot-water pipes, which run free near the ceiling.

The water-closets are on Jennings' principle; they have only small windows opening like doors for ventilation, and one ventilator in the wall.

The lavatories have tilt-up basins, and are on Jennings' principle, with slate slabs.

The baths near the wards are of enamelled earthenware, and there is a common bath-room with vapour baths and douche.

As regards ventilation, there are air-trunks for admitting fresh air, and for this purpose are the trap-doors, seen in the ceilings. There are also a few apertures in the floor and over the windows, corresponding to the round ornamental openings in the walls.

There are 310 beds for patients in the hospital. Three physicians attend as well as four surgeons. Two additional surgeons take care of the eye and ear department. A house-physician and a house-surgeon reside in the house, and there are four resident medical assistants.

A medical school is connected with the hospital, which is well worth a visit.

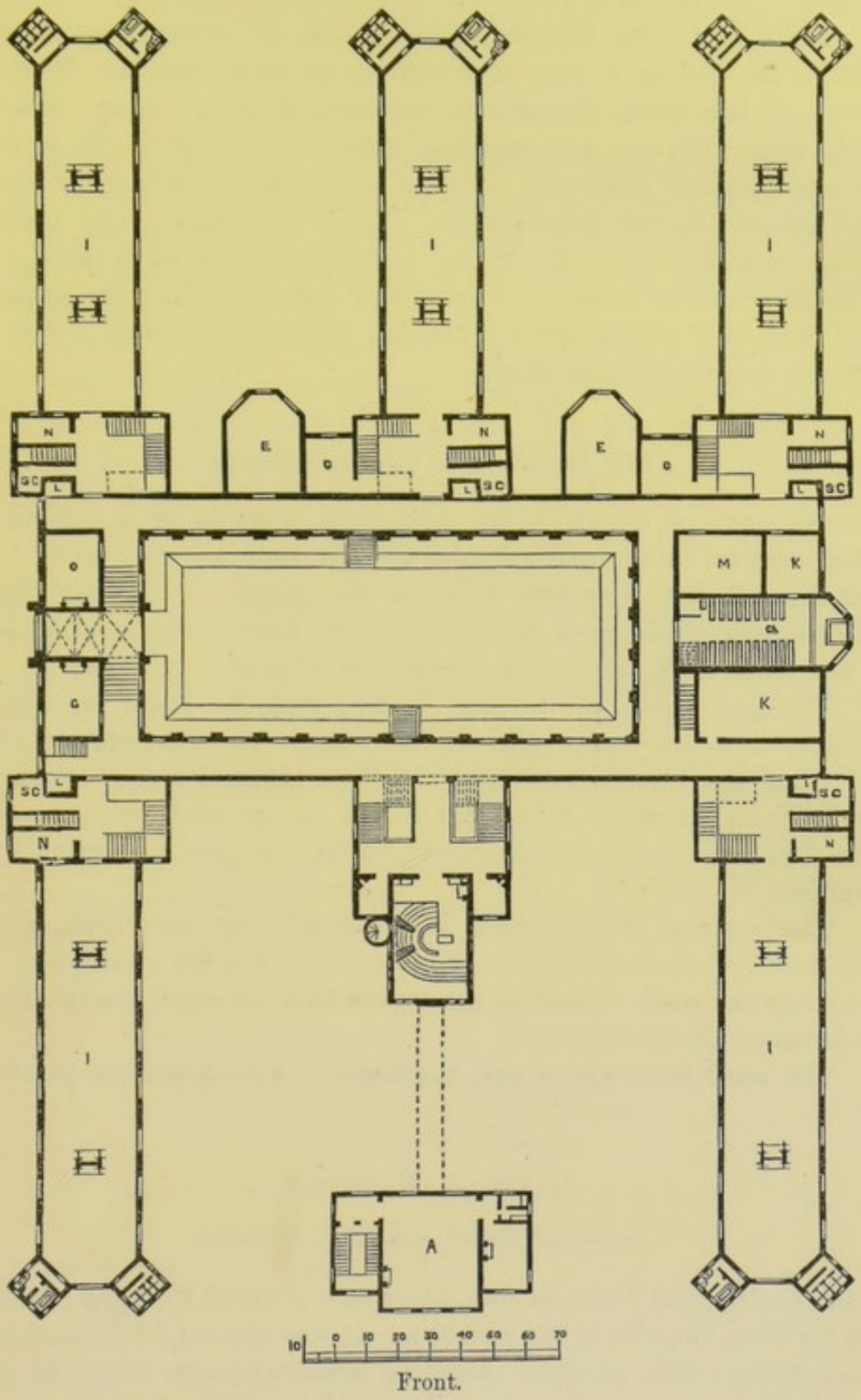


Fig. 21.—New Infirmary, Leeds (First Floor).

A. Board-room.
E. Day-rooms.
G. Separation-room.
K. Bath-rooms.
Ch. Chapel.
M. Vestry.
L. Lift.

Leeds has a special hospital for diseases of women and children, reopened 1861. It contains about 45 beds.

There is a fever hospital called house of recovery, established 1802. It lies in a very poor district, at some distance from the centre of the town, but not in an open locality, many factories being near. It can accommodate about 80 patients. It is built on the corridor plan, and contains numerous chambers for one or two patients, but no larger wards. There were hardly any patients in the hospital at the time of my visit; but when it is full great difficulty must be found in nursing and superintending the patients.

There is a dispensary for diseases of the eye, where a few in-patients can be accommodated.

The Lincoln New County Hospital,

opened (part of it) 1878 for 110 beds, consists of a central or administrative block and two double pavilions, all connected by a corridor 10 feet 6 inches wide on the ground story, and by a covered way of the same width on the first floor. The central block is five floors high, the pavilions east and west of it only two.

The large wards are 88 feet by 26½ feet, the lower ones being 14 feet high, the upper ones 16 feet high. At the extreme ends are octagonal turrets measuring 10 feet internally each way, and cut off from the wards by lobbies 5 feet square with cross ventilation. In these turrets water-closets, baths, slop-sink, and urinals are arranged.

The warming of the wards is principally by open fires, of the corridors by hot-water pipes. Inlets and outlets for ventilation are placed in the walls; those in the wards have separate shafts carried up between the smoke-flues.

The ward floors are of oak, the walls of Parian cement painted.

Liverpool Hospitals.

Liverpool Royal Southern Hospital

is the newest and finest of the Liverpool general hospitals, erected not far from the site of the old one. It was opened 1872, and may accommodate 200 patients, including some who can afford to pay. It is built on the pavilion plan, the buildings have four floors, and opposite sash-windows. There are 10 wards. The largest have a length of 113 feet, a height of 16, and a width of 25 feet. They are warmed by fireplaces, and pipes conveying hot water round each

ward. There are Sherringham ventilators in the walls to admit fresh air. The hospital is visited by six medical officers, and three reside in it.

Liverpool Northern Hospital.

This is a hospital for 147 beds, very badly situated in a noisy part of the town, near two railway stations and a soda manufactory, built on low ground, and surrounded by a densely-populated and low neighbourhood, near the river Mersey. It receives almost exclusively surgical cases.

It is built on the corridor plan, containing 15 wards on three floors; some of them are small and irregular. They are heated by fireplaces, and occasionally by hot air. No less than seventeen nurses are in the hospital—four head-nurses, nine assistants, and four night-nurses.

Liverpool Royal Infirmary

is an old institution, situated in the centre of the town, built in the horse-shoe form; it contains about 270 patients, the greater part surgical cases. A system of ventilation for which an air-tower was constructed, did not answer, and was given up; the air-shaft is now used as a clock-tower. Chimney fires and open windows are the principal means for ventilating the wards; there are outlets for foul air, but they are nearly useless. A separate lock hospital stands in the grounds; it contains 60 beds for male and female patients; a lunatic asylum is managed by the infirmary. A medical school is in connexion with the hospital. It is intended to replace it by a more modern building.

Liverpool Fever Hospitals.

Workhouse Fever Hospital.

It was erected in Brownlow Workhouse, and opened in 1864. It has the shape of the letter T, and consists of four floors, each containing two wards for 20 beds, so that 160 patients can be accommodated. The wards are 64 feet long, 24 wide, and have opposite windows, seven on each side. The cubic space allotted to each patient is said to be about 1100 feet, which would not be sufficient. The means for ventilation are—first, two fireplaces, one at each end of the wards; there are also ventilators close to the beds about a foot lower than the patient, and ventilators on a level with the ceiling, eight in number, to educt the foul air into the smoke-shaft. The

water-closets are at one end of the ward, the nurses' day-room at the other; but the nurses sleep at some distance. The matron's residence and the medical officers' rooms are in a separate building. The wash-house is also detached.

Netherfield Fever Hospital.

The Netherfield fever institution was established 1858. It now consists of an old building and wings, which are pavilions joined to it, and opened in 1872. The hospital can accommodate 100 patients, who enjoy an ample cubic space. The institution is partly voluntary and partly self-supporting. Each patient pays according to a scale of charges fixed so as to suit all classes; the lowest payment is five shillings per week. The sums received from patients are augmented by church collections, donations, etc. A matron resides in the house.

Liverpool has, moreover, an eye and ear infirmary for 44 beds; another for 26 beds; a hospital for cancer and kindred diseases; one for children, containing 80 beds; a hospital for consumption, 24 beds; one for fistula, established 1872, 8 beds; one for heart diseases, 6 beds; and a lying-in hospital for 37 beds. Liverpool has district dispensaries established 1878, and a seaman's dispensary established 1877; the latter is self-supporting, each patient paying one shilling at each attendance.

LONDON HOSPITALS.

(*a.*) General Hospitals.

The general hospitals are—with the exception of the London and St. George's hospitals—situated in densely-populated localities and surrounded by houses. They are three or four stories high; they generally are warmed by open fires which are burning all the year round, and ventilated by sash-windows, doors, and openings in the ceilings or walls. The windows are kept partly open not only during daytime, but also at night; not to such an extent, however, as would be concluded from some descriptions. Usually one upper sash is lowered a little, so that some air can enter. The wards are large, cubic space ample, floors generally of deal and scrubbed (*see*, however, King's College, children's ward). The bedsteads are of iron and low, without footboard; curtains are rare. The exterior is less grand than that of most continental hospitals; surgical cases outweigh the medical ones, and the results of operations are (in some of them at least) more satisfactory than in many cities on the continent.

The out-patients' departments afford relief to a comparatively greater number of cases than in other countries; celebrated schools are connected with the hospitals; libraries, museums, and laboratories also exist.

The number of special hospitals has increased lately to an astonishing extent.[1]

The following is a list of hospitals existing in London, not including workhouse infirmaries:—

(*a.*) *General and Educational Hospitals*—

	Beds.
Bartholomew's Hospital	710
Charing Cross ,,	180
Guy's ,,	690
King's College ,,	200
London ,,	800
Middlesex ,,	310
St. George's ,,	353
St. Mary's ,,	190
St. Thomas's ,,	512
University College ,,	200
Westminster ,,	215
Other General Hospitals—	
Great Northern Hospital	30
Metropolitan Free ,,	40
Royal Free ,,	150
West London ,,	44
	4644
(*b.*) *Special Hospitals*—	
Catholic Hospital (men)	15
Children's Hospitals—	
Belgrave, 20 beds; Cheyne, 33; East London, 92; Evelina, 61; Great Ormond Street, 156; North Eastern, 60; Victoria, 65	487
Consumption Hospitals—	
City of London, 164 beds; Brompton, 350; North London, 35; Royal, 26	575
Convalescent Hospitals	450
Fever Hospitals—	
London Fever, 260 beds; Homerton, 200; Stockwell, 198	658
Fistula Hospital	50
Carry forward	6879

[1] Provident dispensaries have been lately established in London and the country. They are private institutions founded and supported by members who by small weekly, monthly, or yearly payments insure the benefits thereof in case of sickness. No gratuitous work is done by the medical officers attached to them.

	Beds
Brought forward	6879
For Epilepsy—	
Regent's Park, 30 beds; Walbeck Street, 10; National, 120 .	160
For Accidents—	
Poplar Hospital	484
Heart Hospital	20
Incurables—	
British, 5 beds (?); Home, 31; Royal, 190 . . .	226
Hip Hospital	70
Invalid	28
Lock Hospital	208
Lunatic—	
Bethlem, 300 beds; St. Luke's, 200	500
Lying-in Hospitals—	
British, 25 beds; City, 40; General, 20; Queen Charlotte's, 50; St. John's, 15	150
Ophthalmic—	
Royal London, 100 beds; Royal South London, 14; Royal Westminster, 50; Western Eye, 12; Western Ophthalmic, 20	198
Orthopædic—	
City, 24 beds; National, 35; Royal, 45 . . .	104
Skin Hospitals—	
British, 12 beds; Blackfriars, 10; St. John's, 12 . .	34
Smallpox—	
Highgate, 108 beds; Homerton and Stockwell, 204 . .	312
Stone Hospital—	
St. Peter's	16
Throat—	
Golden Square, 21 beds; Central, 20 . . .	41
Temperance Hospital	51
Women's Hospitals, and Women and Children—	
Chelsea, 8 beds; New, 26; Sydenham Park, 33; Vincent Square, 12; Royal, 50; Samaritan, 52 . . .	181
Hospitals for Special Classes of Applicants—	
Atlas Hospital Ship, 200 beds; Seamen's, 300; French, 20; German, 125	525
Pay Hospitals—	
Bolingbroke House, Fitzroy House	100
Total	9951

The workhouse infirmaries contain about 10,000 beds.

Bartholomew's Hospital.

This charity was founded in the year 1102, for the suffering poor of every description except smallpox patients. It was rebuilt in 1730, and is the most ancient hospital building in the metropolis. There is accommodation for 676 patients; 227 beds are allotted to medical cases, 322 to the surgical, 26 to diseases of the eye, 20 to diseases of women, and 81 to the syphilitic. The hospital consists

of separate buildings, which are unconnected with each other and occupy a large piece of ground in a central part of the city. The four principal blocks stand round a square yard and are of equal dimensions. That one which is nearest the entrance serves for administrative purposes, the others contain wards. Each block has from thirteen to fifteen windows in front and four at the ends; each block is intersected in the centre and from top to bottom by a large and airy staircase with old-fashioned wooden banisters. There are four

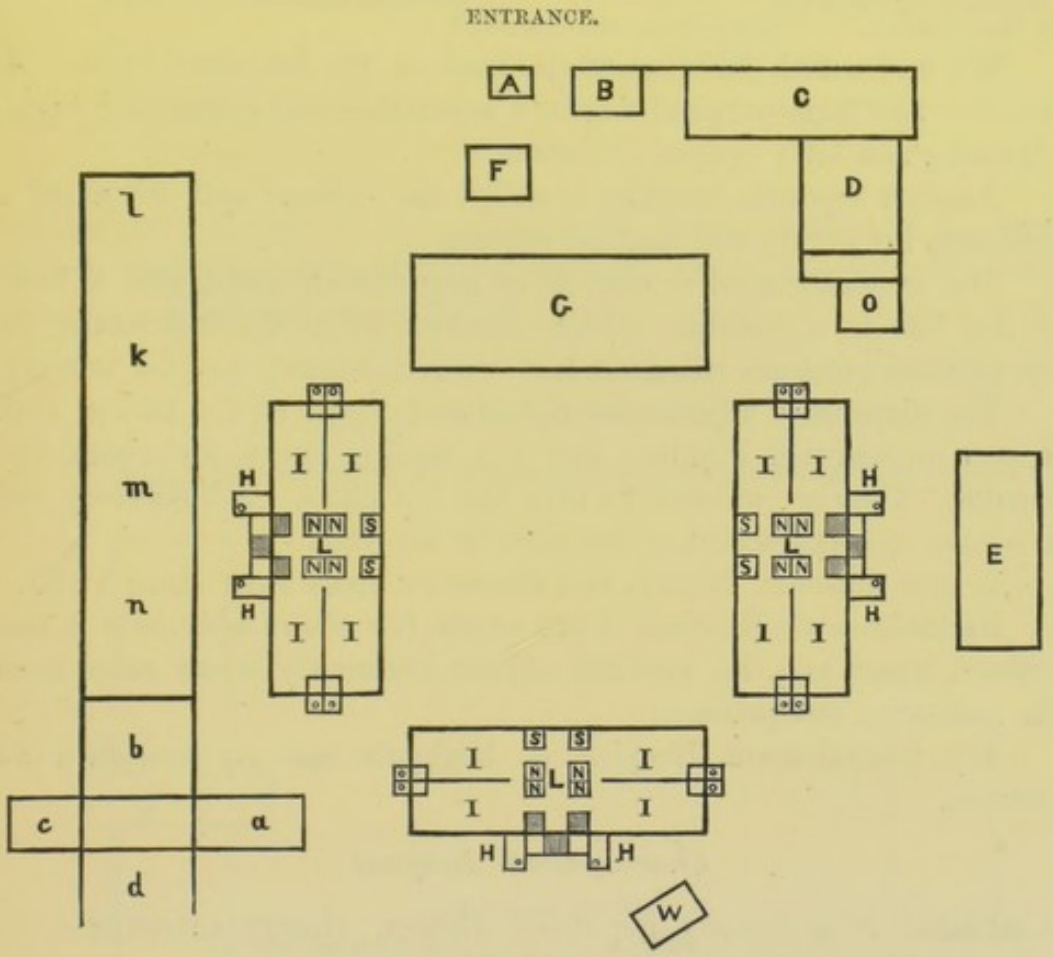


Fig. 22.—Bartholomew's Hospital, 1875.

A. Porter.
B. Chapel.
C. Out-patients & surgery.
D. Surgical wards.
E. College.
O. Operating-room.
G. Administration.
I. Wards.
H. Bath, W.C., scullery.
H. Nurse.
S. Sister.
L. Landing.
a. Waiting-room.
b. Dispensary.
c. Laboratory.
l. Library.
k. Amphitheatre.
m. Museum.
n. Post-mortem rooms.
w. Coach-house.

floors; each contains a double ward with a partition wall; the latter is open at one end only. All the wards have opposite sash-windows, large louvres over the door, open fires in the centre; and the beds stand at a considerable distance from each other, so the cubic space

for the patients is ample. Fresh air is admitted by keeping doors and windows open, and through the louvre over the entrance door; the windows on the staircase are rarely closed.

There are lock-wards in the attics: they afford much less cubic space to the patients, as the ceiling is low and the outside wall sloping. In fact, they would be unfit for acute cases. The water-closets are well placed, built out of the main building and not entered directly from the wards. Baths and sculleries are placed in a similar manner in the projecting portions; and sisters' and nurses' rooms are in the centre.

We find a fifth building at the back of the left-hand block. It contains two large surgical wards, a separation and consulting room; adjoining is a lofty operating theatre.

Another separate building is called the college, and serves as a residence for pupils and medical officers.

The ancient chapel or church is near the entrance, and a little to the left is a building which contains large waiting-rooms for out-patients (who are admitted here without letters), and the surgery.

The dispensary adjoins the right-hand block at the farther end. It is a one-storied building, and has waiting-rooms for males and females. They are warmed by fires and hot pipes. A laboratory was in course of construction at the time of my visit.

A new museum, library, and dissection room exist since 1879.

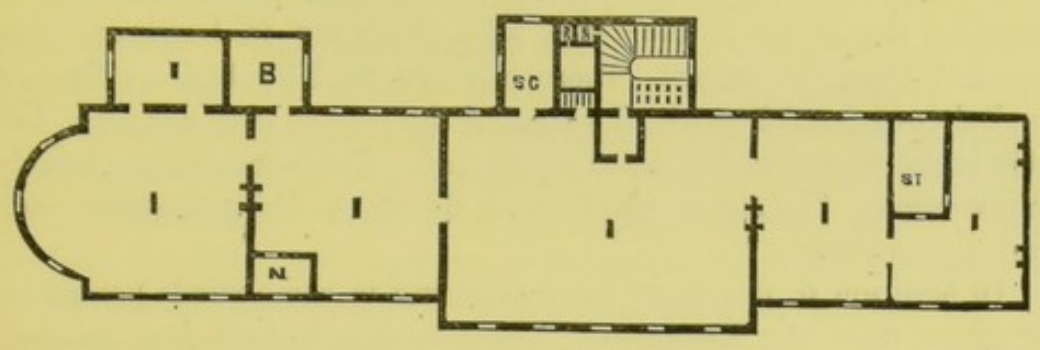
Bartholomew's Hospital is one of the few where admission is free without letter, and the medical officers frequently select cases from the numerous out-patients.

The Convalescent Hospital at Highgate can accommodate 34 patients.

Charing-Cross Hospital

is situated in a densely-populated district, closely surrounded by houses. It consists of a single block, containing three floors over a basement and attics. There are 180 beds; the wards are generally small; the largest can hold 15 patients. The females are on the first, males on the second, and children on the attic floor. A few side-wards for 2 or 3 beds are on the first and second floors at the back. The cubic space allotted to each patient is very variable, and not everywhere sufficient. The principal fault of construction originated in the want of space; all the wards on one floor open into each other. It was most likely in consequence of this that typhus spread in the hospital some years ago: a female was admitted into a ward contrary to the rules, and the disease was caught by a nurse and several patients in quick succession, so that the medical officers

advised the clearance of the hospital. The out-patients' department is on the ground-floor; the nurses live on the premises; 15 medical



Front.

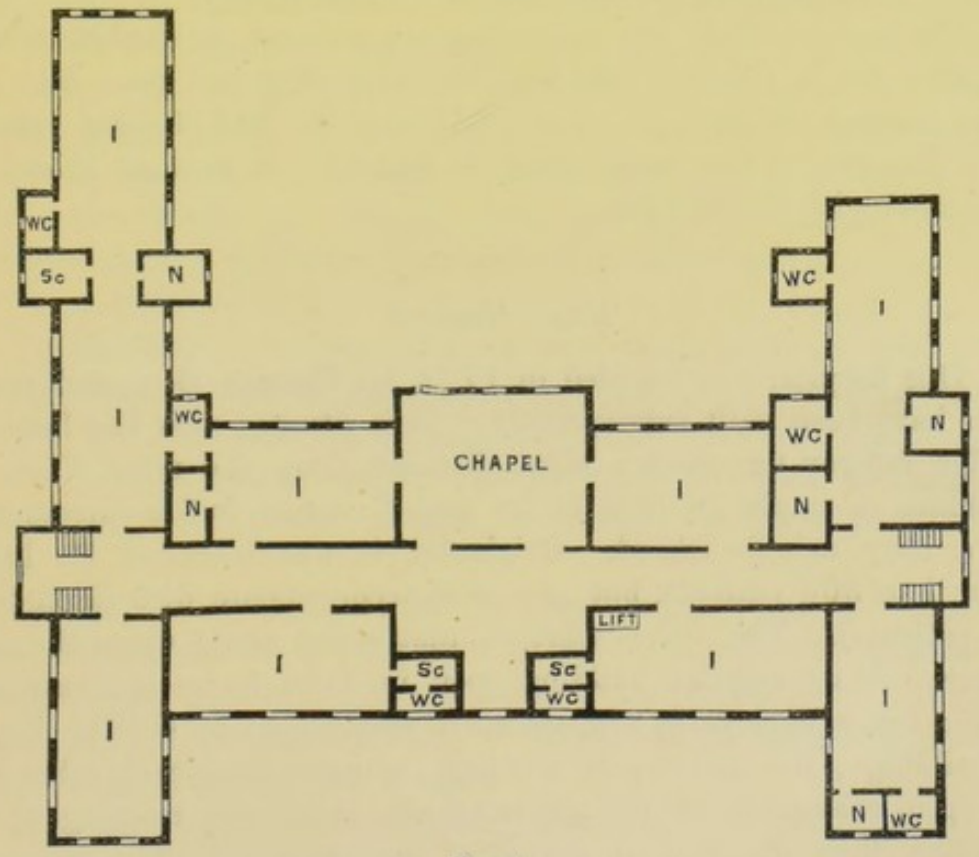
Fig. 23.—Charing-Cross Hospital First Floor (1875).

B. Bath. Sc. Scullery. St. Stairs

officers are attached to it, including the house-surgeon. A convalescent institution for 60 or 70 patients at the seaside has lately been connected with the hospital.

St. George's Hospital.

It was founded in 1733 outside the town, and completely rebuilt



Front.

Fig. 24.—The Old Part of St. George's Hospital, First Floor (in 1875).

and reopened in 1834. It is now, although on one side in close proximity to other buildings, more favourably situated than the rest of the metropolitan hospitals, as it faces the parks on two sides. It resembles the shape of the letter H; one wing is, however, more extended than the other. There is room for 353 beds. The old hospital contains 32 wards, if we count the double ones as two. The cubic space is said to be about 1200 feet. The windows are mostly sash-windows, but some are formed by three compartments, each revolving inwards.

In addition to fireplaces we find stoves in some wards heated by hot pipes from the basement. There is an air-shaft, and Arnott's valves are placed near the ceilings; they are not of much use.

Lifts are used for raising food and also patients; they are raised in their beds to the second floor. Children are admitted into the general wards.

The water-closets are self-acting. There is a telegraph in the hall, used for announcing the arrival of the medical officers. Convalescent wards are a recent addition, and the roof is used as a promenade.

The dispensary and baths are in the basement, which is low; the kitchen is there also, but it is somewhat higher than the other rooms. The patients have the use of a small library.

The new wards in the new wing are warmed by double stoves, the flues run in the floor, and the insurance office had stone laid on them instead of gratings. For ventilation we find Tobins' tubes; their diameter is too small (only 4 inches). A medical school is connected with the hospital.

Guy's Hospital.

This hospital was founded in 1722 by Thomas Guy, and additions have been built subsequently. It is situated near the London Bridge railway terminus, a short distance from the river Thames. It stands in ample grounds of its own (7 acres), but is surrounded by a busy neighbourhood. Originally it was intended for little more than 300 patients, but can now accommodate 690 (including eye-patients). The oldest part is that which abuts upon the entrance. A rectangular building open in front forms the entrance court; two square yards are behind it, surrounded by similar blocks of buildings; the centre part dividing the yards from each other has an open colonnade on the ground-floor. Galleries running along the first floor are now in course of construction.[1] The wings of

[1] January 1867; a new amphitheatre, too, is built on the second floor.

the building stretching out in front serve for administration purposes, but the blocks surrounding the yards are—with the exception of that portion occupied by the library and a few offices—used for the patients. The wards have windows on each side, and stretch round the corners, so that they are generally composed of two rectangular rooms joined in a rectangle.[1] The windows are mostly sash-windows; those looking into the yard on the ground-floor are placed rather high from the floor. Many windows have a middle pane in the upper part opening inwards, and by this means fresh air is admitted day and night. In addition there are louvres over the doors for ventilation, and ventilators in the ceiling. The attic wards (for syphilitic patients) are rather low, but ample cubic space (nearly 1800 feet) is afforded to the patients. In the next yard is found a singularly-shaped building, which is one floor high. It contains to the left of the entrance door a ward, with five windows on each side, for 10 or 12 patients; the corresponding part on the right contains private rooms, and others which are used for microscopical and chemical investigations. There are 2 oblong clinical wards for medical cases; they offer some peculiarities.[2] They have six or seven sash-windows on each side, with wire blinds, and a triple bow window at the farther end. Beyond the ceiling does not form one level, but is composed of a lower and higher portion; the latter forms the centre, and is supported where it joins the former by iron columns. As it is lighted by windows at the sides, the wards receive ample light. In the centre nearer to the entrance are two fireplaces back to back, with a somewhat unsightly ascending flue. The water-closets are entered from the wards. Rooms for the nurses and bath-rooms are conveniently arranged in the centre.

The male clinical ward contains 17 beds, the female one 18. In the building to the left, which is two stories high, we find on the ground floor a ward for males, and adjoining it an operating room. On the first floor is a ward for females; this ward has five windows on one side, at a considerable distance from the floor, and another window opposite the door; there are green curtains to darken the room.

In the block to the right of the clinical wards, and which is three floors high, the ground-floor is used for domestic purposes—ironing, nursing, sleeping-rooms, and a separation-room. On the first floor is a surgical ward for 10 males, and on the second floor a ward for 10 females, with 5 cribs.

The new block is an imposing building, four stories high; the out-patients' department is on the ground-floor, and the upper floors

[1] *See* Fig. 1, No. 3.

[2] *See* Fig. 1, No. 8.

contain wards. Here are the often-mentioned double wards (*salles accouplées*), divided by a spinal wall; with a break over the fireplace and at each end. There are six windows on each side. Between each two wards a day and dining-room is interposed, and a nurses' room, scullery, and closet.

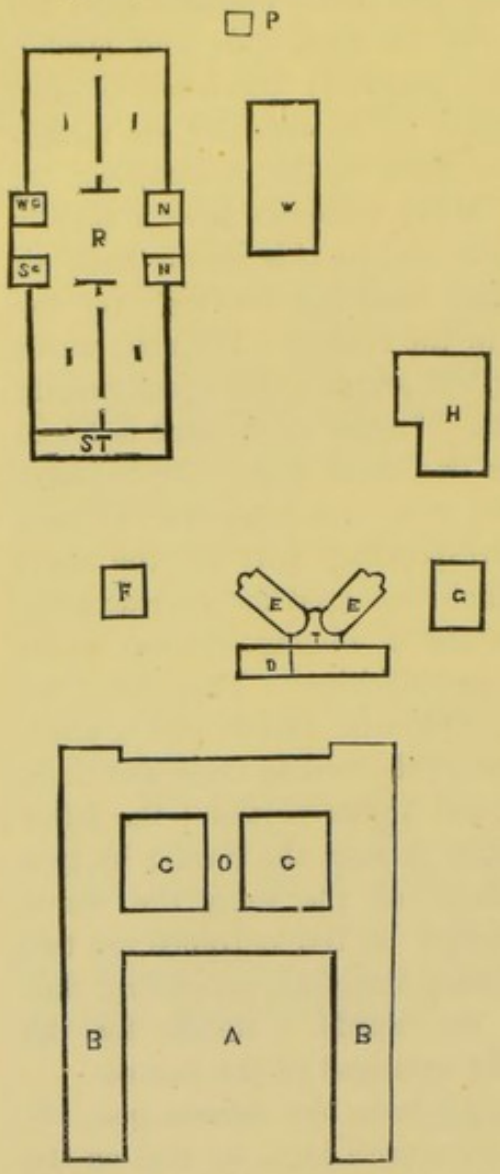


Fig. 25.—Guy's Hospital, Ground Plan (in 1879).

A. Entrance yard.
B. Administration, private rooms.
C. Court.
O. Open arcade.
D. Ward.
E. Clinical ward.
F. Ophthalmic ward.
G. Surgical cases and cribs.
H. Wash-house, engine.
W. Museum, post-mortem, lecture rooms.
I. I. Double wards in the new block.
R. Day-room.
St. Stairs.
N. Nurse.

The patients enjoy in all the wards the extraordinary cubic space of about 2000 feet; these are only for medical cases. The principal ventilation is at present by the windows and doors, and the spacious staircase. The door leading from it into the yard is always open, exept on very cold days, and the windows on the stairs are also kept open. Communication between this reservoir for fresh air and the wards is effected by large louvres and open cuttings in the walls.

Originally an artificial system of warming and ventilation (in addition to fireplaces) was in action, and for this purpose the two towers were constructed; the higher one for drawing off the foul air. The fresh air, heated in winter time by hot pipes in the basement, was intended to enter near the ceiling, and the foul air to be extracted through channels running near the floor; they communicated with the smoke-shaft, which received additional warmth from hot-water pipes. The system was a failure. The fresh air became so impeded in the intricate passages, heated by flues, that it did not enter the wards in any perceptible amount; the extractive power was energetic enough, and the costs moderate; about twenty-

nine shillings annually per bed and patient. A new wing is just completed.

The wash-house is worth a visit. We find a large room, about 50 feet long by 38, and 20 feet high, with large sky-lights. Round the walls are troughs and boilers, with large basins near them. A large wheel turned by machinery was formerly in the centre for subjecting the cloth to the action of hot water and soap. It is replaced by soda boilers with jackets. Steam power is used for a drying wheel. Adjoining the large room is a smaller one to store the linen, etc., and a large mangling-room, where steam is used for the machinery. The whole is lighted by numerous gas-burners, when requisite, and being in close proximity to the engine-room has the steam directly from it.

The last block on the right-hand side contains the museum, amphitheatre, and post-mortem rooms.

There are usually little more than 600 patients in Guy's Hospital. Admission is free, with the usual exception as regards smallpox. The medical school includes midwifery, but the cases are treated as out-patients only.

King's College Hospital.

The architect who had to supply the plan for this building was hampered by the want of space, and, considering the circumstances, showed great ingenuity.

The hospital is situated in a poor neighbourhood, at the back of the Royal College of Surgeons. It is built on the corridor plan round two square yards of limited dimensions, and a staircase into which a third yard is transformed. The first part was opened 1855, the other portion in 1861; and at present about 200 patients can be accommodated. There are four floors over a basement, and attics over the northern and western parts of the house; they are used for sleeping apartments for the nurses. The ground-floor is used for offices and an accident ward; the kitchen is in the basement.

The staircase is on the left-hand side of the building, and is entered by a corridor. It is of imposing dimensions (44 feet broad, 31 feet wide, and 63 feet high), and lighted by twenty-four windows (six on each floor). The stairs are of stone, the balustrade of iron. The wards do not open into the staircase, but into the corridors and lobbies adjoining it. Most of the wards are of considerable dimensions; some 70 feet by 24, others 85 by 85. They have spinal walls open at one corner, and with small top-windows. There are no small side-wards. The walls are lined with Parian cement, the ceilings whitewashed, the floors of plain pinewood (except the former chil-

dren's and lying-in ward in the third story, where the floor is oiled and lacquered). The wards have windows on one side, and some of them a single window at the end. The windows consist of three compartments, the top one revolving inwards, the lower being sash ; or all can be opened inwards. The cubic space allotted to patients is 1800 feet; in some wards even more. The wards are heated by one or two fireplaces of modern dimensions; the water-closets are mostly self-acting. Two large lifts are close to the staircase; they are raised by water power.

The patients are attended by lady sisters, who live in the house (the western part), and day and night nurses. The out-patients' department is in the eastern part, and partly built out of the main building. The consulting-rooms are numerous, but small, and somewhat dark. The large waiting-room is in the basement, to which there can be no objection. It is approached by iron stairs.

As for the construction of the building, it has been praised as much as it has been condemned. I do not recommend it for imitation. As regards the staircase, it might be improved by taking off part of the ceiling, and replacing it by a movable skylight. The air is close in the upper part of the stairs, and the nurses' sleeping-rooms, approached by a small side staircase from the main staircase, must be unhealthy. The wards were lately brought into more direct communication with the stairs by cutting out parts of the intervening walls. The plot of ground in front looks very plain, and, although small, should be embellished a little.

There is serious danger in a hospital like this from hospital disease or fever spreading, if imported or generated in the house.

The London Hospital

lies in the Mile-End Road, in a densely-populated district, where casualties happen continually. Of all metropolitan institutions the London Hospital receives the largest number of surgical cases. The building has the form of a square open at one side, but two new arms have been lately added, viz. the Alexandra wing in 1867, the Grocers' Company wing in 1876. There are three floors over a basement; through the front building runs a central corridor, which is heated by hot-water pipes. In front of it, on the ground and first floors, are various-sized rooms, such as consulting, secretary's, private, and committee rooms, and the chapel. Two large wards lie at the back of this corridor.

The two old wings contain large wards, divided in two by spinal walls. In the centre we find a day-room, and at both sides of it

nurses' rooms, sculleries, bath, and water-closets; lavatories, stairs, and additional water-closets, are at the farther end. The wards are warmed by open fires surrounded by air-chambers, and have circular ventilators in the ceilings.

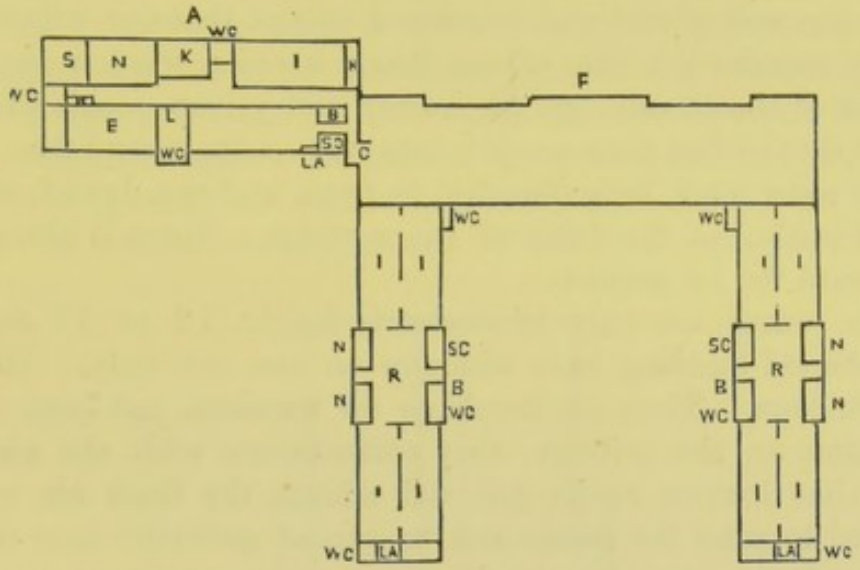


Fig. 26.—London Hospital, Second Floor (in 1875).

A. Alexandra wing.
B. Bath.
F. Front.
I. Ward.
La. Lavatory.
R. Day-room.
Sc. Scullery.
C. Corridor.
L. Lift.
K. Hebrew kitchen.
E. and T. Hebrew wards in Alexandra wing.
H. Linen stores.
S. Sister.

The Alexandra Wing of the London Hospital

is a block attached to the old building, and communicating with it. It contains three floors, a basement, and attics; the latter are used for the sleeping-rooms of the nurses. The longest side has eleven windows, including one triple window; the shortest side has three windows, or two on the ground-floor, and a portico between them. The latter is not used, as the Alexandra wing is entered by a corridor from the old part. On each floor a central corridor runs the whole length of the building. It is lighted by a window at the east end, but there is no corresponding window at the other end by which it might be ventilated; but we find in its place rooms for nurses, private rooms, or a water-closet. There is a stone staircase in the centre with iron balustrades. It is well lighted at the top by skylights, but badly on the ground and first floors. The walls of the corridor have a lower border, and facings of white polished gypsum.

The wards are on the ground and two upper floors. They accommodate about 70 patients.

There is one ward on the ground-floor facing the yard; it is a

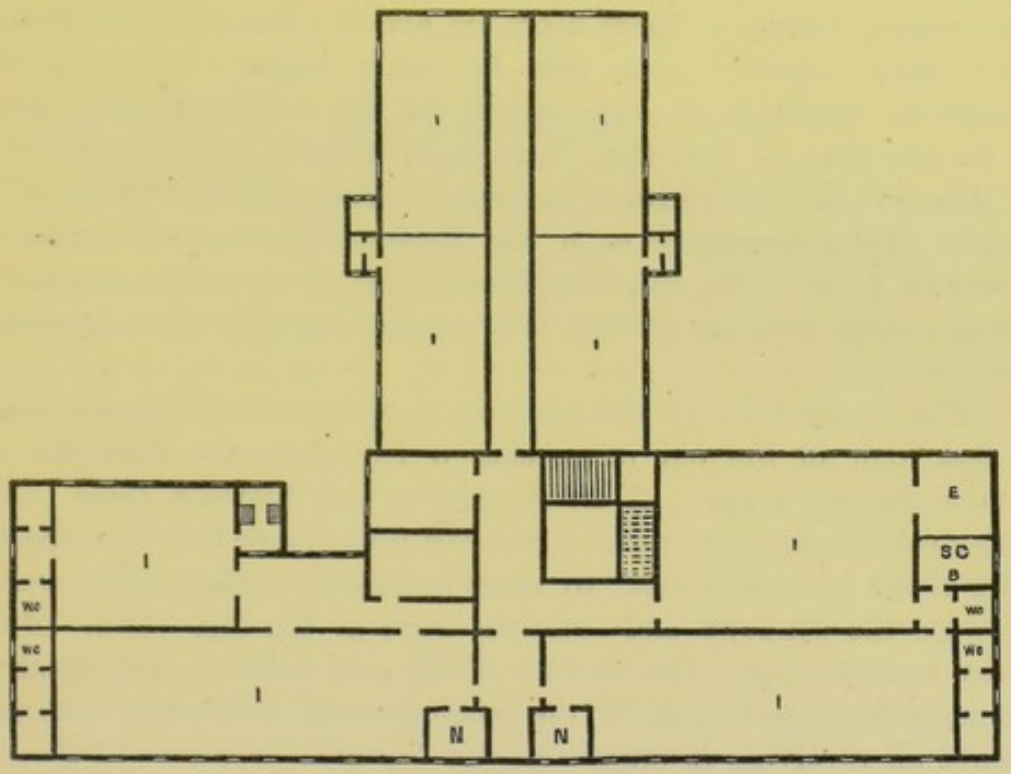
children's ward for 25 beds (at the time of my visit there were 26 cribs in the ward, standing rather close). The nurses' room and scullery are partitioned off at one end; the water-closet (not self-acting) is at the other. It is built out at the side of the ward, oil-painted, and well ventilated by a large window. The other water-closets are well placed and ventilated, except that one which blocks up the corridor (on the second floor), where a window should be. In front of the corridor are the nurses' and private rooms facing the road. On the first floor are 2 wards, and on the second floor 3; one Jewish ward for 7 beds (females) in front, and one Jewish ward for 9 beds (males) at the back of the corridor. There is also another male ward for 14 patients.

The wards are only of moderate height, 12 or 13 feet, and, as in the old building, have windows on one side only. These are sash-windows. There are fireplaces for warming, and large circular ventilators in the ceilings; they communicate with the air-tower, which has louvres at its top, and admits the fresh air, which is expected to enter the wards and to spread gradually near the ceiling, the disc under the circular opening preventing an immediate draught downwards, the foul air to escape by the windows. I did not find any foul smells at my visits, because the doors were kept open. The bath-room and scullery are partitioned off at one end of the ward, or the bath-room is at the side; the lavatories (which however, did not act) are generally in the sculleries. The most objectionable part is the bath-rooms; they are dark and badly ventilated. They receive a dim light only through the glazed partitions, and have no window. They have one gas-burner, but this is not lighted during the daytime. The steam from the hot bath cannot find its way out by any aperture but the door, and comes into the adjoining ward. This might even now be altered by cutting a slanting opening in the wall.

The beds have mats of cocoa-nut fibre, paillasses, and mattresses; the latter are mostly of horsehair. Some beds have curtains; most of them are without. The wards, corridors, and closets, are kept scrupulously clean. The number of beds is now 790. New baths for out-patients and a club-house stand in the grounds, in the latter the students may dine. The Grocers' Company wing corresponds to the Alexandra wing on the other side of the old part of the hospital. Here some of the corridors are heated by steam, and in some of the wards warm air can be let in through gratings from the basement.

St. Mary's Hospital, Paddington,

was opened in 1851, and contains now 150 beds—60 for medical, 79 for surgical, 5 for ophthalmic cases, and 8 for diseases peculiar to women; but a new wing is in course of construction, by which it will be possible to receive more than 200 in-patients. The building has the shape of the letter T, and is constructed on the corridor plan; but some of the wards open into other wards, and are not connected with a corridor. The front part has, besides the basement, a ground-floor, entresol, and two upper floors; the entresol is used for nurses' sleeping-rooms, which is a very objectionable



Front.

Fig. 27.—St. Mary's Hospital, First Floor (1875).

arrangement, and will cease to exist as soon as the dormitories for nurses in the new wing are finished. Although I did not enter these nurses' sleeping-rooms, I judge from the height of the lower rooms that they are very deficient in height, and they have only small windows on one side.

The ground-floor contains a central corridor dividing it through its whole length, and on each side of it various offices and private rooms, also one or two consulting-rooms. The kitchen, engine-room, nurses' dining-room, dispensary, and out-patients' waiting-room, are all in the basement, which is somewhat dark.

In the centre of the building are a beautiful hall and staircase. The stairs, which are of stone with iron railings, lead to the upper floors, and receive light from above through a glass cupola. In the centre of the latter is a patent ventilator of perforated zinc; but I should think it would be an improvement if some of the windows could be opened by ropes. On the first and second floors we find the principal wards, the accident ward excepted, which is on the ground-floor, but was closed at the time of my visit on account of repairs. It is, however, the only ward which has opposite windows; all the others have them on one side only.

The advantage of having a spacious staircase is in some manner counterbalanced by the small size of the entrance-doors and the intervening lobbies. These doors are about 7 feet high and 3 wide, and could certainly even now be made larger. Any one who enters the wards is at once struck by the height of them, which is no less than 21 feet, that being more than is found anywhere in London or on the continent except in Italy and the Hospital St. Louis. In consequence of it the patients have a cubic space of 1600 or 1700 feet; but they benefit less by it, as the impure air always keeps near the ground, and ascends only by slow degrees to the ceiling.

The construction of the windows is of interest: they are about 9 feet high in the old part, being 5 feet from the floor, and are double, having a space of nearly half a foot between them. The lower part of the outer window revolves inwards, and so does the top part of the inner windows; by these means the outer air can ascend between the windows and enter the ward at the top. Some of the inner windows open like doors. There are ordinary sash-windows found besides, and those of the accident ward have four compartments, all revolving inwards.

The wards are principally warmed by open fires; but besides, the outside air is admitted, which becomes heated before it enters the wards by passing over coils of hot pipes. For ventilating we formerly found apertures in the walls near the ceiling; they were the ends of eduction-channels, which took the foul air to a ventilating furnace at the top of the stairs. This furnace, however, did not seem to act efficiently, although a fire was kept day and night, in which, I was informed, not only coal, but also rubbish from the wards, was burnt. Now we find Tobins' tubes arranged along the central passage; those on the right communicate with gratings in the left-hand wall, those on the left with the right-hand wall. In some wards there are large square apertures in the walls opposite the windows or doors.

Some of the smaller wards are only about 14 feet high, and entered from the back stairs. The water-closets are self-acting, and well placed.

The new part contains three floors; the wards are on both sides of a central corridor; they are about 16 feet high, and the windows extend nearer to the floor than in the old part; their height is nearly 12 feet. The floors are of iron and concrete; the corridor is 5½ feet wide, and has a large end window. Water-closets and sculleries are built out at the sides, and apertures are left in the wall opposite the windows. In 1876 the water-closets of the largest wards were also set outside the wards; the illustration shows them as they were before this time. New post-mortem rooms were also built at this time. A new wing for 60 patients is being built.

Middlesex Hospital

is situated in Charles Street, Tottenham Court Road, and contains 310 beds. It resembles exactly the shape of the letter H; the central portion is used for offices and private rooms, medical officers, apothecary, etc., with the exception of the top ward, where cancer patients are accommodated. There are 8 wards in each wing; the largest contain 20 beds, and are situated in front; the wards in the back wings are separated from those in the front by landings and lobbies. The height of the wards is moderate. A sisters' room and bath-room are partitioned off the landing. The wards have opposite windows, with the top compartments generally inclining inwards; they are retained in an inclined position by small ledges fixed to the framework. In various places perforated zinc plates are inserted in the walls on a level with the ceilings. They correspond to similar ones in the outer wall, which admit fresh air. There are square apertures in the ceilings of the top wards communicating with the space beneath the roof, and louvres are over the entrance doors.

A lift of moderate dimensions is in the eastern wing; the stairs are of stone, and have iron balustrades; the central corridors, although wide enough, are rather dark, and might be improved by cutting apertures in the walls, separating them from the private rooms, and these apertures might be filled with semi-transparent glass.

The nurses live in a separate house connected with the hospital by a passage. Sixteen physicians and surgeons attend to the patients (in-door and out-door), including two house-surgeons. There are also two dentists. A new theatre and dissecting rooms were lately added.

This hospital is one of the few in London that can boast of a garden where the patients take exercise. The special departments include a cancer department and a ward for diseases peculiar to women.

Royal Free Hospital.

The hospital, founded in 1828 by a medical man, is situated in a densely-populated and poor district in the north of the metropolis. It contains 150 beds. The principal part, containing the wards, has the shape of the letter L; there are three floors over a high basement. Two wards are found on each floor, having a common staircase of stone. But some of the wards in the smaller but deeper block (B) are divided through their length by partitions. All the wards have a considerable height, 16 or 17 feet, and opposite windows. The windows looking into the yard are larger and higher than those opposite; they are 4½ feet from the floor; some have three compartments, of which one or two incline inwards; others are common sash-windows. Some windows are 7 feet from the floor.

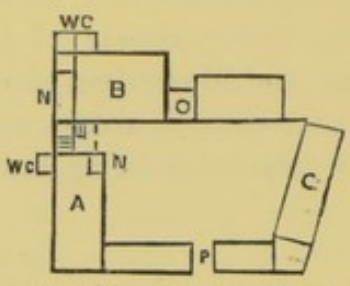


Fig. 28.—Royal Free Hospital (Ground-Floor).

A, B. Wards. C. Out-patients' dept. P. Porter. N. Nurse.

The walls and ceilings are whitewashed, the floors scrubbed. At one end of the ward, near the stairs, is the nurses' room and scullery; but the nurses' room is only an incomplete partition, 7 or 8 feet high, formed partly by curtains drawn across, and partly of wood. The water-closets are self-acting, well placed and free from smells.

The wards hold 23 or 24 beds, some of them standing close together; and 2 wards are generally kept empty, or nearly so, for transferring patients. There are two special lock-wards; in one ward I found medical and surgical cases together, but on opposite sides.

We find two fireplaces at the opposite ends of the wards for warming them; and, in addition to the windows, apertures in the wall facing the yard for admitting fresh air. There are baths attached to the wards, and I saw one of white glazed cement, imitating marble, which had a very good appearance; but there was no means of warming the bath-room.

The out-patients' department is separate, and males and females have different waiting-rooms. The hospital contained about 100 patients at the time of my visit. It is capable of much improve-

ment, as the original plan of construction was a good one. If the walls were painted like those of Addenbrooke's Hospital, they would at once attain a cheerful and pleasing aspect.

St. Thomas's Hospital.

The old building opposite Guy's Hospital had to be given up, as the ground was wanted for certain railway improvements, and a temporary hospital on the south of the Thames was occupied by the patients till the new one was ready for their use. The temporary building contained large wards for about 80 patients, and could altogether accommodate about 300.

The new building occupies a site opposite the Houses of Parliament, Westminster, close to the river. It consists of twelve pavilions, surrounding a square yard; they are connected by a corridor, not on the ground-floor only, but also on the first floor. Most of the blocks are four stories high.

The building stands partly on land reclaimed from the river and partly on shore. The foundations on the river portion are carried down to the London clay. The ends of the blocks next the river have a solid foundation of about 22 feet deep. The flank walls have a foundation 10 feet wide. The pavilions are built on piers and concrete arches. The pavilions for patients are placed at right angles to the corridor, from which a passage leads direct to the wards, on one side of which is the staircase. The wards are 28 feet wide, 120 feet long, and 15 feet high, giving a cubic space for each patient of 1800 feet. The windows are arranged alternately with the beds, opposite to each other, at a level to enable patients to see out. The external balconies looking to the river Thames may be used by the patients in fine weather. Small wards for 2 beds are contiguous to the larger ones. The water-closets, lavatories, and bath-rooms, attached to each ward, are projected from the main building, and are cut off from the ward by intercepting lobbies, with windows on both sides.[1] The water-closets, lavatories, etc., have also windows on all four sides, to provide a thorough ventilation. Foul-linen and dust shoots are found communicating with a receiving-room in the basement for external removal. The wards have flat ceilings throughout, and the windows are carried up to the ceiling. The windows are constructed in three divisions, the upper sash drops to the depth of the transom.

The wards are warmed by three open fireplaces; they stand in the middle of the wards, and have vertical shafts painted a light

[1] *See* Fig 2

colour. An auxiliary system of hot water is used in very cold weather. The corridors and staircases are warmed by hot-water pipes. The shafts are constructed with an outer case of cast-iron, and an inner wrought-iron smoke-tube 15 inches diameter. The space between the two tubes becomes an efficient ventilating-shaft. The stoves have an air-chamber at the back.

Twenty-five millions of red bricks were consumed exclusive of the facing bricks. They were made in Fareham, Hampshire. The windows were executed in Sweden, the iron girders in Belgium. The stone used is mostly Portland stone. The building is richly ornamented by turrets, balustrades, and balconies. The expenses are said to have been £600,000 sterling. The number of beds is about 600, viz. 588 for patients admitted by recommendation or otherwise, and there is a limited number of beds for paying patients, who are accommodated in smaller wards in the southernmost pavilion. The cost of a bed is therefore about £600.

A large entrance-hall is in the centre, and forms the substructure of the chapel, which has 300 seats. The out-patients' department has a separate entrance. The kitchen is on the ground-floor. The Nightingale nurses are accommodated in a special part; each of the 40 probationers has a separate bedroom. The treasurer's house lies nearest Westminster Bridge. The school-buildings, post-mortem rooms, kitchen, etc., are conveniently arranged.

University College Hospital.

This hospital is situated opposite University College. It has a front building and two wings of different lengths, and may, when full, accommodate 200 patients. The thoroughfare in front is closed for carriages; there is only a small yard at the back, and the houses closely adjoin the hospital at this part.

There are four floors over a basement, and attics in addition. The entrance is from the side, as the principal entrance-door is kept closed; it has, however, small windows, which, when open, admit fresh air. A corridor runs on the ground-floor at the back of the main building; it receives light through skylights, and air through perforated zinc plates. On the ground-floor we find two surgical wards, 60 feet long, 26 wide, and 16 high. They have windows on both sides; those facing the thoroughfare are about 8 feet high. On the opposite side is the corridor, which is about 10 feet high, and there are also windows of a smaller size—they are about 5 feet high. There are only 14 beds in each ward, and the cubic space allotted to each patient is very large—more than 2000 feet.

The walls are stuccoed; the lower part is coloured light-brown, the upper part light-blue. Two surgical wards are covered with Keene's cement. The windows are all sash-windows, having dark-green curtains. We find open fires for warming, and no artificial means of ventilation. But there are openings in the walls on a level with the ceilings at various places, and large square holes are in the ceilings of the top wards.

Small side-wards are very numerous in this hospital for separating contagious and delirious patients; they have one window only, and contain 1 or 2 beds.

The wards in the upper floors have high opposite windows, reaching nearly to the ceiling. There is a central staircase, and one near each end of the main building; but a large lift has been recently added for hoisting food from the kitchen to the upper wards. The kitchen is in the basement, which is rather low; they cook with gas and open fires. The door to the street area is left open for the entrance of air through the basement.

Lavatories are in different parts of the building; the sisters' day-rooms adjoin the wards; in 1879 new and improved water-closets, entirely cut off from the wards by cross ventilation, were provided; new pipe-drains were laid, and entirely disconnected from the main sewer by proper trapping.

There is a day-room on the first floor. Common bath-rooms were opened in 1875. In addition to simple baths and douches, there are found those for fumigation of the arm or leg, sulphur, iodine vapour, iodine, mercurial fumigation, steam vapour, sulphur vapour, steam. Two disinfecting chambers are adjoining the baths. They are built of stone and iron, with channels or tubes to admit fresh, and withdraw foul air. The air may be heated by a fire to a temperature of 300 degrees Fahr.

Connected with the establishment is a celebrated medical school. There are two physicians, professors of clinical medicine; one physician, a special professor of clinical medicine; an obstetric physician, three assistant-physicians,[1] a consulting surgeon, two surgeons, professors of clinical surgery; two assistant-surgeons, and a dental surgeon, lecturer on dental surgery.

The matron keeps the keys, and has charge of all the household goods; visits the wards, sees that patients have clean linen, food,

[1] But upon these gentlemen the honorary title of "Physician" has been lately conferred, although they continue the duties special to the so-called "Assistant-Physician;" that is, they see the numerous out-patients who come to the hospital, and in the absence of the clinical physician they take charge of the in-patients.

etc.; superintends nurses and servants, and presides at the meals of the resident medical officers and pupils.

The entire nursing is at present undertaken by the Protestant sisterhood of All Saints' Home, the matron being a lady superior of the sisterhood. The sisters superintend and train nurses. Three houses adjoining the hospital are rented for a portion of the nursing staff.

The nurses come on duty in the summer at six, and in winter at seven o'clock, and remain on duty till nine in the evening. They may absent themselves from their ward for one hour, with permission of the matron. The night-nurses come on duty in summer at nine, and in winter at eight o'clock in the evening, and remain on duty till eleven next day.

Admission is more liberal than in most of the other metropolitan

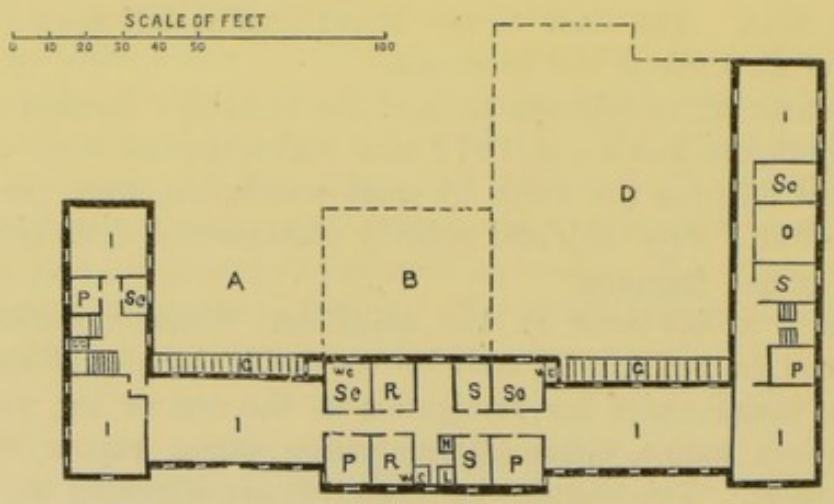


Fig. 29.—University College Hospital (First Floor).

A. Out-patients' department on ground-floor.
B. Amphitheatre, lecture-room, on ground-floor.
D. Yard.
P. Private (side) wards.
R. Resident medical officer.
S. Sister.
Sc. Scullery.
O. Ophthalmic ward.
H. Hoist.
L. Lavatories.

hospitals; and the medical officers especially select such cases as are useful for clinical instruction. During the vacations the number of patients is considerably less, to save the funds of the hospital. Most of the wards are cleaned and whitewashed once a year.

The management of the affairs of the hospital is peculiar. The institution is connected with University College, and the government is vested in the council of the college, but a fair share is left to the subscribers. The council appoint a treasurer; the committee is composed of the treasurer, fourteen members elected by the gover-

nors at an annual meeting, seven appointed by the council of University College, and three delegates from the medical committee of the hospital. They have the management of the house, and meet every fortnight or oftener. There is a medical committee besides, and this consists, not of the medical officers only, but of the members of the faculty of medicine of the college in addition. They have control over the medical and surgical departments of the hospital and the medical education of the pupils.

The resident medical officer, in the absence of the physicians and surgeons, is the chief medical officer of the hospital, and he has the power to interpose in the treatment of the patients when circumstances appear to him to render his interference necessary. He visits the wards every morning at nine o'clock, and prepares daily and annual reports; he is also responsible for the conduct of the business of the dispensary, and makes the post-mortem examinations of inquest cases. He must not leave the house without being replaced. He has a dispenser and assistant-dispenser under him, and the physicians' assistants and clinical clerks report to him.

Westminster Hospital.

It was founded in the year 1714, but completely rebuilt and reopened in 1834. It can accommodate nearly 200 patients. It is constructed in a semi-Gothic style to correspond with the neighbouring structures. It has not a very favourable site, and is partly surrounded by houses, but there is a free space in front. The park is close by, and sometimes used by the patients. There are three floors over a basement, and attics. The building has the shape of a horse-shoe; a spacious corridor (10 feet wide) runs through the part which stands in front. There are two large windows at each end of this corridor; they form a capital means of ventilation, and there are some back windows which might be broader. In addition, there are well staircases at the ends of the corridor where side corridors branch off, extending backwards, and these stairs have skylights at the top; the top windows open like louvres, and are used for admitting fresh air. A lift is on the right hand of the stairs.

The wards have the corridor on one of their sides, and, as seen by the plan, windows on two sides; but the end wards have them even on three sides. The windows are rather narrow; the top compartment revolves inwards. The number of beds in the wards varies from 9 to 12. The floors are of deal, and scrubbed. The wards are warmed by open fires and water-pipes, which are formed into

coils in the corridor; through these the fresh air has to pass before entering the wards. There are outlets and inlets at various places in the walls.

Water-closets and sculleries were formerly partitioned off the wards, as seen in the figure, and this was of course an objectionable arrangement. They are now in turrets built out of the house.

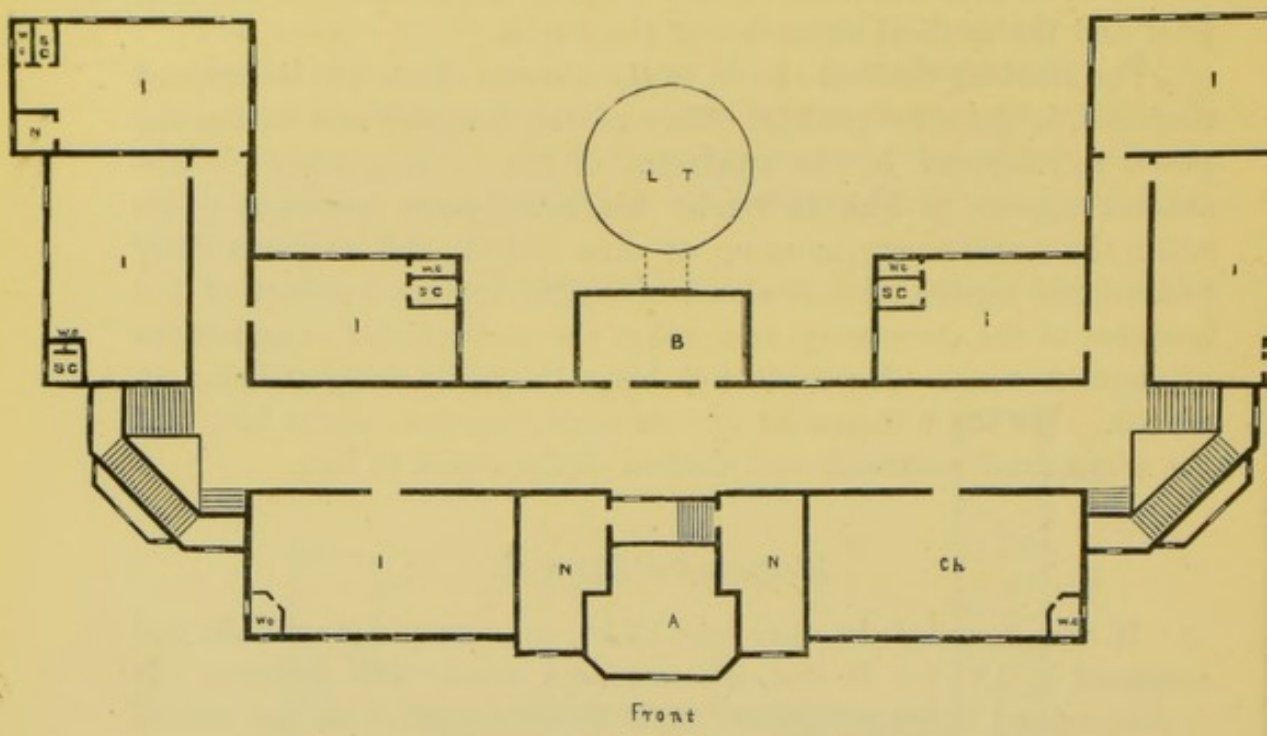


Fig. 30.—Westminster Hospital, Second Floor (in 1879).

A. Matron.
N. Nurse.
B. Lobby on ground-floor.
L. T. Lecture theatre on the same.
Ch. Chapel.

(*b.*) Special Hospitals.

Hospital for Consumption and Diseases of the Chest, Brompton, S.W.

The first portion of this hospital was opened in 1846; it contains now 210 beds, and it is intended to enlarge it. The building has the H shape, and is three stories high; two towers are conspicuous, and some portions project from the main building. The wards face the west, and the corridors the east, so that the former are in some way protected from cold winds. The female patients are on the first, and the males on the second floor. All but the end wards have windows on one side only. The wards generally contain 2 or 3 beds; a few have 8. There are sash and double plate-glass windows, about an inch intermediate space being left between the plates. The walls are coated with Parian cement of

various colours. The corridors, 10 feet wide, are covered with cocoa-fibre matting, and, being kept of the same temperature as the wards, can be safely used as dining and day rooms.

The western half of the building is warmed and ventilated on Dr. Arnott's plan, who first instituted here his air-pump, which was afterwards replaced by another apparatus. In winter time fresh air enters after passing over hot plates in the basement, and there are grated openings for foul air near the ceiling, which lead into the smoke-shafts. In the other wing the fresh air is similarly heated by passing through a spacious air-chamber in the basement, which contains hot-water pipes; the foul air finds its way into a tall extracting shaft, having a hot-water tank at the top; the water is heated by steam pipes from the basement. In addition to the heating apparatus fireplaces are in the wards. I found the temperature in the corridors $60\frac{1}{2}$ degrees Fahr.; it was freezing outside.

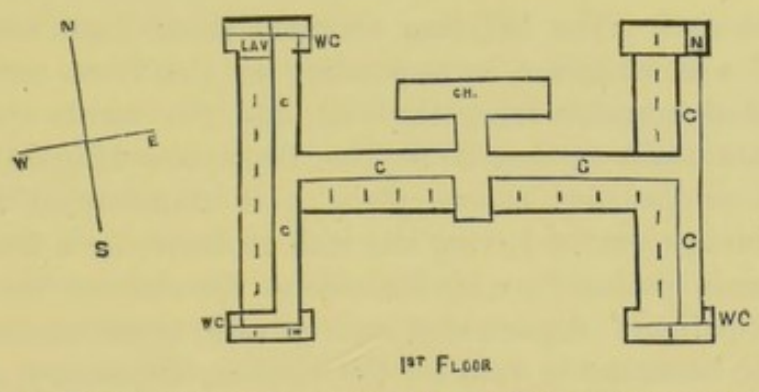


Fig. 31.—Hospital for Consumption and Diseases of the Chest, Brompton.

C. Corridor. La. Lavatories. N. Nurse.
Ch. Chapel. W. Matron.

The baths are of painted zinc, and the condensed steam of the boiler is used for them. The lavatories are on Jennings' system; the dispensary has a small enamelled slate tank for cod-liver oil; it is drawn from a tap. Hot water is supplied by the condensed steam.

Steam and water boilers are in the centre; various lifts for food and patients are worked by steam power; steam is also used in the kitchen.

The kitchen contains a gridiron for chops and steaks, which can be raised and lowered. The smoke is drawn away by a side flue. Milk is kept in large enamelled slate vessels under which a cold air-current passes. The storerooms for meat have the walls covered with encaustic tiles to a considerable height, and white enamelled slabs.

A new consumption hospital for 137 patients, the foundation-stone of which was laid in 1879, stands opposite the old one. It is built in the horse-shoe form, has four floors and small wards, the highest number of beds being 8. The wards open into wide corridors intended for the patients to walk about. The warming is partly by open fires, partly by hot water circulating in pipes. The bad air is withdrawn by channels leading into the large smoke-shaft. Coils of steam pipes are in the latter to increase the draught. The kitchen is on the fourth floor.

City of London Hospital for Diseases of the Chest.

The hospital was founded in 1848; it contained about 90 patients at the time of my visit. The building has the shape of the letter L; the long stroke represents the main part, the short one a wing. The axis of the former lies from north-north-west to south-south-east. The building contains three floors over a basement, and a clock-tower corresponding to the front entrance. A broad arched corridor faces the east, and the wards open into it; the patients use it as they do at the Brompton Hospital for day-room and promenade; at one place it is transformed into a convenient dining-room by having the wall replaced by a few columns.

The male patients are on the second, females on the first, and offices, out-patients' department, and private rooms on the ground-floor. The basement is used for the kitchen, dispensary, and store-rooms. Nurses sleep at the top part in the centre.

The wards are generally small, for 2 or 4 patients, and have windows on one side only, but there are larger end wards having opposite windows, three on each side and two others opposite the door. All are sash-windows, most of them double. Here the beds stand 2 between two windows, quite close together, which should not be the case under any circumstances. The beds themselves are comfortable; they have paillasses and good horsehair mattresses; the latter being remade outside the hospital when necessary, are a great expense, and there is a great loss of the horse-hair in this institution as in others by this arrangement. The bedsteads are of iron, and high at both ends, so that footboards can be placed at the lower end.

There is an artificial system of heating similar to that at Brompton. An air-channel runs under the basement through the whole length of the building; the cold air enters it at one side or the other according to the direction of the wind. Hot air which has been in contact with hot-water pipes ascends through hot-air

channels into the wards. The quantity of hot and cold air admitted can be regulated by valves or air-doors, but practically they are not much used. The wards have apertures for admitting hot air near the floor. The foul air is educted by channels which open near the ceilings, and lead to the foul-air shaft, the extractive power of which is heightened by a similar process to that at Brompton. At the time of my visit, the temperature outside being very mild (50 degrees Fahr.), the system acted but slightly; there was but little draught either in the underground channel or in the upper ones; besides, the windows of the corridors were open, and also those in some of the wards. The air was close in some wards at the time. They have also open fireplaces.

The water-closets are well placed and entered from the corridor through a lobby; but they have wire-pulls for admitting water, and the wires were mostly broken. The water-closets are not warmed, but the lavatories are.

The kitchen, which is rather low, has open fires, a range of steamers for cooking vegetables, and a hot-plate in the centre. The patients seem to belong to a superior class, and conduct themselves properly; as a rule they only stay six weeks in the house. The exceedingly low death-rate—scarcely 7 per cent—can only be explained by the system of admittance (by letter) and the regulations. Patients who are in the last stage of consumption are considered as incurables, and not admitted.

There is a matron, two sisters, and seven nurses—all paid, a resident medical officer, a chaplain, and ten physicians attached to the hospital.

City of London Union Workhouse and Infirmary.

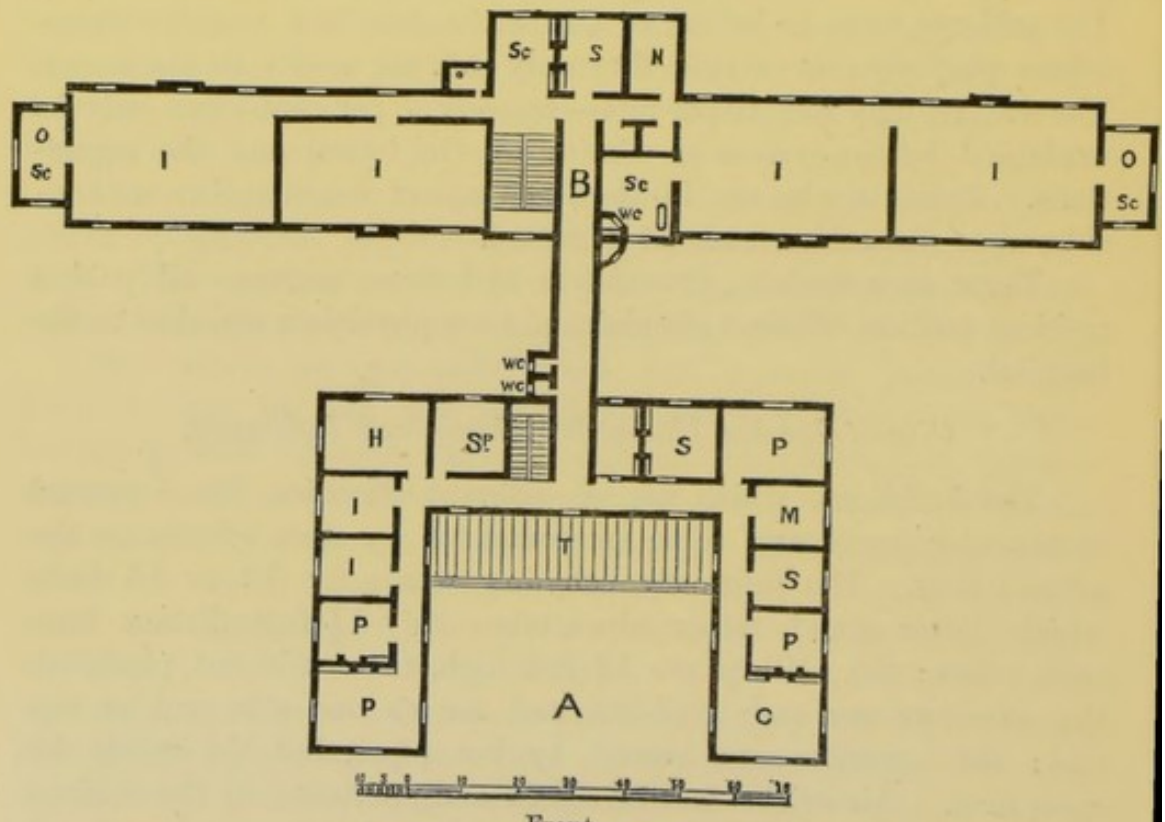
The buildings, which are of different elevation, stand around rectangular yards, and some are connected by open arcades on the ground-floor. The infirmary contains wards for 12 or 15 beds, which latter stand rather close, often only $1\frac{1}{2}$ foot distant from each other; the ceilings are 12 feet high, the walls not plastered, the windows are sash-windows, and are on one side and at one end; the corridors are heated by hot pipes, but the wards by open fires. Air-bricks on the floors, and apertures in the ceilings protected by perforated zinc plates, serve as inlets, and ventilators over the fireplaces as outlets. There are iron bedsteads with flock beds, and to purify the latter we find a flock-room, where the flocks taken out of the beds are baked in an oven. Good water-closets, some lavatories of enamelled iron, and a few baths of the same material, are attached to the wards.

The kitchen is well arranged, contains several ranges of steamers, hot plates, etc., and a large scullery is adjoining. The wash-house is large, but there is only one machine—a wringing-machine—as everything is done by hand.

There are paid and unpaid nurses; the number of patients was at the time of my visit 180, to whom only one medical man attends; he has more than 400 under his care, including the bedridden and lunatics. There were two smallpox cases in a separate room, and two females in a small lying-in ward. The number of inmates of the workhouse was 865. The dormitories are not so crowded as in other workhouses, and the establishment is altogether above the majority of its class. The patients are very well satisfied with their food.

German Hospital.

It is situated in Dalston, and consists of two parts connected by a gallery, one standing at the back of the other. It contains at



Front.

Fig. 32.—German Hospital, Dalston (First Floor).

present 125 beds, and is destined for Germans, but accidents are admitted without distinction.

Part A contains on the ground-floor offices, private rooms, and the entrance-hall (T); on the first floor small chambers for paying

patients (P), and rooms for sisters (S), matron (M), servants (C), operating-rooms (H), surgical wards (I), and the splint-room (S^P).

The principal wards are in the portion (B), which forms a long block, and is one floor higher than the other building. The ground-floor contains the chapel and the accident ward; the first floor 4 wards—2 for males, 1 for females, and a children's ward. All the wards but one have opposite windows and are warmed by fire-places, two of them by a Gurney stove in addition. They contain generally 10 beds each. In the centre are nurses' (N) and sisters' rooms (S). Sculleries (SC), and baths are near the stairs and at both ends (O). All water-closets are built out of the main building. The out-patient department is now in a separate building, erected at a cost of £9000, and convalescents may be transferred to a large private house opposite the gates of the hospital taken by the committee.

Holborn Union Infirmary, Upper Holloway,

for 624 paupers. The wards have opposite windows, the latter are made as casements with upper sash. The wards are warmed by thermo-hydric stoves. The fireplaces are surrounded by wrought-iron casing containing water. This is made to circulate through two upright coils of pipes. The fire is therefore utilised in a twofold manner, as the heat also radiates from the fireplace. Fresh air also enters through gratings after passing through hot pipes. There are numerous outlets in the walls for withdrawing bad air. The wards contain 50 beds each, arranged in a peculiar manner by incomplete partition walls.

Kensington Workhouse and Infirmary.

It stands in large grounds, and has the shape of a quadrangle.

The infirmary contains mostly small wards for 11 beds, and a few larger ones. At the time of my visit the wards were overcrowded, and had 2 or 3 additional beds placed in each, in addition to the number for which they are intended. The ceilings are low, except where the roof is thrown into the wards (on the second floor). The beds stand close together, sometimes leaving hardly more than 1 foot clear space between them. Some wards have windows only on one side, and they are small; others have them on both sides. Some are sash-windows; many open like louvres.

Neither sculleries nor lavatories are attached to the wards. The infirmary contained 260 inmates, including insane, infirm, small-pox patients (2), and females who had been confined. One

medical officer is attached to it, and spends five or six hours there; extra visits not included. Nurses are paid. One complained that the pay was only one shilling a week.

The whole building contained 570 inmates; and day-rooms and dormitories were of course overcrowded, as the house was not originally intended for so large a number. I was even informed of the startling fact, that to make room for all applicants, two persons had to be placed in some of the beds, which are small.

The kitchen is too small for the increased number. Children are sent into the country after they have been put in a fit state of cleanliness in the workhouse.

New Pauper Infirmary, Marylebone,

opened 1881, stands on $3\frac{1}{2}$ acres of ground. There is an administrative block in the centre, flanked on either side by two double-ward blocks parallel to each other. There are 6 wards in each block, or 24 wards in all, exclusive of a few separation-rooms. Each ward is 84 feet long, 24 feet wide, and 13 feet high; the walls are coated with Keene's cement. The warming is by thermo-hydric stoves. The hot-water pipes at the side are made in the form of small columns, and are thus ornamental, and the whole has a pleasing appearance. The stoves are an invention of Saxon Snell, architect.

Fever and Smallpox Hospitals in London.

Up to the year 1870 only two special establishments existed for fever and smallpox patients. The London Fever Hospital in Liverpool Road received principally patients suffering from typhus, typhoid, recurrent fever, and a limited number of smallpox cases. The Smallpox Hospital in Highgate admitted the latter only. The New Metropolitan Asylums Board founded new establishments for both classes of patients; the first of them were opened in 1870, viz. the Homerton Fever Hospital for 200 beds and the Stockwell Fever Hospital for 198 beds. The Homerton Smallpox Hospital and the Stockwell Smallpox Hospital, both containing 102 beds each, were opened in 1871. They are all built on the pavilion plan.

The Fulham Smallpox Hospital, established 1877, is now practically useless by the injunction obtained to limit the patients received into it to residents in the immediate neighbourhood. It is composed of ten pavilions standing in 6 acres of ground, each of 30 beds (at the highest).

It is probable (and desirable too) that in times to come the

Asylums Board will be authorised to provide hospital accommodation for all fever and smallpox patients. The Royal commission on smallpox lately came to the conclusion that in London 3000 beds were required for fever patients, and 2100 for smallpox cases.

London Fever Hospital, Islington.

The institution lies in a part of the town which is reputed healthy: it stands a little removed from the thoroughfare, and is enclosed by moderate grounds. It is built on the corridor and

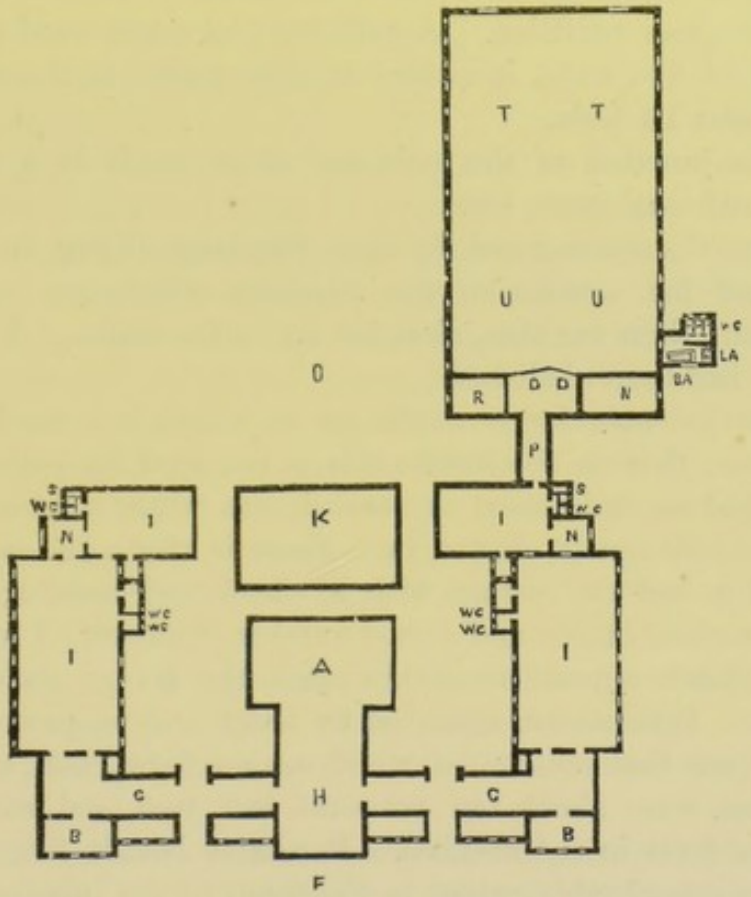


Fig 33.—London Fever Hospital, Islington.

A. Kitchen, stores, scullery, coals.
B. Private rooms.
C. Corridor.
F. Principal entrance, lodge.
H. Committee room, physicians' room, stores, matron's linen room.
B A. Bath.
L A. Lavatories.
I I. Male and female scarlet wards.
K. Wash-house, ironing and mangling room, drying closet, feather cleaning room, boiler, engine-room, engineer, engineer's workshops, refuge.
NN. Bath-rooms, sculleries, or private rooms
R. Private room.
S. Coals.
D D. Doors, now altered.
P. Passage.
O. Mortuary, disinfecting chamber, etc.
T T. Male fever patients.
U U. Female fever patients.

block plan combined. A corridor on the ground-floor is open at some places so that the circulation of air is facilitated. The centre

building has three floors, the others one or two. The administrative department, board-room, receiving-rooms (H), kitchen (A), etc., are in the centre; a few wards for paying patients (£3 : 3 : 9 a week) immediately in the front. Two similar rooms with a bath-room adjoining are found on the upper floor.

The main wards (for scarlatina patients), are placed side by side in the lateral buildings, and measure 79 feet long, 25 feet wide, and 17 feet 6 inches high, and each affords accommodation for 17 beds, giving to each patient a floor-space of 102 feet and cubic space of 2033 feet. The division between the two wards is by a wall with lofty arched openings, filled to a height of 6 feet 6 inches by a wood and glass partition. A subsidiary or cross ward (I), 55 feet long and 24 feet wide, is placed at right angles to the main wards, and contains 14 beds.

At the junction of the main and cross wards is a small ward kitchen with coal store, etc.

The wards are warmed by open fireplaces (three in each main ward), and for ventilation the windows which are opposite are relied upon; there are also inlets for air in the walls. A fan worked by steam has been abolished.

Over the outer large wards on each side is a ward of similar dimensions; that on the female side is not used for patients.

We find an ambulance or coach-house, where a fever-carriage is kept: two beds can be slipped in. There is also a bed-carriage, consisting of a bed on castors, with a wheel and handle; there is a resident medical officer, and a good number of nurses. I was informed that the nurses almost invariably catch the fever: six did so some years ago. Patients are admitted by letter and on payment; but it often happens that acute cases, which are not fever cases, are received. These cases were about ten per cent last year, and some of them caught the fever in the hospital. Parochial boards formerly contributed to a considerable extent to the funds of the institution.

The building to the east of the female wards is devoted to the reception of enteric fever.

It is divided transversely in the centre by the entrance-ward, kitchen, and bath-room—the eastern portion (T, T) being devoted to male, the western (U, U) to female patients. At the western end of this building are two rooms for private patients. In point of size these wards are much the same as the large scarlatina wards; the main difference being that there is no upper story, and the division between the two wards is by a dwarf wood and glass partition with openings at the floor level.

The walls of all the wards are painted a dark-red tint, and var-

nished up to a height of about 5 feet; above this they are distempered a pale gray.

The building standing midway between the ends of the two cross wards (K) contains the laundry, engine-room, boiler-house, etc.

To the east of this is the mortuary and post-mortem room (marked by the letter O), at the back of which is the disinfecting chamber, with rooms on either side for infected and disinfected clothes, etc. The disinfecting apparatus is that of Dr. Ransom, and consists of an iron chamber 5 feet by 5 feet by 6 feet, enclosed in a wooden casing, with a layer of felt 5 inches thick between the wood and the iron. At the side of, and at a lower level than the chamber, is the furnace, the heat in which is generated by burning gas with smokeless flames, by means of a large atmospheric gas ring Bunsen burner. This burner is contained in a cast-iron cylinder, having at its sides cast-iron webs through which the air enters. The products of combustion, mixed with the heated air, pass by means of a horizontal flue to the floor of the chamber, which they enter through perforated iron plates. The heated air, after penetrating every portion of the chamber, escapes through an outlet flue at the top, which is provided with a damper to regulate the speed of the current through the chamber. The entrance of the gas into the chamber is regulated by a self-acting mercurial regulator, so arranged that the gas is gradually shut off as the temperature rises, by which means, when the regulator is once set to any given temperature, that temperature, in the absence of any supervision, is maintained for an indefinite period. The usual temperature being 240° to 250° Fahr.

The kitchen (A) is of moderate dimensions, and the scullery adjoining it is small. The cooking apparatus consist of a large "close" stove, two gas-stoves, and a set of three steamers for vegetables.

The engine-house and laundry are under the same roof. In the engine-house is a steam-boiler with a 3-horse power steam-engine; adjoining is a workshop for the engineer, with forge, etc.

The wash-house contains, besides the usual coppers, steeping tanks and washing troughs, a washing machine and a centrifugal wringing machine, or "hydro-extractor;" between the wash-house and the laundry is a drying closet with horses on wheels, so arranged that the wet clothes are put in in the wash-house and taken off when dry in the laundry. The laundry or ironing-room is small and insufficient for the work it has to do. It contains a mangle and a stove for heating the irons.

The original design of the hospital is much changed owing to the accommodation at present provided for fever patients by the Asylums

Board, and further alterations are likely to be made by the architect of the hospital, Keith D. Young.

Highgate Smallpox Hospital, London,

established 1746, situated at Highgate Hill, in a favourable position; can accommodate about 100 patients. The building is an oblong block, with a central corridor and wards on each side of it. They are on two floors only, and have large front windows, and small ones looking into the corridor. In addition to open fires, we find a system of artificial heating and ventilation much resembling that of Duvoir, only the air does not pass through water-stoves in the wards, but over hot plates before it is admitted.

Admission is granted by governor's letter, or on payment of small sums.

York Road General Lying-in Hospital, London,

contains two floors, basement and attics, and can accommodate 30 patients. The wards are heated by fireplaces and air which passes over hot plates before it enters. A matron, a midwife, and one or two students reside in the house. An extensive out-patients' department is connected with it. There is one larger lying-in hospital in London, Queen Charlotte's, for 50 beds; there is one in Endell Street, and a fourth in City Road, for about 20 in-patients each. A fifth, Maternity Home for Married Women, exists since 1877 in Chelsea.

Manchester Hospitals.

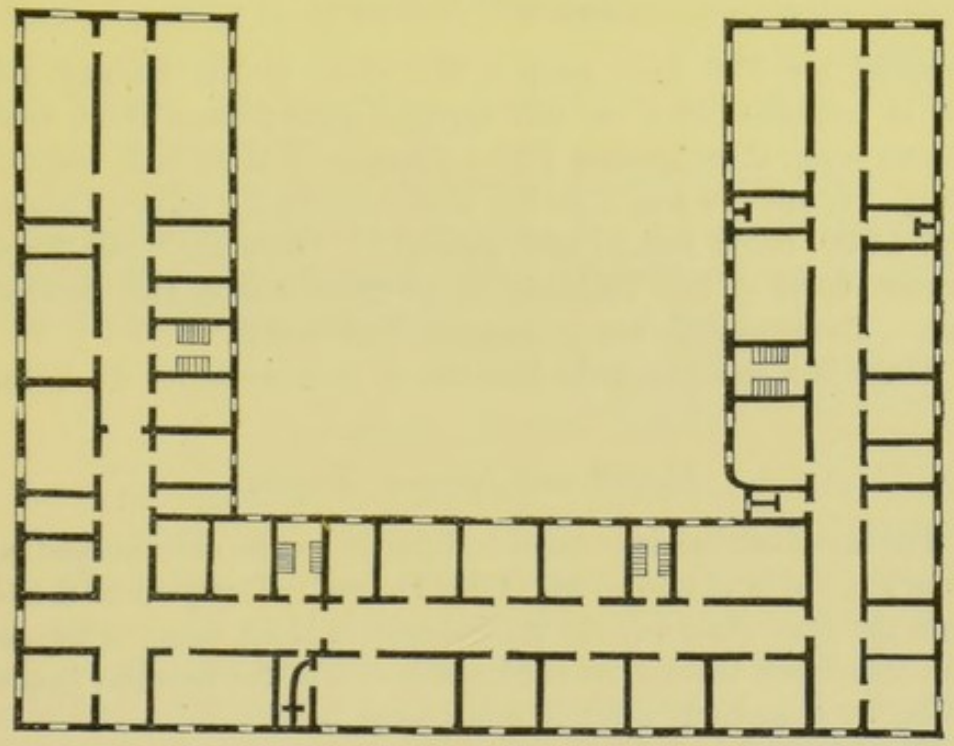
Manchester Royal Infirmary.

It was founded in 1797. Its site is in the centre of the town, but it stands by itself in a large, open, and noble square. It can accommodate 210 patients.

The hospital has the shape of an open quadrangle. It has an imposing exterior, heightened by lofty columns and a central clock-tower, with a fine cupola.

It is built on an objectionable plan. A corridor runs through the centre of the building, and wards are on both sides; but it has been lately much improved by removing partition walls and cutting apertures into walls where needed. At the time of my visit the process of improving was going on in some parts. All the end wards, which were divided by brick partitions about half the height of the room, are large wards, with windows on two sides, and louvres over the doors.

The corridor is spacious, 9 feet wide, warmed by hot pipes. Offices and private rooms are on the ground-floor, the wards on the two upper ones. The female patients occupy more the wings, the males more the centre part. The corridors and wards are lofty, oil-painted of a pleasing light-green colour. The floors are mostly oiled. Many new and good beds are in place of the old ones; they mostly stand four 4 apart. There are sash-windows, open fireplaces, self-acting water-closets, enamelled earthenware baths and lavatories.



Front.

Fig. 34.—Manchester Royal Infirmary (First Floor).

The wash-house is in the yard. It is lofty; in the centre stands a wheel, where the clothes are subjected to the action of soap and soda. The washing trays stand near the wall. A wringing machine, like that of Guy's Hospital, is used for the cloth before it goes into the drying-room. In the latter we find the horses moving on castors. Mangling machines are worked by steam. All the cloth is marked and numbered, to be stacked properly. A new boiler-house was lately constructed, and a new dispensary built.

Thirty nurses attend to the patients—six head, six night, and eighteen assistant-nurses; five physicians, and two assistant-physicians; five surgeons, and two assistant-surgeons; two resident medical officers, and a medical superintendent. The Barnes Convalescent Home, Cheadle, is attached to the hospital, and contains 140 beds.

There are some smaller and special hospitals in Manchester: St.

Mary's Hospital, for 50 beds; Salford and Pendleton Royal Hospital, 60 beds; Royal Eye Hospital, 68 beds; Clinical Hospital and Dispensary for Sick Children, 56 beds; Manchester Hospital for Consumption, 13 beds; Lock Hospital, 50 beds; Hospital for Skin Diseases, 6 beds; Northern Counties Hospital for Chronic and Incurable Cases, 100 beds; Southern Hospital for Women and Children, 19 beds; a new pavilion Hospital for Children at Pendlebury, 140 beds.

Newcastle Infirmary,

a hospital for 230 beds, upon a hill close to the railway station, built in irregular form on the corridor plan; has a front building and one wing, three stories high; contains 6 large new wards, 111 feet by 24, and 14 feet 6 inches high, holding 24 beds. They afford about 1600 cubic feet to each patient.[1] There are 8 old wards on different floors of the building, of irregular shape, and deficient in space. The syphilitic are in separate lock-wards.

There is a separate fever hospital in Newcastle for 45 beds.

Norfolk and Norwich Hospital.

The new hospital is constructed partly on the old site and partly on the piece of land known as "Flint House." The plan of the buildings is the form of an H, the administrative block being in the centre. From this block there is access to each side of the hospital (male and female) by a spacious corridor and glazed hall.

The out-patients' department will now be entirely distinct from the working portion of the hospital, and will be formed in the old north-east wing, which will further be adapted for the purposes of the museum and nurses' dormitories, etc.

The kitchen department is provided in a well-lighted and airy basement story.

In the rear of the centre block, and equidistant from the male and female sides of the hospital, the operating theatre group is constructed. It is a one-story building with small separate wards for 10 patients after operations, and contains a consulting-room, nurses' room, ward scullery, and bath-room, etc

The main corridor is 10 feet wide, with windows on both sides, and one story high only, thus allowing a free circulation of air from

[1] The following plan of improving the floors has given great satisfaction :— After planing them, they are saturated with two coats of boiled linseed oil mixed with a little umber to give tone, then a couple of coats of best oak varnish are superimposed, which should be allowed three weeks to dry and harden.

front to back. At each end of the corridor, and at right angles with it, the pavilions (forming the hospital proper) are constructed. Each wing is about 260 feet long and 29 feet wide, two stories high, and contains large wards for 24 beds each, with nurses' rooms, ward sculleries, and smaller single wards.

The bath-rooms, water-closets, etc., in connection with each ward are in octagonal turrets separated from the ward in each case by a lobby, having a window in each outer wall.

On the side nearest the town, the back portion of the wing or pavilion, instead of being occupied by only one large ward, is divided into two smaller wards on each floor, one for 13 beds for children, and one for 4 beds. Adjoining these wards are nurses' rooms, ward sculleries, and water-closets.

An isolated ward for contagious cases will be provided.

The accommodation thus provided will be for 200 patients, exclusive of wards for infectious cases. Clinical lectures are delivered by the physicians and surgeons.

Northampton General Hospital.

It can accommodate 144 patients. It is well constructed, though built more than 100 years ago (1744). Its site is beautiful; it stands in not less than 16 acres of ground. There are large and small wards; the cubic space afforded to the patients is ample. The wards are warmed by open fires, and there is no system of artificial ventilation. The only noteworthy arrangement is that a subsidiary building stands near the hospital, and is used by convalescents. It contains a female and a male ward for 7 beds each.

Nottingham General Hospital.

It was established in 1782, and can accommodate 170 patients; is situated in the town, on a hill near the market place; has an old central part, three stories high over a basement, to which latter two wings were added, a smaller one on the left, and a larger one on the right side. A separate fever-house is also a modern addition; it stands in a line with the central building, but separated from it by the chapel. The central part is traversed by a corridor, and the wards lie in front and back of it. We find day-rooms, a special female and male eye-ward, and an out-patients' department.

There are fifteen nurses living on the premises, four physicians, five surgeons, and two resident medical officers.

There is also a Union hospital and dispensary in Nottingham;

more than 200 in-patients can be accommodated by the former. There is an eye infirmary with 14 beds, a children's hospital with 34 beds, and one for women with 9 beds.

Oxford Hospitals.

The Radcliffe Infirmary, Oxford,

stands in large grounds just outside the town, and is composed of an old building dating from the year 1770, and two new ones; they form the letter T. The new buildings are only one story high, and stand in a line, whereas the old one has three floors over a basement and attics. One hundred and eighty-seven beds can be allotted to patients.

The old block has a central corridor and end wards, which are pretty large, and have sash-windows on more than one side, but the wards in the centre are smaller, and have windows on one side only. There is a large children's ward on the second floor. The walls are plastered; the floors of deal, and scrubbed; the beds of iron, with woollen mattresses, and cocoa-nut fibre matting under them.

Some of the water-closets and most of the nurses' rooms are badly placed, especially some which are squeezed in between water-closets. The baths are mostly of painted zinc; I saw one of glazed tiles.

The passages are warmed by hot flues, the wards by open fires. There are ventilators in the ceilings and walls.

The kitchen is in the basement of this part; it is pretty large, and contains, in addition to the open fires, steamers for vegetables.

Of the new buildings, one is the accident ward, the other serves as the out-patients' department. The ward is 78 by 26½ feet, and 18 feet high. The walls are coated with Keene's cement, which is polished and coloured a reddish brown, but unfortunately very blotchy; the ceiling is of white polished cement, with transverse varnished deal beams. The floor is of polished oak, except under the beds, where it is of glazed tiles, white and with a red border; the sash-windows are opposite, and of plate glass, and there are two end windows. The lower part of the windows contains a glass frame, 2 feet 4 inches high, which is fastened to them by screws; it is intended to prevent draughts, and makes the lower part of the windows double, but gives some trouble to the servants when it has to be unscrewed.

The beds are the same as in the other wards; one stands between two windows; they have bed-pulls over the patient's head, bed-curtains, and side-tables, the latter on an American model. They

are called locker tables. The top of them may be lowered or raised, and stretch across the bed.

Each patient, of whom 20 can be accommodated, has a cubic space allotted of more than 1800 feet.

Water-closets, baths, and lavatories are built out at the end in a similar way as in the Hospital St. Jean in Brussels. They are separated from the ward by swing-doors, and outside these is a warm-air flue.

The ward is warmed by two fireplaces, and warm fresh air can

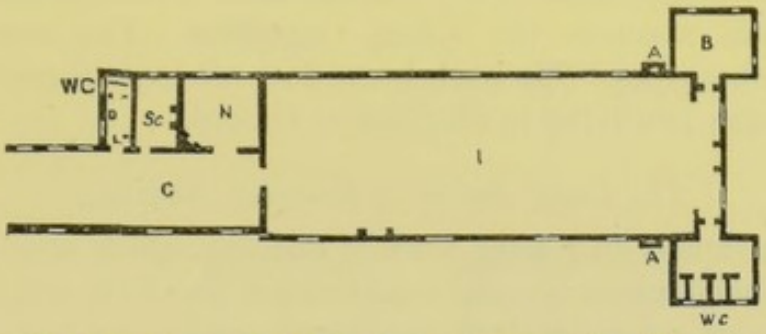


Fig. 35.—Radcliffe Infirmary, Oxford (New Wing).

A. Smoke flues.
B. Bath, lavatories.
C. Corridor.
D. Sink.
L. Linen shoot.

be admitted through six gratings which we observe in the centre of the floor. For ventilation we find trap-doors in the ceiling of considerable dimensions, and ventilators over the beds; they have valves which should open by their own weight, but do not act.

The out-patients' department is completely separated from the hospital, and the only objectionable arrangement is that some of the consulting-rooms have only one door for admission and egress. The cod-liver oil in the dispensary is kept in little stone barrels with taps. A bath-room is attached to this part of the hospital.

A new chapel, presented to the hospital, stands at the right-hand side of the entrance-court.

The Workhouse and Infirmary, Oxford.

This is a recent building. The workhouse was opened seventeen years and the infirmary fifteen years ago. Both are of moderate dimensions, the total number of inmates being 200. Children are not admitted. The house stands in the country on rather low ground. The infirmary, which contained 40 patients, but can hold 50, is situated at the back of the workhouse, and not, or at least not yet, connected with the other part.

The wards are for 9 or 10 patients; they have opposite sash-windows, and afford more cubic space to the patients than those of London workhouses. The walls are of brick, not plastered but whitewashed; the ceilings (in accordance with the regulations) only 12 feet high .The beds have woollen mattresses. Water-closets and lavatories with slate slabs are attached to the wards. The latter are warmed by fireplaces, and there are ventilators in the ceilings and walls. A dead-house lies separate.

The cost of constructing this infirmary was about £4000. The workhouse contains day-rooms and dormitories; the latter have mostly 10 beds, with reasonable space between each. The kitchen is high, and contains steamers for boiling vegetables. The corridors are warmed by hot pipes. The wash-house does not contain any machines.

There are two lying-in charities at Oxford.

The Royal Berkshire Hospital, Reading.

In the rapidly-increasing town of Reading, which numbers about 40,000 inhabitants, a hospital was founded in 1839, and additional buildings were constructed; the establishment can accommodate now 150 patients.

The plan of the building is peculiar, and I therefore append a sketch, from which it is seen that part of the buildings stand round a court, but other newer parts are exposed to the free circulation of the atmosphere. All the wards, the old as well as the new ones, have opposite sash-windows; some of the latter are very high, and contain three compartments; the patients receive ample cubic space, which varies between 1400 and 1700 feet. The nurses' rooms are extremely well arranged; we find lavatories with slate slabs, and the water-closets well placed but not warmed; the stairs are of stone, and the principal corridor is broad. There is unfortunately no means of warming the bath-rooms, but the baths are comfortable; they are of zinc painted white, and glazed tiles. The walls are plastered; some white, others coloured. They burn gas, but a large ward is provided with one burner only, over the mantelshelf.

The passages are warmed by coils of hot pipes, the wards by large fireplaces. The principal means of ventilation are trap-doors in the ceilings, and ventilators in the walls over alternate windows. The floors, excepting those in the new wards, are of deal.

There is a large new ward built out at the back; it was opened 1866, and can accommodate 20 patients. It is high and lofty, has opposite windows, three on one side and seven on the other; they contain three compartments each. Walls and flooring are on improved principles; warming and ventilation as in the other wards.

The water-closets, baths, and lavatories are at the farther end of the ward. They are also on improved principles, but the space allotted to them seems somewhat limited, owing most likely to the circumstance that an end window was desired.

The out-patients' department is on the ground-floor of the old part, and affords relief to a great number of applicants.

A new large and airy convalescent room was added two years ago; a patients' library has been recently instituted by the chaplain. A large kitchen is in the basement; made higher by carrying the floor lower; steamers are a recent addition.

The nurses come from the Bath Institution; and I cannot for-

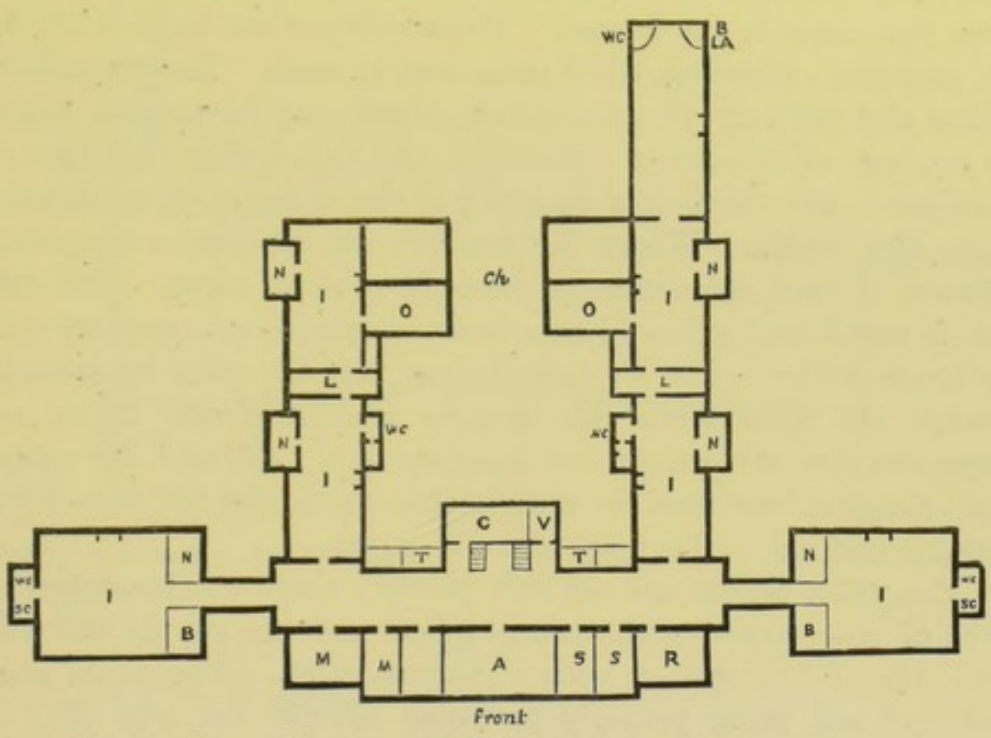


Fig. 36.—Royal Berkshire Hospital, Reading (First Floor).

A. Board-room.
B. Bath.
C. Operation-room.
La. Lavatory.
V. Vapour bath.
T. Stores.
R. Officers' dining-room.
Ch. Place where the Chapel was formerly.
S. House-surgeon.
M. Matron.
L. Laundry.

bear remarking that the red (Garibaldi) flannel jackets they wore at the time of my visit are not a very appropriate dress. At that time, of all the 120 patients not a single one was an acute case. A nurse's home and servant's wing, lately (1881) added, form a detached building, and are connected with the main hospital by an open arcade. The square yard formed by the buildings standing round it is now open at the part where the chapel stood, the latter having been pulled down.

Sheffield General Infirmary.

In the town of Sheffield, which has lately increased with unexampled rapidity, we find a large general infirmary for 200 patients which was built in 1797, but has been recently enlarged. The building was originally erected in the country, but the houses now extend to it. It is, however, surrounded by large grounds. As seen by the plan, the building has the shape of the letter L. The old portion is built on the block, the more recent additions on the corridor plan. The medical officers are of a unanimous opinion that the patients make a better recovery in the old building than in the new ones, and sometimes the patients are transferred for this reason from the latter to the former. The wards are not large—for 8 or 12 patients—affording 1300 cubic feet to each. The walls have a yellow and not very pleasant colour, which may have been selected on account of cheapness. Brattices are found over the doors for ventilation, and ventilators in some of the ceilings, especially those under the cupola. Where the windows are opposite, a simple contrivance is used for admitting fresh air even at night. The lower sash is raised, and a board half a foot wide placed as a support under the lower border. The air finds its way into the ward by ascending through the open space left between the lower and upper sash. There are Arnott's valves, but they are not used, and do not act. Open fireplaces are used for warming the wards, and hot flues for the passages and hall. They are also day-rooms.

The water-closets are all well placed; there are lavatories and baths of zinc coated with enamel; four cisterns supply the water. They are of iron coated with a patent paint. The pipes are of lead, and not being properly protected against the cold they had burst shortly before my visit by the water freezing in them. A museum is on the upper floor; it contains many specimens of black lungs.

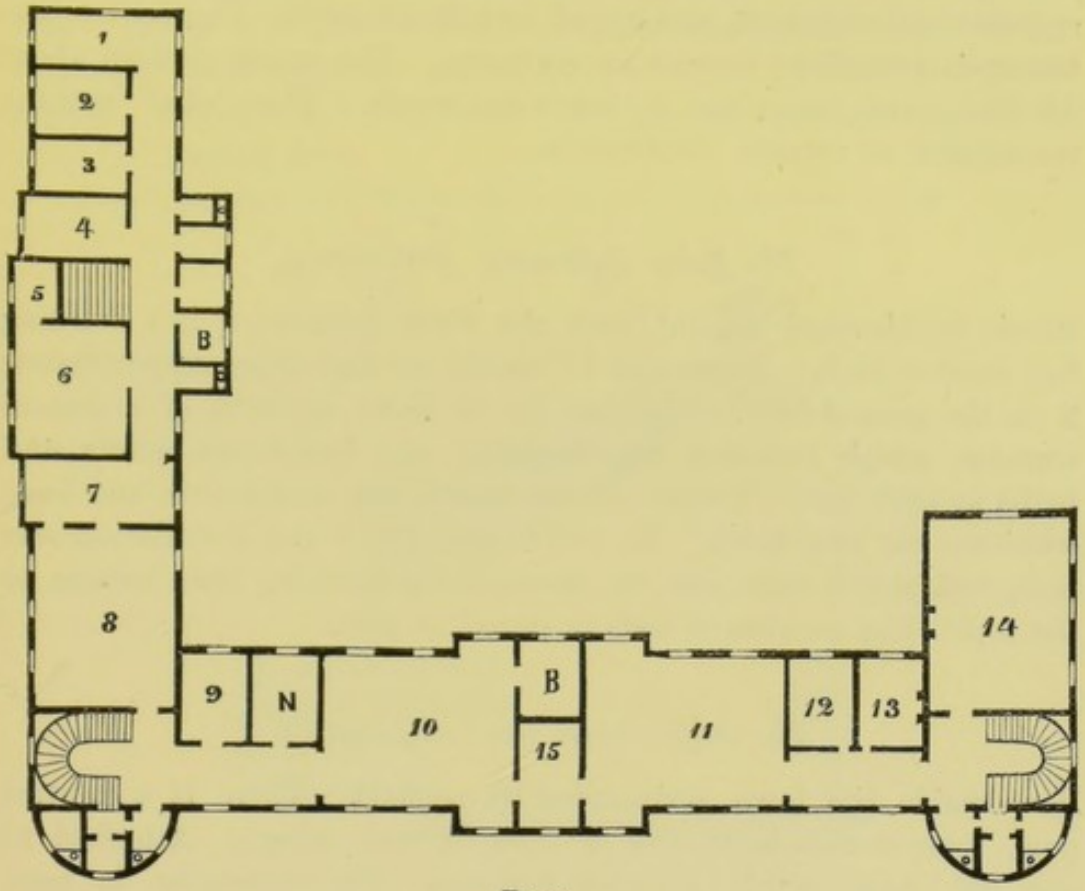
The kitchen, which is in the basement, has only open fires for cooking. The wash-house is detached; a machine stands in the centre.

As regards the administration, admission is by letter; but there are numerous accident cases always admitted at once; they afford, together with the medical cases, ample means of instruction to the pupils visiting the hospital. There is a resident and assistant medical officer, physicians, surgeons, and nine or ten nurses.

Fever patients, who were formerly received into a special and separate part of the house, are now admitted into the general wards, and, as I was informed, with no evil consequences. Neither medical

men, nurses, nor patients had caught the disease since this change was made (now some years ago).

There is a rich medical library, and a patients' library, founded fifteen years ago by the chaplain, and kept in his office. It contains two thousand volumes, presented by friends or bought with money



Front.

Fig. 37.—Sheffield General Infirmary (First Floor).

	Beds		Beds
1. Male Ward, containing . .	4	10. Women's ward, containing (Surgical)	12
2. Boys' Ward, ,, . .	8	11. ,, ,, ,, ,,	12
3. ,, ,, ,, . .	3	12. Senior Assist. House-Surgeon's bedroom.	
4. Assistant Nurse's bedroom.		13. Junior ,, ,, ,,	
5. Nurse's room.		14. Chapel.	
6. Boys' ward, containing . .	7	15. Examining-room.	
7. Women's ward, containing (Medical)	4	B. Bath.	
8. ,, ,, ,, ,,	12	N. Nurse.	
9. ,, ,, ,, (Surgical)	3		

voluntarily contributed. The books are of various descriptions, religious and philosophical works, novels, etc. They afford entertainment and useful instruction to the convalescents, and as these exchange them between themselves, the chaplain, who kindly and judiciously superintends this department, is not much troubled.

Sheffield Public Hospital and Dispensary.

This is a small hospital for 105 beds; originally it was a dispensary, founded fifty years ago, but recently wings have been added to the centre building. The latter contains committee-room and offices, and has three floors; the wings are on the block plan with opposite sash-windows, and are of two floors only. The centre part has open verandahs instead of corridors. The wards contain about 10 beds, and there are a few side-wards. They offer nothing remarkable as regards construction.

The Salop Infirmary, Shrewsbury,

stands on elevated ground, near the river Severn; it is a building five stories high. There are 17 wards on the three upper floors; 2 on the ground-floor. They all lie in front or back of a central corridor, which traverses the building and has water-closets and baths at each end. Twelve of the wards are end-wards, and have windows on two sides. In 1875 and 1876 the ventilation was improved, shafts were run up through the building from bottom to the top. The number of beds is stated as 140.

The Staffordshire General Hospital

lies outside the town, surrounded by gardens. There is a central part, four stories high, and 2 three-floored wings. Attached to one are fever wards for 24 patients. The basement is used for economical purposes and the out-patient department. There are small wards containing 5, 6, and 9 beds respectively on the ground-floor, the principal wards on the first floor, lock-wards on the second. Some of the passages are narrow. One hundred and twenty patients may be accommodated. Heating is by open fires in the wards. Ventilators are in the windows and in walls where necessary. A day-room was recently set apart for use of convalescents.

Taunton and Somerset Hospital.

The hospital is situated in East Reach: it consists of an old central part, four stories high, and two new wings. Ninety patients find accommodation. The new wards are much superior to the old ones; they have opposite windows and perforated zinc plates for ventilation, and ventilators near the ceilings besides. They are heated by open fires.

Swansea Infirmary.

The new infirmary, opened about ten years ago, has replaced the old one established 1817. It consists of two pavilions connected by a bow-like passage. There are large wards on the first floor containing 24 beds; they are warmed in winter-time by open fires. Large sash-windows are used for ventilation. The lavatory and water-closets are in turrets (C) separated by lobbies from the wards. Eye-wards are in block B. The out-patients' department is on the ground-floor.

One hundred and thirty patients can be accommodated.

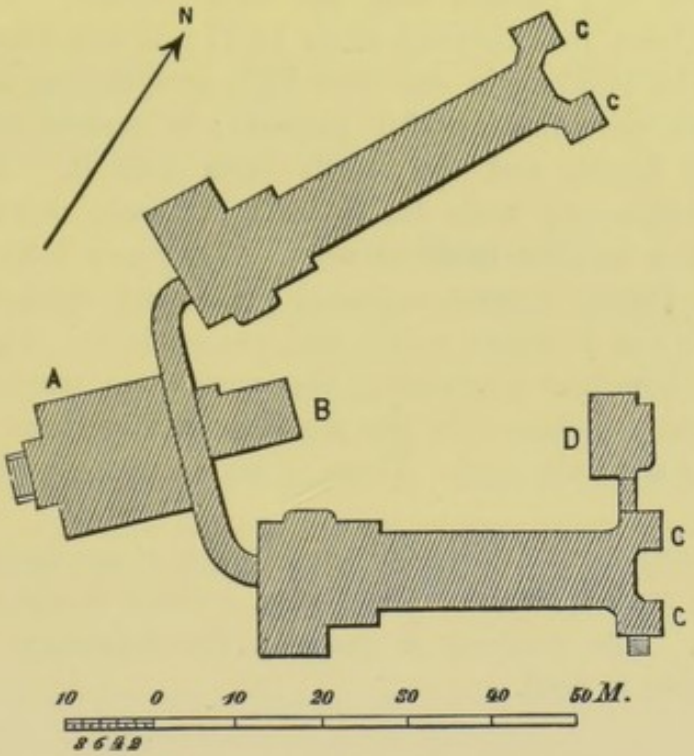


Fig. 38.—Swansea Infirmary.

A, Administrative Block; B, Eye-Ward; C, Turrets containing Water-closets, Lavatories, Baths; D, Out-Patients.

Whitehaven Hospital.

Smaller than the last one (for 56 beds), but, like it, also possesses an old part which is deficient in many respects, and a new one which affords improved accommodation to the patients.

Royal Hants County Hospital, Winchester.

A new hospital was erected in 1857. The plan of building

much resembles that of the Royal Surrey County Hospital, Guildford; there is a centre building and large wards attached to it on both sides. These wards contain 18 beds; have opposite sash-windows; nurses' room and ward-kitchen are on the inner side; baths, lavatories, and water-closets, built out of the main building at the outer end. There are 5 large wards and 3 special wards on three floors, containing altogether 108 beds. The house is heated with hot-water pipes from two boilers in the centre.

Windsor Infirmary.

This institution is occasionally visited by her Majesty the Queen, who is very pleased with the arrangements. In its present form it has been in existence since 1857; it was originally a dispensary. The building is one floor high, and, having been recently enlarged, can accommodate 30 patients; a central corridor runs through the house, and the wards open into it. There are 3 principal wards—one male for 8 beds, a female one for the same number, and a smaller accident ward. They are lofty, have walls coated with Parian cement, coloured green, and opposite windows; two of which are, however, small and placed high. The beds have woollen and horsehair mattresses; the wards are warmed by open fires and have ventilators in the windows and ceilings. The latter communicate with the roof. There is an operating-room, with sky-light only.

The management is in the hands of a committee; a medical officer and a matron live in the house. There is one day and one night nurse. The washing is done in the infirmary. Bradford's patent machine is used.

South Staffordshire General Hospital, Wolverhampton,

for about 100 beds, situated in the town, built in the H shape; it has three floors over a basement; the wards are rooms situated in front and back of a central corridor. They are heated by fires; the foul air is drawn into channels by a fire, which is in a central shaft. The corridors are heated by hot-water pipes.

All the nurses live in the house (in the attics). A new laundry was built in 1879. The dirty linen is put in closed washing-boxes filled with soap and water; they are rotated by steam power for fifteen minutes. The linen is next placed in rinsing machines, then in a hydro-extractor, then in the drying-room.

Worcester General Infirmary,

for the same number of beds, contains large wards, and these afford a cubic space of at least 1300 feet to each patient. The beds stand far apart; the floors are polished; there are plenty of apertures for admitting fresh and letting out foul air.

York County Hospital

stands in ample grounds; it contains only 4 wards for 20 patients, each divided, however, by party-walls into four unequal compartments. They were heated originally by hot air, which was forced in by machinery, and eduction-pipes led off the foul air. The windows did not open at all. After preserving this system for nine years (1850-59) it had to be given up, because patients and medical officers complained; and there are now open fireplaces, and the surgical operations have much better results.

English Military Hospitals.

These are only small buildings, as the army is not numerous, and it is rare that more troops than one regiment is quartered at one place. The construction consequently offers no difficulties. For one regiment the Commission appointed for improving the condition of Barracks and Hospitals consider a hospital containing 60 beds sufficient. Two wards are on the ground-floor, with windows on both sides, divided by the staircase, the superintendent's little room between them; offices are on the first floor; kitchen and dispensary in the yard, connected with the principal building by covered galleries. The cubic space for each patient is 1500 feet, or 1800 in warm climates. The wards are warmed by open firegrates, and, as a rule, there is no artificial ventilation. Of course the Herbert Hospital is built on an entirely different plan. (*See* next page.)

Naval Hospital, Haslar, Portsmouth.

I mention this hospital briefly, on account of the singularity of its construction and the large number of patients it can receive (nearly 1200). It is destined for marines, and the buildings form a square, open on one side, but they stand in a double row, leaving a space between them. All the wards have windows on both opposite sides, and contain 14 beds.

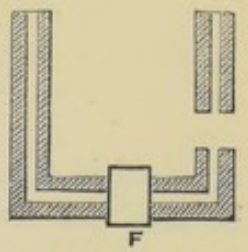


Fig. 39.—Naval Hospital, Haslar.
F. Front.

The Royal Victoria Hospital, Netley.

This is a large hospital-hospice, built on the corridor plan, with which a school for medical officers of the army is connected. It consists of a number of buildings.

We find a long front building, containing wards for 9 or 12 patients. They have opposite windows looking on one side into the corridor. Behind this building stands another, which contains offices for administration and the dispensary, and is connected with the front building. A long block, with two wings, stands farther at the back. It contains dead-house, wash-house, etc., and separation-rooms for infectious diseases. A corridor runs on its ground-floor, and connects it with the other building.

The establishment, considered as a large convalescent institution at the seaside, seems to be well adapted for the purpose, and contains many modern improvements.

Hospital Tents, Marquees, and Huts; Floating Hospitals.

They are used in time of war. The Commission for improvement of Barracks and Hospitals recommend the following dimensions:— The tents 14 feet in diameter and 10 feet high; the marquees 33 feet long, 12 feet broad, 5 high at the sides, and 12 feet in the middle. Both should have ample openings around the top of the poles, for ventilation. It is very important that the ground be properly selected; all damp or malarious districts to be avoided.

Huts are of wood or iron, built a little above the ground, and roofed over. They should have the proper number of inlets and outlets for ventilation (ridge ventilation), and require fire-grates in cold climates. The Commission for improvement, etc., consider the following the best arrangement:— ////// because the wind sweeps freely through. The next best plan would be (*en échelon*) _¯¯_ if there is no room to place the huts in one _¯¯ ¯¯_ line, or they might be placed in quadrangle form if the enclosed place is ample |¯¯|.
| |
|_ _|

Floating Hospitals, Hospital Ships,

are used in time of war (*see* American Hospitals); ships should not be used for hospitals in time of peace. It is advisable to place fever cases and contagious diseases on separate ships. The hospitals should be well ventilated, and the greatest care bestowed on cleanliness and disinfection.

Malta.

Of the proposed hospitals and other public buildings only a very small part is as yet finished. The plans were prepared by Mr. H. T. Wyatt of London, and are throughout on the pavilion principle.

There is a military general hospital; it consists of six pavilions, of which two are smaller than the others. They are two floors high, placed parallel to each other, and the block for administration stands in a rectangle to them, as in the plan of the hospital of Philippeville. There are two separate buildings for nurses and baths respectively.

There is further an asylum for aged and infirm persons, 500 of each sex. It is composed of eight pavilions two stories high. Four of them stand round two large rectangular courts respectively; in the centre of each court is a day-room. The buildings for washing, cooking, offices, bed-carding, etc., stand detached at the back of the said courts. A new feature is that the water-closets and lavabos are constructed on modern principles.

Closely connected with the above are the Orphan Asylum and the Female Prison, the Male Prison, and the Magdalen Asylum and Reformatory.

A civil hospital for 290 beds will receive the incurables and the sick. Double pavilions (similar to those of the Herbert Hospital) stand on each side of a spacious yard; they contain wards for 32 beds, water-closets and baths at each end, dining and day rooms detached, but accessible under corridors. Two small blocks for contagious diseases (for male and female patients respectively) stand detached at the back.

The cubic space for the patients is 1500 feet. The roofs are used for promenades.

Lastly, there is a Lunatic Asylum, which is already occupied.

We might feel surprised that so many large buildings are proposed for the poor of Malta, as the island contains only 6000 inhabitants; but I am informed that half of them are paupers, and the number of female paupers is especially large; further we might wonder why all the buildings are placed close together. But this is considered preferable on account of centralisation. The locality where the buildings will be situated is considered as the most healthy on the island.

INDIAN HOSPITALS.

The hospitals in East India are native or military hospitals. The former are generally sheds, where the sick natives are often placed, not on beds but only on mats. The patients receive nothing but medicine; they do their own cooking as prescribed by their religion. According to the descriptions given of the buildings, they are deficient in every particular, and need much improvement.

The military hospitals are not quite so bad as the native ones, and have become lately the subject of greater attention. There are some points of particular importance in their construction. First, as regards the site: swampy and malarious districts have especially to be avoided; the soil should not only be dry, but the foundation where the hospital is built covered with concrete. The wards, as all authorities agree, should be raised from the ground.[1] So great an amount of disease and death has been traced in China to the circumstance of Europeans' and soldiers' dwellings being close to the ground, that this mode of building has been thoroughly abandoned. In hospitals the basement or ground floor should be used for offices and stores only.

Double roofs are now generally employed, and made slanting and not terraced. They can be arranged for ridge ventilation. Double verandahs (an inner and an outer one) are considered by Dr. Gordon preferable to single ones, although they darken the room. The Bengal standard plan, as proposed by the Commission for Improvement of Barracks, etc., in India, is on the same principle. The outer verandahs are open, the inner ones glazed, and there are a great many opposite doors and windows. Though verandahs can be dispensed with in Italy and Spain, they may still be a necessity in India. I should, however, think single ones preferable; and they might perhaps, in many instances, be replaced by double Venetian blinds.

The privies are generally approached by passages; the Commission recommends that they should be detached, and also the outbuildings; and a good plan is to arrange the buildings *en échelon.*

Nowhere is cooking more neglected than in India. At this present moment, Dr. Gordon writes, there is not, with one or two exceptions, a cooking-range in any regimental hospital; the cooking place is only a "chula," *i.e.* on the ground; there are no means of

[1] Miss Nightingale; Dr. Gordon, *Army Reports of India.* London: Churchill, 1866. *Report of the Commission on the Sanitary State of the Army in India.* 1863.

cooking a pudding; rice is baked in the cinders. The cooks are untrained, and obtain less wages than servants.

Warming is not needed in India except on the hills. As for ventilation, other rules have to be observed than with us. First, the cubic space allotted to a patient should be larger, at least 1800 feet, and 2000 in unhealthy places. Secondly, the great object is, not to obtain pure air from outside, but pure and cool air. For this we find various appliances used in India. The thermantidote is a fan by which the air is propelled into the rooms, and forced through wet scented grass roots. There are the punkahs; they are suspended from the ceiling at short intervals, and kept swinging over the heads of the patients by coolies. Tatties are light bamboo frames, in which the slender roots of a fragant grass, kuskus, are arranged. (For engravings of these, see *Report of the Commission*, p. 428). The tatties are placed in the doorways on the windward side, and kept well watered; they are called inestimable by Dr. Gordon.

As regards the system of nursing and attendance in Indian hospitals, I only mention the fact, confirmed by several writers, that one matron to a battalion is considered sufficient, and that medical men and nurses often live at a great distance from the building.

The European General Hospital, Bombay.

This building was constructed after a design of Mr. T. Roger Smith, architect, of London, which was approved of in the year 1864. I copy the plan (*see* p. 180) from the *Builder*, and the following is an extract from the description :—

The whole building has a frontage of 500 feet, and is 66 feet high. The ground-floor is raised 3 feet above the level of the surrounding ground, and this story, which has a clear height of 14 feet, is devoted to receiving, dispensing, and accident wards; living, sleeping, and bath-rooms for various officers, and to other similar services.

The two upper floors have a clear height of 18 feet, and contain the wards (1), which are on the first floor 23 feet 6 inches, and on the second 24 feet wide. Adjoining is a surgery (2). On the first floor over the "Porte-cochère" is placed the chapel (3), forming one limb of a kind of transept, while at the back the other limb of the transept on the same floor is occupied by an operating (5) and nurses' room (6). In front of all rooms—front and back—stretches a verandah 10 feet wide. Portions of this will be made use of by the servants, and hence scullery and nurses' room are not needed. At

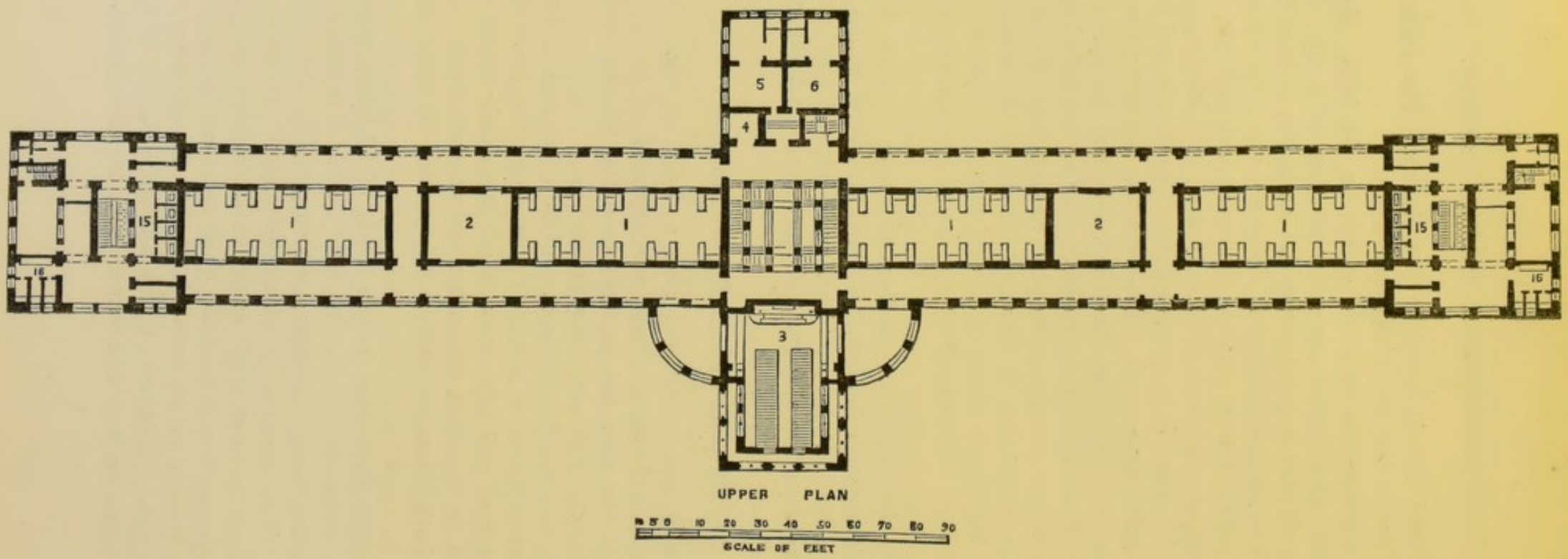


Fig. 40.—European Hospital, Bombay (Upper Floor).

1. Ward.
2. Surgeon.
3. Chapel.
4. Patients' lift.
5. Operating-room.
6. Nurse.

each extremity baths and lavatories are found; and separated from these by a wide space, with a free current of air always playing through it, are placed the conveniences. Stairs and floors are fire-proof.

Hoists (4) are in the centre. The ventilation is carried on by windows, which are very lofty and opposite each other. The lower part of each window has casements acting like doors. The upper part has casements hung at the bottom to transoms and opening inwards. Ventilating openings are also provided close to the ceiling. In each window-frame there are hung not only glazed casements opening inwards, but also casements filled with Venetian blinds opening outward, and it is also proposed to supply means for closing when necessary the outer openings of the verandahs.

Missionary Hospital, Canton.

Dr. Hobson has from time to time given reports on the above establishment. The building can receive between 150 and 200 in-patients, but the out-patients' department is of great importance. The yearly number of out-patients is 2000. Dr. Hobson had the assistance of a native, and the dispensing is done by two coolies.

IRISH HOSPITALS.

As regards construction, they are almost all built on the corridor plan, and have no artificial system of heating or ventilation. As for regulations, their system of admission is on more liberal principles than in England; no letters are required, and no disease is excluded, with slight exceptions. Medical and surgical cases are generally found in equal numbers. In some hospitals out-patients receive advice only, but no gratuitous medicines, in the same way as we find the *consultations gratuites* in France. Paying patients are received into private wards. Religious orders attend to the nursing in some institutions; committees manage the affairs of the hospitals; medical schools are attached to almost every Dublin charity; the medical officers generally attend in rotation; medical officers of workhouse infirmaries do not supply medicines.

Belfast Royal Hospital,

established 1817, is situated in the town, has four floors; the basement is used for domestic purposes, the three other floors almost exclusively for wards. The corridors run in the centre of the

building, and have wards in front and behind; they are shorter in the two higher floors, as the end wards extend from back to front. There are about 160 beds in 15 wards; the latter are mostly small. There are no contrivances for ventilation, but perforated zinc panes in the windows and louvres over some of the doors. Open fires warm the wards. The bedsteads are of iron, without curtains, and have flock or hair mattresses. The nurses reside in the house. Nine medical officers attend to the patients. Four surgeons and five physicians visit the hospital.

A number of smaller hospitals were recently opened in Belfast, one for consumption, 4 beds, established 1880; one for skin diseases, erected 1874, 20 beds; one for children, opened 1873, 50 beds; one for eye and ear diseases dates from 1867, 30 beds; Samaritan Hospital, established 1873, 30 beds; Convalescent Hospital, 1877; 30 beds; Throne Hospital for Chronic Diseases of Children, established 1874, 32 beds; Ulster Eye, Ear, and Throat Hospital, opened 1874, 30 beds; Ulster Hospital for Children, established 1872, 20 beds. A small Lying-In Hospital dates from 1794. Belfast has about 100,000 inhabitants.

Adelaide Hospital, Dublin,

is for Protestant patients; has 140 beds, 21 for children. The building is five stories high; most of the wards are in the three upper floors. Windows are on one side only, the corridors on the other. Fever patients are in a separate house.

There are eight medical officers and a medical school connected with the institution; admission is by governors' letters.

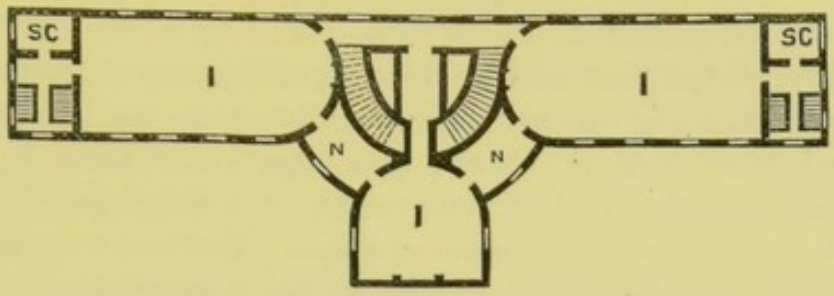
City of Dublin Hospital,

founded 1832, enlarged 1851, for 130 patients, originally a school-house, and therefore not without defects; there is, however, ample cubic space allotted to the patients. The arrangements for heating are on the usual plan, and so are the beds, windows, water-closets.

The House of Industry Hospitals.

Three Government hospitals, close together and under one management, contain 312 beds, and receive all classes of diseases without letters and at any time. They afford ample means of instruction to numerous students and resident pupils. There is first—

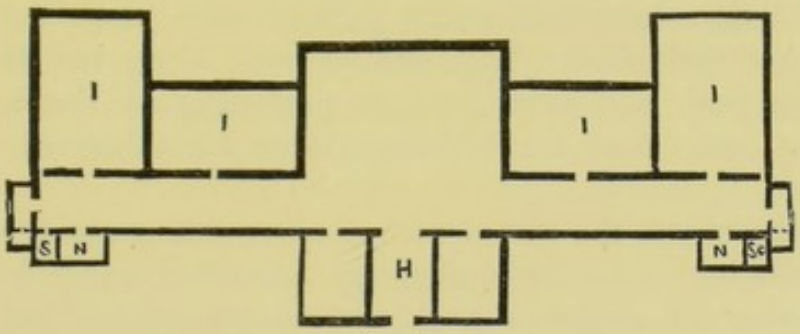
The Hardwicke Fever-House.—It is three stories high. Two large wards (I) for 17 beds are separated by a staircase. A convalescent ward is built out at the back. The nurses' room (N) lies between the wards.



Front.

Fig. 41.—Hardwicke Fever Hospital (First Floor).

2dly. *The Whitworth Hospital* is a very regular building, and well arranged. The wards contain generally 10 beds; the water-closets are built out at the ends near the sculleries.



Front.

Fig. 42.—The Whitworth Hospital, Dublin (Ground-Floor).

H. Hall. Sc. Scullery. N. Nurse.

3dly. *Richmond Hospital*, originally a dwelling-house; very defective, and long condemned as a hospital.

Jervis Street Hospital,

founded 1721, was originally a private house; it holds about 60 beds. The nursing is in the hands of Sisters of Charity. Ten medical officers attend.

Mater Misericordia Hospital

was founded in 1861 by the Sisters of Mercy—a religious order; is situated north of Dublin, in ample grounds of its own, and is the largest hospital in Dublin.

The buildings surround a court, similar to the Rudolphstiftung, 200 feet long by 160, are three stories high, and large and lofty corridors, with fine arched roofs, run along the inside. They have large end windows, and numerous side windows, looking into the yard, with small windows opposite the latter communicating with the wards.

In the centre part of the front building and in front of the corridor we find the out-patients' department, on the ground-floor; one small ward is at the back; two large wards for 8 beds, and 2 cribs lie on each side of the centre, and there are 2 private wards at the farther end adjoining them. The same arrangement exists on the first floor; but on the second 2 small wards are cut off at the inner end, in addition to those at the extremity. The large wards are 60 feet long, 17 wide, and 18 high, and afford 1800 cubic feet to each bed. In one corner is a bath enclosed by a wooden partition, in the other a cloth-press. The water-closets are built out into the yard. The heating is by open fires.

The wards contained in the buildings at both sides of the yard are larger; they accommodate 28 patients each, and there are two of them on each floor. The corridor runs along the inner side facing the yard, and some portions projecting on the outer side and in the centre from the buildings serve for side-wards and the requisites.

The sisters and the chapel occupy the building which closes the court at the back; the latter might as well have been left open by disconnecting the residence of the sisters and the hospital. There was space enough for this arrangement.

The Meath Hospital

lies in the country to the south of Dublin. It has 120 beds, and three floors over a basement; the wards are mostly small, behind and in front of a corridor; none of them contain more than 10 beds. The windows have perforated zinc panes, and the ceilings ventilators. A celebrated school is attached to the hospital.

Mercer's Hospital,

established 1734, is situated in the centre of Dublin, surrounded by a crowded neighbourhood. It contains 110 beds. The wards are irregular in shape; most of them open into corridors. Here we find wooden bedsteads, without curtains, straw mattresses, and in

lieu of water-closets or privies only night-stools (unless this has been changed lately). A new wing has been added recently for 50 beds.

Stevens' Hospital.

Established 1720. It lies to the south-west of the town, somewhat low; it contains 250 beds, if we include the fever-house. The buildings are erected round a square yard of moderate dimensions; a spacious corridor runs along the inner side. The wards have opposite windows, which on one side open into the passage. There is ample cubic space for the patients on the ground-floor, where the ceiling is 15 feet from the floor; but in the second floor the height of the wards is only 7½ feet, and the roof is sloping; therefore the cubic space allotted to the patients is not sufficient. The bedsteads are of iron, and have straw mattresses, and in one ward (accident ward) the floor is tiled.

There are further St. Vincent's Hospital, established 1834, 120 beds, and attached to it a convalescent hospital, 24 beds; Combe Lying-In Hospital, opened 1826, 40 beds; Rotunda Hospitals, established 1745—one for lying in, the other for diseases of women; Sir Patrick Dun's Hospital, 100 beds; St. Michael's, established 1876, 40 beds; a Lock Hospital for 150 beds, females only; two small hospitals for eye and ear diseases; two for children containing 30 beds each; also an orthopædic and lunatic hospital, a Maison de Santé, and a fever hospital (Cork Street) for 200 patients; it was established 1704, and consists of four blocks, each four floors high.

Limerick

is a town of more than 50,000 inhabitants. The Barrington Hospital was founded 1829 by the Baron of the same name and his sons, originally for 150 patients; their number is now greatly reduced. It has a fine site near the river Shannon. It has four floors, the largest wards have a length of 80 feet, a width of 19 feet, and a height of 15 feet. The windows are opposite to each other. The affairs are managed by a committee. A medical school and out-patients' department are in connexion with the hospital.

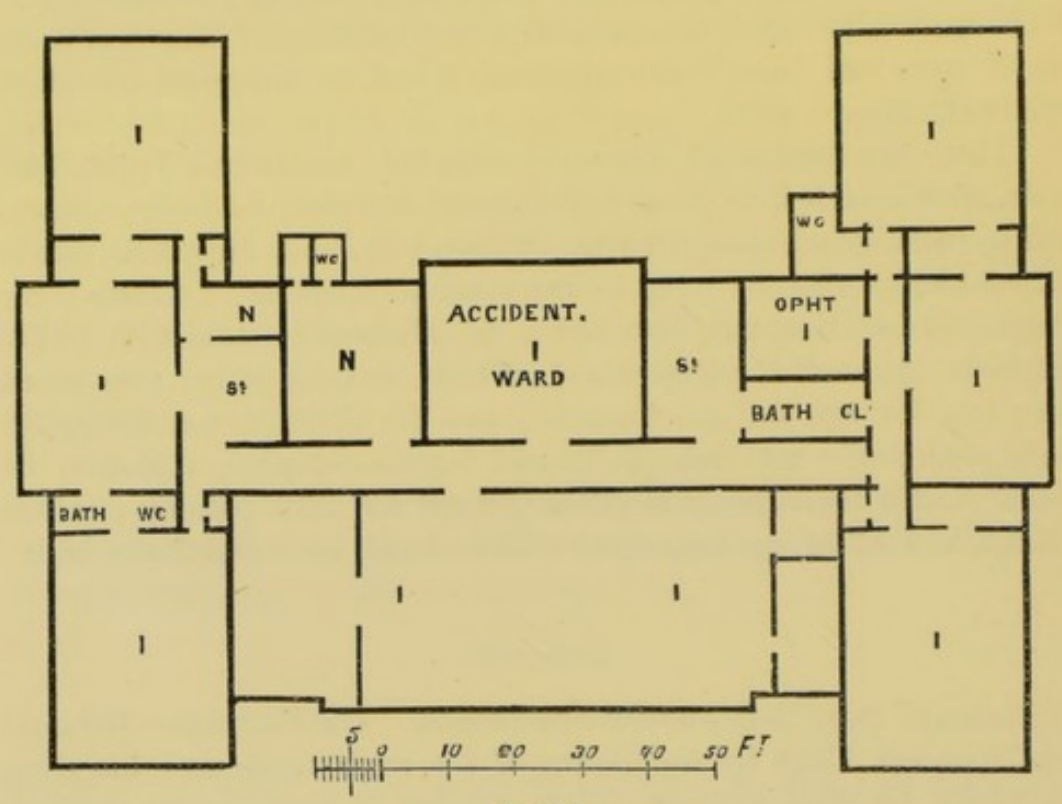
There is a county hospital for 100 beds; a fever hospital, 100 beds; a maternity, 12 beds. Four district poor law medical officers attend to the poor, each with a salary of £100; and two medical officers are attached to the workhouse.

SCOTCH HOSPITALS.

They differ from English hospitals in reference to the regulations, which are more liberal, for admission. Besides the out-patients' department we usually find a district department, which sends a visiting medical officer to the sick poor; his prescriptions are made up at the establishment.

Aberdeen Royal Infirmary.

A hospital for 250 beds, established 1739, rebuilt 1834, three floors high, consisting of an old central part and two new wings



Front.

Fig. 43.—Aberdeen Royal Infirmary (First Floor).

added to it, but it is generally half empty. The water-closets, with one exception, are well placed; originally they were in the centre of the building, and the drains run under it. For warming we find fireplaces. As seen in the engraving, the wings of the hospital interfere and impede the ventilation of the central corridor. The cubic space for each patient is about 1100 feet. At the back of the building two pavilions for fever patients are found. Admittance is free; at least a householder's certificate is sufficient, the case requiring hospital treatment. The Lord Provost presides over the committee.

There is a childrens' hospital for 30 beds, and one for incurables, 35 beds. Aberdeen has 47,000 inhabitants.

Arbroath Infirmary

is a Union infirmary for 60 beds, not quite up to the standard of modern requirements. Water-closets without lobbies open into the wards on the female side; there is no resident medical officer, nor even dispenser; medicines are supplied by contract at so much a bottle. Two nurses reside in the house. There are perforated zinc plates in the upper part of the windows for admitting fresh air.

Dundee Royal Infirmary,

opened 29 years ago; it stands on a hill overlooking the Frith of Tay, and is built in horseshoe form, a corridor running along the inner side. It contains 280 beds in large and small wards; the largest have 26 beds each, placed between a pair of windows. They allow ample cubic space, about 1400 feet, to each patient. Fever, smallpox, and lock-wards are separate. The whole of the bath-room and water-closet accommodation in the house has been completely renewed: the containing projections much enlarged, and all the pipes and basins put in anew, and the whole well ventilated—all the soil-pipes being carried above the roof, and disconnected below. A series of pipes heated by hot water has been laid in every corridor, and in every projection in the house. The air introduced from the back of the house is well warmed in the corridors, and then admitted into the wards to aid the open fires there in use. There are two visiting physicians, two visiting surgeons, an aural surgeon, an ophthalmic surgeon, a pathologist, a medical superintendent, and a medical assistant.

Edinburgh Royal Infirmary.

The new infirmary was opened two years ago; it has replaced the old building, which dates from 1736, and is now used for fever patients. The new hospital is exclusively built at the expense of voluntary contributors, exceeding £300,000, and is on a magnificent scale. It is constructed after the pavilion style, and an old building, George Watson's Hospital, was with great ingenuity made the centre round which the new blocks are grouped. It was converted into a home for nurses and resident students. The site is extensive, there being nearly 12 acres of ground, and the latter is sloping from north to south. The administrative department is in a central block

four stories high with a high clock-tower. The pavilions for patients are ten in number;—four medical, six surgical, their long axis is nearly from north to south, and they are connected by corridors, one story high, except the connecting passage of the surgical pavilions, which has two stories. The pavilions have three ward-floors and an attic. The medical wards are 111 feet long, 28 feet wide, and 15 feet high; they contain 21 beds, and each patient enjoys about 2200 cubic feet of air. The walls are coated with cement painted, and the floors of deal stained yellow. The windows are 2 feet from the floor, and reach near to the ceiling. Their lower part consists of sashes with an upper pane inclining inwards. The latter may be fixed at will in a desired position by the nurse using a long pole. The usual appendages are in round towers and entered from lobbies with cross ventilation. The soil-pipes have all 3-inch ventilating pipes going up to the top of the turrets.

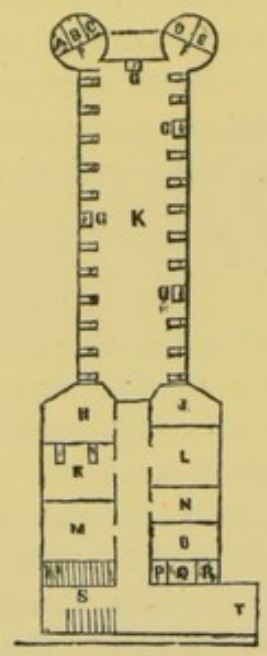


Fig. 44.—Edinburgh Royal Infirmary, Medical Pavilion (First Floor).

A. Water-closet. B. Urinal.
C. Sink. D. Bath.
E. Lavatory. F. Ante-room.
I. Med. Officer's room. K. Wards.
L. Convalesents' room. M. Ward kitchen.
N. Bath and W.C. O. Mattress room.
P. Lift. Q. Patients' lift.
R. Foul linen shoot. Sink. S. Stairs.
T. Corridor.

The wards are warmed by three fireplaces; some of these are Galton grates, and steam is made use of in the corridors. There are a great many inlets for fresh air, and outlets for vitiated air, but there is some doubt whether the desired effect will be attained.

There are small side wards with 2 beds, convalescent rooms, two theatres, and all the usual appendages of a hospital on improved principles.

The medical hospital contains 276 beds, the surgical 295 beds, total 571 beds.

It is well known that the medical school connected with this hospital is of European fame. Patients are admitted on liberal principles.

The other charitable institutions of Edinburgh can only be mentioned by name: The Royal Hospital for Sick Children, established 1860, 84 beds; the Home for Cripple Children, 20 beds; the Eye Infirmary, 6 beds; two Ear Dispensaries; the Hospital for Incurables, 44 beds, established 1874; Chalmers' Hospital, established 1864, 40 beds; Leith Hospital, 68 beds; and there are a few more dispensaries.

The Glasgow Western Infirmary

is a recent pavilion hospital, opened 1874. It contains 380 beds—200 medical, 180 surgical. The wards are on three floors—31 of large size, 15 small for one or two beds. The large wards have opposite sash-windows; they are 78 feet long, 26 feet wide, and 15 feet high. The hospital is visited by five physicians and four surgeons. A medical superintendent lives in the house, and students attend to lectures given there.

Glasgow Royal Infirmary.

Glasgow, a large town of more than half a million inhabitants, and an industrial centre, has a large hospital—the Royal Infirmary, containing 532 beds. It was established in 1794. It is badly situated, but surrounded by ample grounds. It consists of three different parts, each five stories high, viz. the old infirmary, the former fever-house, and the new surgical wards. Each section contains large wards having opposite windows, and smaller ones in addition. A peculiar feature is that the fireplaces are in the middle of the wards. Spring mattresses are in some parts of the hospital.

The old building has the form of the letter ⊥ reversed. Two large wards in a line are separated by stairs and offices, and the third part stands out at the back of the principal building. Small sidewards and the usual appurtenances are at the ends. There are 218 beds.

The old fever-house has a central part and two wings standing in a line. In the wings are large wards for 20 beds; smaller sidewards are in the centre. Since 1876 it has been used for the reception of surgical cases, and it contains 174 beds. It is connected with the surgical house by means of gangways on each flat.

The new surgical hospital, opened in 1861, is built on the modified block system. Two large wards are separated by the staircase; the usual side-rooms are at the farther end; two fireplaces are in the middle of the large wards, back to back, and ventilating tubes ascend in the space between them. The cubic space allotted to each patient is ample. The closets (Jennings' patent) are as far away from the wards as possible. The house contains 144 beds.

A special fever hospital has been opened in 1870. It is a municipal establishment, into which all infectious diseases are sent. It consists of separate pavilions, which are only one story high. The original ones contain 2 acute wards for 10 or 11 beds, and 2

convalescent wards, with baths, sculleries, nurses' rooms, and water-closets built out at the sides. There are opposite windows and sky-

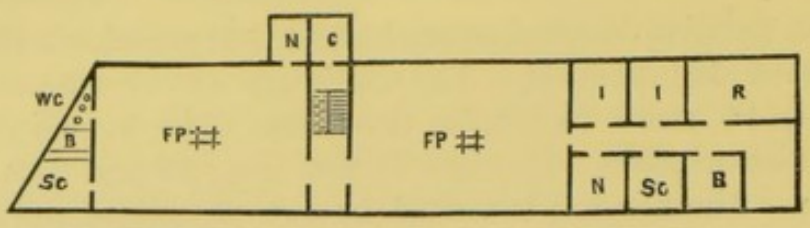


Fig. 45.—Glasgow Surgical Hospital (First Floor).

B. Bath. C. Clerk. FP. Fireplace.
N. Nurse. R. Day-room.

lights. Convalescent patients can step into the garden without descending any steps.

The wards are heated partly by fireplaces, and partly by hot-water pipes running along the sides; they are ventilated by windows and skylights opened by rope and pulley, and by letting fresh air enter and pass over the pipes. The drains are all outside the buildings.

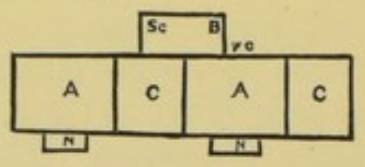


Fig. 46.—City of Glasgow Fever Hospital.

A. Acute ward.
B. Bath.
C. Convalescent ward.
Sc. Scullery.
N. Nurse.

The resident officer lives in a separate house, and is superintendent of the whole, including the artificial ventilation.

There is only one class of nurses, and they watch at night in rotation, because it is thought important to have as good nursing at night as in the day time, and not an inferior class of nurses for night duty. Great care is taken for supplying a proper diet to the patients.

550 beds can now be placed.

The Greenock Hospital

stands near the river Clyde, 35 feet higher; consists of the fever hospital, a regular block for 80 beds, and a general hospital for 140 beds, irregularly constructed. Both are perfectly divided the one from the other, although attached and standing in a line.

The cubic space is in some wards rather limited; open fireplaces are found for heating. There are wards with opposite windows, and others with windows on one side only.

Montrose Royal Infirmary

consists of a central portion and three wings, the former one floor

higher than the latter. There are 52 beds; we find 2 large wards in the back wing and 1 in each of the other wings, containing 12 beds. The windows are opposite, and contain punched glass

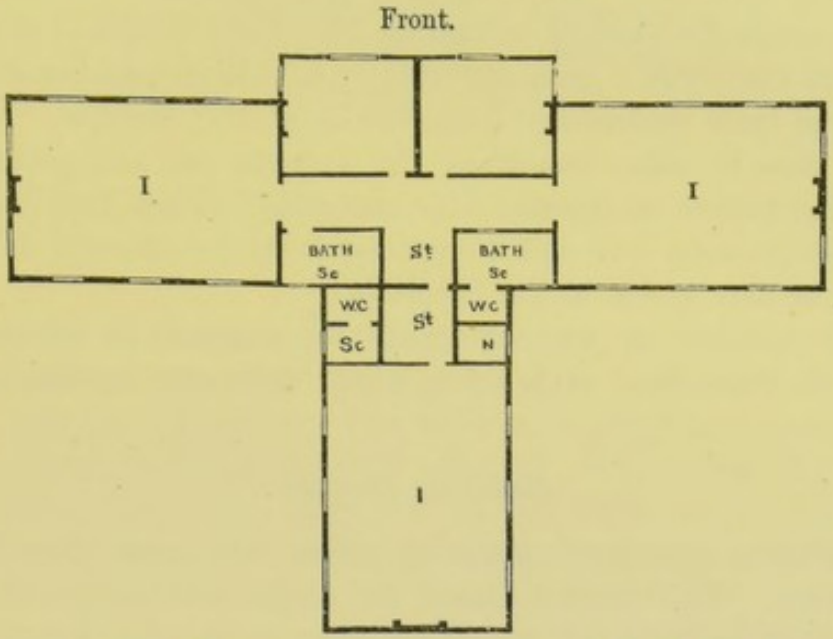


Fig. 47.—Montrose Royal Infirmary (First Floor).
Sc. Scullery. St. Stairs.

panes; there are ventilators in the ceilings and walls. Besides fireplaces we find hot-water pipes which run round the wards.

Paisley Infirmary,

for 132 beds, is built in the form of a T. There are three floors and 11 wards, with opposite windows excepting where the wards are united to the central portion.

There is nothing to be noticed, but that the closets are not well placed, as they open into the wards.

FRENCH HOSPITALS.

The most remarkable establishments are found in the capital; but those of the country are not without interest, especially the convalescent institutions. The Paris charities continue to be improved by the exertions of the Central Administration and its able director. As a striking difference in the arrangements of hospitals, I may mention that they contain a great many baths, more than 600 altogether, and they are used in some institutions by out-patients. Another peculiarity is the *consultations gratuites* at the hospitals,

where advice is given but no medicines. Instead of dispensaries we find twenty *bureaux de bienfaisance*, which are also under the Central Administration, but distinct from the hospitals. The *service à domicile* is connected with them and well regulated.

As means for medical education the Paris hospitals stand very high, and they offer a good opportunity to a large number of *internes* to enlarge their professional experiences at the bedside. Contrary to the uses in other countries, the *internes* are not permitted to obtain the license to practise "the *doctorat*." They have to give up their appointment first, and are consequently not allowed to practise as long as they reside in the hospitals.

The number of accouchements in hospitals is comparatively greater in Paris than in London, where more are confined at their homes.

Bordeaux Hospital.

Bordeaux is a large seafaring place, with more than 200,000 inhabitants. The hospital named St. André, established 1329, was rebuilt from 1825 to 1829. It was one of the first hospitals constructed on the pavilion plan, according to the principles laid down by the Commission of the Paris Academy. The hospital is constructed on almost exactly the same plan as the St. Jean Hospital of Brussels, only the buildings for administrative purposes are more confined; the pavilions are larger, and intended for a larger number of patients. In front we find the chapel and some offices. We enter a large square yard, surrounded by the open gallery which connects the pavilions on the first and ground floor. In a transverse building closing the yard opposite the entrance, we find the kitchen and dining-rooms. Two smaller square yards are behind this part. The dispensary is between them, and still farther behind are the operating theatre, the wash-house, coach-house, and post-mortem rooms, but all connected by the gallery.

The pavilions are five on each side; they have nine opposite windows on their longest sides, but the pavilions on the right side farthest removed from the entrance have only seven opposite windows. Nurses' rooms and a scullery are built out of the blocks near the passage, and baths, latrines, and side-wards are arranged at the other end, just as in the Hospital St. Jean. The number of wards is 24. Those for males have a length of 42 m. 50 c., a width of 7 m. 80 c., a height of 5 m. The largest wards for females are 36 m. 50 c. long, 7 m. 80 c. wide, and 5 m. high. The number of beds is 650. The floors, formerly of bricks, are parquetted, the walls oiled. There are fireplaces and stoves for warming, eduction-channels for

for bad air heated by gas-burners, and openings in the walls for fresh air to enter. A fan was formerly used for injecting air. There is a hospital for children up to the age of fifteen; it contains 350 beds. A general hospice is found in the country; it possesses 24 hectares of ground, 150 beds for incurables, 300 for aged people, and a maternity department of 40 beds.

PARIS HOSPITALS (*see* next page).

St. Antoine

is situated in the suburb of the same name, and surrounded by large grounds and gardens. It was formerly a convent, and was opened in 1795 as a hospital. Two arms were added some years ago.

The new wards have opposite windows, and contain 24 beds. The latrines are not at the ends but in the centre. Water-closets are also found. Some of the wards are ventilated by a fan, unless this has been given up lately.

The hospital was formerly overcrowded, and the corridors were used for wards. A new pavilion was added to it in 1882.

Beaujon

consists of an old building, and four pavilions opened in 1844; they are connected by a gallery. The institution occupies a large piece of ground, separated by one street from the Parc de Monceau. The entrance is from the main road, but the buildings near it are occupied by offices.

The old and new wards are very different; the former have spinal walls, open at the ends; seven opposite windows; they are 60 feet long by 40 wide, and only 10 feet high; cubic space 1500 feet. The new wards have the same length and breadth, but are 15 feet high; the cubic space is 1800 feet. They are greatly superior to the older wards. A room for 2 beds adjoins them near the staircase, and the conveniences are at the other end. The chapel is at the back.

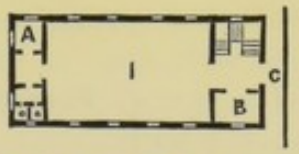


Fig. 48.—NEW WARD OF BEAUJON HOSPITAL, PARIS.
A. Scullery (W.C. opposite).
B. Separation-room.
C. Corridor.

The system of heating and ventilation is that of Van Hecke; the air is injected by the action of a fan with two blades, and in winter time passes over coils of heated pipes, placed in an air-chamber, before it enters the wards. The foul air finds its way out by apertures near the ceiling; the water-closets are warmed.

INSTITUTIONS ADMINISTRATED IN 1882 BY THE "ADMINISTRATION GÉNÉRALE IN PARIS.

			Hospital Beds for Adults	Infirmary Beds	Cribs	Total
General Hospitals		Hôtel Dieu	543	—	16	559
		Pitié	695	—	24	719
		Charité	472	—	32	504
		Saint Antoine	599	—	22	621
		Necker	400	—	18	418
		Cochin	205	—	44	249
		Beaujon	400	—	22	422
		Lariboisière	662	—	44	706
		Tenon	587	—	48	635
		Laënnec	560	—	20	580
		Hôpital Bichat	180	—	—	180
Special Hospitals	Adults	Saint Louis	813	—	30	843
		Midi	336	—	—	336
		Lourcine	219	—	24	243
		Maison d'accouchement	214	26	76	316
		Cliniques	74	—	56	130
	Children	Enfants malades — Paris	562	—	—	562
		Enfants malades — Forges	222	—	—	222
		Trousseau	427	—	—	427
		Berck-sur-Mer	600	—	—	600
		La Roche-Guyon	100	—	—	100
	Temporary buildings (Baraques)—de Saint Antoine, de Cochin, de Saint Louis, Hôpital des Tournelles, etc.		660	—	—	660
	Maison municipale de Santé		343	—	—	343
	Total of Beds		9,873	26	476	10,375
Children's Asylums	Hospice des Enfants-Assistés	Enfants en dépôt	225	60	35	320
	Asile Riboutté-Vitallis		40	—	—	40
	Total for Assisted Children		265	60	35	360
Abodes for Infirm and Old People	Hospices	Vieillesse-Hommes	1,628	166	—	1,794
		Vieillesse-Femmes	2,789	320	—	3,109
		Incurables	1,920	109	—	2,029
	Maisons de retraite	Ménages	1,391	70	—	1,461
		La Rochefoucauld	226	20	—	246
		Sainte Périne	255	34	—	289
	Hospices et Maisons de retraite fondés	Boulard (Hospice St. Michel)	12	—	—	12
		Brézin (Hospice de la Reconnaissance)	309	16	—	325
		Devillas (Hospice)	65	—	—	65
		Chardon - Lagache (Maison de retraite)	150	15	—	165
		Lenoir-Jousseran (Hospice)	96	10	—	106
	Total for Infirm and Old People		8,841	760	—	9,601
Insane Asylums	Bicêtre		640	—	—	640
	Salpêtrière		720	—	—	720
	Total		1,360	—	—	1,360
	Additional Children's Beds farmed by the "Département"		198	29	97	324

L'Hôpital Bichat,

situated in the north-east of Paris, is established in an old building, but on a favourable site. It is not yet opened, but will be so in a few months, and will accommodate medical and surgical cases.

Bicêtre.

This is a large almshouse, founded in 1656, for aged, infirm, and insane males. The building is an old château in the country, of large size, but not so large as the Salpêtrière; the number of inmates is also much less. There were, some years ago, about 3000, but this number is now greatly reduced. The number of beds for insane is 620. An infirmary is attached to the institution, and a library and servants' school have been lately added.

The buildings stand around nine yards, mostly square, and the most recently constructed are worth a visit. The Prison de Bicêtre, which stood inside the enclosure, was removed about 1836. A library, common baths, and lavatories are of recent origin.

Charité

has a less favourable site than most Paris hospitals; it is in the centre of a busy neighbourhood. It was founded in 1637, but enlarged at different times. The buildings surround two square yards, and one arm branches off at the back. Part of the hospital was lately reconstructed.

In some wards the ceilings have been made higher. The ward St. Charles, containing 25 beds and nine windows at each side, had four cupolas placed in the low ceiling, by which light and air may be admitted. It is heated by two calorifères. The beds are 3 feet distant from each other, and have spring mattresses covered by thin mattresses. Long wards have been divided by partitions of wood and glass, and day-rooms arranged with open fires. The floors are waxed. Water-closets were built to replace the latrines, which dated more than 100 years ago. There are movable baths of copper, and others of zinc, painted. The common baths are on improved principles, and include douches, fumigation, and sulphur baths, bidets for female patients.

Les Cliniques

is a hospital in the Quartier Latin. It serves, as the name implies, for clinical instruction. The building was formerly a convent, and reopened as a hospital in the year 1834. It has tiled floors, and there are other objectionable arrangements. The wards were frequently overcrowded, which now is less the case.

The beds are divided between surgical and midwifery cases; there are 74 beds for adults, and 56 cribs. There are 6 lying-in wards.

Hôpital Cochin,

one of the smallest hospitals in Paris, was founded in 1780 by a clergyman of the same name. The old part is built on the corridor plan: the corridor has two large wards in front for 17 beds each, and two small ones for 6 beds are built out at the back. The stairs are in the centre, and at both ends; the water-closets are badly placed in the corridor. The chapel is opposite the front entrance. Nurses' rooms are partitioned off from the wards.

A new "Maternité" is connected with the Hospital Cochin. The wards contain 10 beds for females who have been confined, and a crib to each. The cubic space allotted to them is very ample. The wards have opposite windows; there are only two wards on one floor, and a staircase is interposed between them. They are warmed by open fire-grates placed opposite the entrance, and by tubes, which pass from a calorifère in the basement straight up and through the wards to the ceilings.

Hôtel Dieu.

This hospital was erected near the site of the old building of the same name, opposite the Cathedral Notre Dame de Loretto, in the centre of Paris. It was begun in 1866, but it took about ten years before it was finished, as the building operations were discontinued for several years during and after the Franco-German War. The plan of building much resembles Lariboisière; the pavilions branch off in a rectangle from the passages, which form quadrangles. There are more wards arranged in the passages between the pavilions than at Lariboisière. Here are also found day-rooms for convalescent patients. There are three principal pavilions for males, and three for females; the space between two long sides is 37 metres. It is laid out in gardens. The large wards contain 26 beds, and have large opposite windows. The ventilation is by these and air-channels heated by gas-burners. There is a number of wards for 6 patients,

and about 40 patients may be accommodated in small wards containing 1 or 2 beds. The necessary appendages are arranged at the inner sides of the pavilions.

The wards on the ground-floor are higher than those of the first floor. Medical and surgical cases are received into the hospital, and lectures are given there. Supplementary wards are arranged not far from the hospital, but it is intended to vacate them as soon as the Hospital Bichat is opened.

Hospital Lariboisière.

The site of this hospital is in a northern suburb of Paris, not far from the Northern Railway Station. The building consists of a

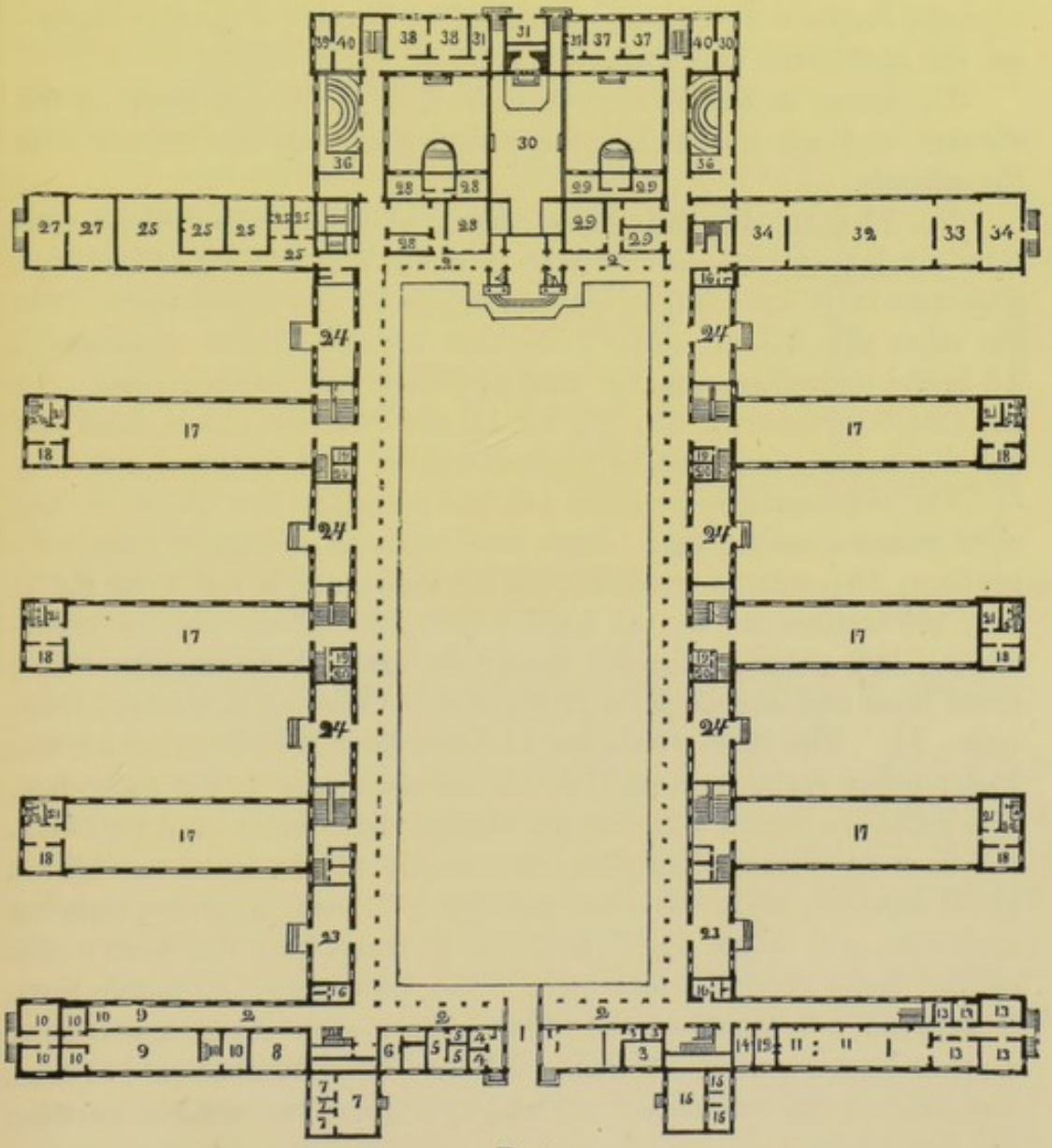


Fig. 49.—Hospital Lariboisière (Ground Floor).

number of pavilions three stories high, connected by passages, 2, which are only about 10 feet high, and the roof of which serves for promenades.

There are six pavilions on each side of a large yard (whose axis is nearly from north to south); there is a small entrance-yard and two smaller yards at the back, where we find the chapel. Passing the entrance, 1, and porter's lodge, 4, we find to the right the directors' rooms, 3, to the left those of the *économe*. No. 6 is destined for the medical officer of the day; No. 7 for out-patients; 8, dining-room for officers; 9, kitchen. This is a large room, about 50 feet by 20, and has two very large ranges and several smaller ones. In one of the former we find eight large cast-iron steamers in the upper part of the stove for cooking soup, or *bouillon*. A separate fireplace for roasting is heated by wood. Near the kitchen are the storerooms and sculleries, 10.

The rooms in the first floor over 7, 8, 9, 10, are used by the steward and officers; and in the second floor there are bedrooms for the officials.

No. 11 is the dispensing department, well lighted and airy; contains six large tables, covered with metal. The cabinet of the head dispenser is at one end, so that he overlooks the whole room. On the other side, 13, are stores and other requisites of a dispensary; 15 is the committee-room for medical officers and the lavatories. In the first floor over 11, 12, 13, 14, 15, are directors' rooms, head and sub-dispensers', and resident medical officers'; 16 is the closets.

The three nearest pavilions are for patients—the males on the right, females on the left. Each floor contains a nurse's room, 19; scullery, 20; a large ward, 17, for 32 beds; and a small one for 2, 18; the latrines are at the farther end, 22. There are no water-closets, but water is thrown down the drain from time to time; there is an iron rail in place of the seat. Close by is the foul-linen room, 21. The large wards are 115 feet long, 26 wide, and 16 feet high; cubic space for a patient, 52 metres, nearly 1900 cubic feet. The walls are coated with Parian cement, light green and polished; the floor is wainscot (parquet); it consists of sexagonal oak blocks glued together, beeswaxed, and polished. Sixteen windows, eight on each side, give ample light; they almost reach from the floor to the ceiling, being about 11 feet high. The beds stand in double rows, 2 between two windows, the sides against each other, but leaving a space between of more than 10 feet. The bedsteads are of iron, and have spring mattresses and white curtains; the window-curtains are also white.

Between the first and second pavilion is a library for patients,

23; between the others, convalescent-rooms, 24, some of them now used as wards; 25 are sisters' rooms, 26 their staircase; 27, stores; over 25, 26, and 27 are sisters' rooms on both floors; 28, baths for females, 29 for males; 30, chapel; 31, vestry; 32, wash-house; 33, drying-oven; 34, for ironing. Overhead are rooms for stacking the clean linen and sleeping-rooms for servants; 35, operating theatre; 36, surgeon's room; 37, dead-house and post-mortem rooms; 38, common dressing-room for all the patients; 39, stables; 40, coach-house.

Wash-house.—A sister is at the head. All washing is sorted by the sisters; that of contagious patients is removed from the wards to a separate place; also very dirty linen is not washed with the other, as it is subjected to a higher temperature in separate tubs.

The following is the process:—The things to be washed are soaked in cold water; they then come under the action of hot ley; they are afterwards washed with hot water and soap, then rinsed, pressed, and dried.

The washing-pan and four tubs are in a large room, 18 feet high. The tubs are of wood, 6 feet wide, 4 feet high, and divided in two parts by a perforated board (*a*), the lower part (*bb*) contains the hot ley, the surface of which is 4 inches from the board; on the latter the cloth is placed. The hot ley is heated by the steam pipes (*dd*) to 212 degrees; it is pumped upwards in the centre by the pump (*e*), and thrown against the cover (*g*) of the tub, from which it falls on the cloth, through which it percolates, and the proceeding is repeated; (*c*) is a hot-water pipe.

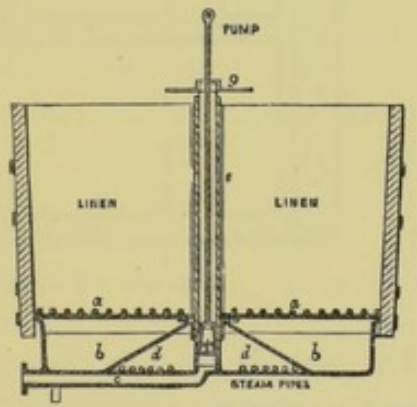


Fig. 50.—Tub in the Wash-house of Lariboisière.

The stone pan in the centre of the room is 39 feet long, 18 feet wide, and has four compartments—the largest one for cold water, two smaller for hot water, one being for the linen of contagious patients, and one for hot water and soap; round this the washerwomen, 25 in number, stand, each in a wooden chair or stall.

The washed cloth is wheeled on little carriages into the yard or drying-rooms (*séchoirs*). In the latter the drying is effected by hot air, which ascends through chinks from below.

Warming and Ventilation.—We find two systems of heating and ventilation in Lariboisière. On the female side the Léon-Duvoir system is in use. The water is heated in the boiler, 1 (Fig. 51),

and expanding, rises upward. The pipes, 2, take it to a tank or reservoir, 3, from which it finds its way, 4, to the several floors and back to the boiler. On each floor the water-pipes pass through four stoves.

The ventilation is caused by the heat of the reservoir, 3, to which all the foul-air channels lead. The reservoir, containing several divisions, forms a large surface, from which heat is thrown out.

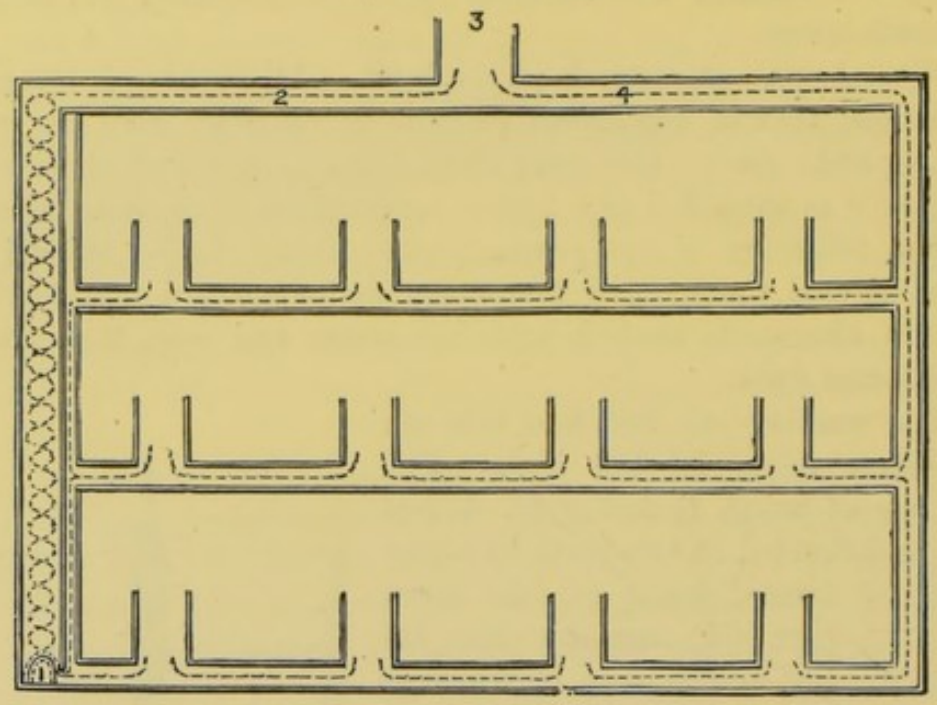


Fig. 51.—Warming in the Hospital Lariboisière.

The foul air ascends through the channels formed by these divisions, and ultimately escapes by a chimney. Fresh air continually replaces the impure, being admitted through channels which end in the outer walls and communicate with the stoves. As these are warmed in winter time, the pure air gets heated before it enters the ward. A patient is said to receive 20 cubic metres of pure air per hour. If it is wished to admit the air unwarmed, the water is shut off from the stoves.

The following is the second system, the system Grouvelle-Thomas-Laurence. There are four stoves filled with water in each ward; this water is heated by steam pipes from a boiler in the cellar, each pavilion having its own boiler.

The ventilation is by forcing in, or injecting, the air. An air-shaft, higher than the chapel, communicates with a cellar, where a fan is placed. This fan or ventilator has four wings or blades, bent to an angle, and revolves very quickly, viz. 400 times a minute; it is set in motion by steam power. It draws the air from the shaft

and forces or injects it into a channel which takes it to the wards. The air passes through the stoves in the wards, and from their forty-eight apertures and some openings in the flooring it moves up to the ceiling with a considerable force, and replaces the foul air at the ceiling, which finds its way out through apertures near the floor.

The smaller rooms for 2 beds have a separate stove. Each patient is said to receive 60 cubic metres of fresh air per hour. With regard to this, however, it might be urged that the patients do not breathe this pure air before it is more or less mixed with that of the ward.

If it is necessary to ventilate without heating, the steam is shut off from the stoves and pipes.

Remarks on the Systems of Warming and Ventilating in Lariboisière.—As regards the warming, both systems are satisfactory. The wards can be heated to a temperature of 62 degrees, and higher if required. Duvoir's system is extremely simple, easy to regulate and to superintend, as it requires only one man who has to look after the fire under the boiler. The temperature may be increased rapidly and without difficulty. The stoves keep warm for a long time, as great quantities of hot fluid circulate. The other system also answers well; I think an escape of steam happened once. Repairs are certainly rare. The air is not dry generally, but its humidity has sometimes to be augmented by wetting the fans.

These artificial systems of ventilation are objected to on the ground of unhealthiness. It is said, that not only is the air less sweet than where doors and windows are solely relied upon, but that people die faster, and operations are less successful than elsewhere.

Now to accuse the ventilation for all this is not quite fair. First, windows and doors are certainly used to a considerable extent in Lariboisière. Duvoir especially employs no other means in summer during the day; and in the wards on the male side the windows are not so rigidly closed as is represented elsewhere.

As regards the death-rate, it is admitted that no circumstance influences it more than the regulations for admission. Where admission is free, the mortality is always higher than where it is limited.

In Lariboisière, nearly one-third of the patients are tuberculous; a great many clinical cases are admitted, and the number of light cases is small. It is necessary to mention these facts, in order to explain that Lariboisière has a high death-rate. It could not be compared in this respect with the London charities; but if com-

pared with Vienna, its death-rate would be found comparatively less.

On the other hand, no one can deny that the expectations have not been fulfilled, which were based on theoretical calculations, and that the enormous costs of construction are not repaid by corresponding tangible advantages.

The existing means for ventilation, if not relied upon exclusively, may certainly be used with great benefit in the hospital.

Administration.

One director lives in the house; one *économe;* six officials connected with the bureau; sixteen male and nine female servants; besides the *aumôniers* and *religieuses.* There are six physicians and two surgeons, who receive 1500 fr. each; twelve *internes* (receiving 600 or 400 fr. according to time of service); one head dispenser (2700 fr.), and eight assistants (600 or 400 fr.).

The physicians visit their wards each day at eight o'clock.

The annual expenses for each bed are 911 fr.; the average cost of a patient per day $2\frac{1}{2}$ fr.

The laundry undertakes the washing for two other institutions besides Lariboisière.

A school of medicine is connected with the hospital.

Lock Hospitals.

La Lourcine is the female lock hospital, opened in 1836; it contains 243 beds, 24 of which are for midwifery cases. It cannot be visited without special permission.

Midi (l'Hôpital du) contains 336 beds; it is a special hospital for venereous diseases, males only. It is built around several square yards, and offers nothing worth notice as regards construction. It was brought into notice by Ricord, whose open-air lectures were held there. Some of the patients make small weekly payments.

St. Louis.

An immense building, one floor high. It consists of many blocks, which stand around square yards.

Its origin dates from the time of the great plague, when 68,000 people died of it in one year at the Hôtel Dieu (1606). It was constructed and opened during the reign of Henri IV., and bears the name of King Louis, who died of the plague. It was not opened before 1612, and serves now for the reception of contagious

and skin diseases, including itch, struma, tinea, etc. It contains 813 beds—viz. 608 for medical, 155 for surgical, 32 for midwifery cases, and 18 cribs.

The wards are of great length, having but few windows. These are opposite to each other, six or seven on each side. There are square wards in the corners of the quadrangles; they contain 9 beds, but the large wards have from 37 to 39. The wards open into each other, as there are no corridors. I found floors of red brick, but this may be changed now. The ceilings are very high (on Italian models) and arched. In some of the large wards wooden partitions are found, 10 feet high. The wards are warmed by three stoves or calorifères; open fire-grates were formerly used in the square wards, but they are bricked up. The blocks, with few exceptions, are only one story high.

Of all the arrangements, the baths are the most interesting to a medical visitor. They were founded in 1816, and recently improved. They are not only used by the in-patients, but also by out-patients. Twelve hundred to fifteen hundred baths can be given daily. All kinds of medicated and vapour-baths are found, and hot plates for warming the linen, and linen-shoots. Various apparatus are used for hydro-therapeutic purposes. A great many persons visit the baths at one time, and strict order is kept by the officials.

L'Hôpital Necker

adjoins the Rue de Sèvres, and contains 418 beds; is built in the form of a quadrangle, partly open at one side; but the ends of the wings are connected by a gallery on the ground-floor. The buildings have three floors. There are wards for 20 and for 6 beds each; the windows are opposite in the former. The attendants' room is between the larger wards; water-closets and baths are built out at the ends of the wings. The number of baths is 12.

The system of heating and ventilation is the same as at Beaujon.

La Pitié.

The building dates from the year 1612; it can accommodate 719 patients, there being beds for medical cases, for surgical ones, for women to be confined, and cribs.

La Salpêtrière

is a large almshouse in Paris for females, including lunatics. There

are forty-five different buildings, which have 4682 windows, and stand mostly around rectangular courts. As Tenon mentions, there were once 8000 inmates at one time, but this number is reduced at present to about 3000. The actual number on July 1, 1862, was 2635 epileptics and idiots; 1513 lunatics, 109 waiting to be sent elsewhere; 778 servants and officials; the total number being 5035 persons. At present there are 16 medical officers and 23 dispensers; 553 officials, 120 journeymen workmen, 1 director, 1 steward.

A large laundry is attached to the Salpêtrière; it does, or did till lately, the washing for five other institutions—Hôtel Dieu, Beaujon, Charité, Les Cliniques, and La Boulangerie. The inmates are divided into different sections.

The infirmary of the Salpêtrière contains 300 beds, and was at one time celebrated as a school for the science of mental diseases.

L'Hôpital Tenon in Ménilmontant, Paris.

L'Hôpital Tenon, 635 beds, lies in the extreme east of Paris, on the Ménilmontant heights; was opened for patients in 1878. It is a pavilion hospital; the pavilions are connected by passages where no patients are accommodated. The pavilions have three floors over a basement and attics, except two isolation-pavilions, which are one-storied. The wards of these are 25 m. 80 c. long, 8 m. 60 c. wide, and $5\frac{1}{2}$ m. high. The cubic space for each of the 22 patients is 100 c.m. There are twelve opposite windows reaching near to the ceiling. Ceilings and walls are cemented, and all corners rounded off. Water and steam are used for warming, and a fan may be used for injecting air. Lying-in and smallpox wards stand separate in the grounds, which are laid out in gardens.

Hospitals for Children.

L'Hôpital Trousseau, so called in memory of the late Dr. Trousseau, formerly was named Ste. Eugénie in honour to its late patroness, the Empress. It was opened in 1853, and the name changed by order of the Prefect, 1881. It is situated in the Rue Charenton, Faubourg St. Antoine, and has beautiful grounds.

It contains 427 beds—more than 300 for medical, the rest for surgical cases. Particular care is bestowed on the baths.

Les Enfants Malades—instituted 1802, for 600 children, only 98 beds being reserved for surgical cases—has been subjected to severe criticism by different authors as an unhealthy hospital.

Three annexes, or country hospitals, are in close connexion with these establishments. They are, first, the Hôpital Berck-sur-Mer (Pas de Calais). It is composed of pavilions, two floors high, having opposite windows (fifteen on each side); they stand in parallel lines, are connected by galleries, and the chapel is in the centre. The buildings are close to the beach. Scrofulous children are received.

The other is l'Hôpital Forges-les-Bains, consisting of two principal pavilions, connected by a centre building. The establishment is in the country, about 24 miles from Paris. Anticlinic children are admitted.

A third one, la Roche-Guyon, is of recent date, for convalescent children, boys only.

Other Institutions which are under the General Administration.

In addition to the "Hospices proprement dits," there exist some special institutions of a similar character. The "Hospices Fondés" are almshouses founded by private persons, and with peculiar regulations.

I.—Hospices Fondés.

1. *Fondation Boulard.*

It is destined to accommodate twelve or thirteen aged males who formerly belonged to a better class of society, and is situated at Saint Michel (suburb of Paris).

2. *Fondation Brézin.*

It contains 325 beds, 16 standing in the sick wards. It was founded by the proprietor of a large foundry, who died about twenty years ago, and is intended for poor artisans aged above sixty years, especially brass-founders, locksmiths, etc. It is situated in the country (Département Seine et Oise).

3. *Fondation Devillas,*

for working men, aged sixty years or more, containing 35 beds. It is situated in Paris.

4, *Chardon-Lagache,* and 5, *Lenoir-Jousseran,* are similar institutions lately added.

MORTALITY OF PATIENTS ADMITTED INTO THE PARIS HOSPITALS AND THE SUBSIDIARY HOSPITALS in 1878.

		Adults.		Children.		Medium Mortality.	The Mortality compared.	
		Males.	Females.	Boys.	Girls.		In 1877.	During the decade 1865-74.
		1 in	1 in	1 in	1 in	1 in	1 in	1 in
General Hospitals.	Hôtel Dieu	7·03	7·75	8·73	6·12	7·30	7·02	6·95
	Pitié	7·07	6·96	26·28	12·31	7·20	7·40	7·42
	Charité	9·26	7·73	8·	16·25	8·61	7·66	7·76
	Saint Antoine	6·34	6·29	3·95	3·92	6·12	6·97	7·10
	Necker	7·31	8·66	4·47	5·41	7·47	7·49	6·55
	Cochin	9·07	16·37	11·43	22·62	12·49	16·06	13·26
	Beaujon	7·45	7·64	8·55	6·32	7·51	7·09	6·99
	Lariboisière	6·56	7·80	12·86	12·84	7·47	7·08	6·61
	Tenon	9·96	10·	2·50	4·	9·42	—	—
	Laënnec	5·28	5·34	5·11	5·62	5·30	6·70	5·97
	Total	6·95	7·42	7·65	8·44	7·20	7·39	6·87
Special Hospitals. Adults.	Saint Louis	21·83	27·30	15·03	11·35	21·99	19·78	16·59
	Midi	471·80	—	—	—	471·80	555·75	45·66
	Lourcine	—	227·83	2·26	3·84	38·42	36·84	21·29
	Accouchement	—	52·73	11·07	17·52	23·12	21·39	14·77
	Cliniques	—	32·38	15·68	16·11	21·86	17·64	14·35
	Total	42·38	39·21	11·32	13·37	30·46	26·33	18·83
Special Hospitals. Children.	Enfants Malades	—	—	4·65	4·30	4·47	4·65	5·58
	Sainte Eugénie	—	—	4·86	4·20	4·51	3·83	5·56
	Berck-sur-Mer	—	—	10·24	15·84	12·38	12·88	13·09
	La Roche-Guyon	—	—	66·12	—	66·12	49·30	69·91
	Total	—	—	5·52	4·45	4·98	4·68	5·79
United Hospitals		8·61	9·08	6·66	6·15	8·27	8·24	7·91
Maison de Santé		6·21	5·75	—	—	6·04	5·71	6·02
General Average		8·48	8·92	6·66	6·15	8·17	8·14	7·84

II.—Maisons de Retraite.

These establishments serve as a retreat to those of the poorer classes who are not quite denuded of all means.

1. *Les Ménages* (Rue de la Chaise)

contains 1400 beds, the infirmary 70. Married couples or widowers and widows are admitted; the former pay £128 on admission. They receive board and lodging and small sums of money (seven shillings a month). They must be aged sixty years or more.

2. *La Rochefoucauld,*

situated in a suburb, contains 246 beds, 20 in the infirmary; is intended for poor officers in the army, impoverished clergymen, or clerks.

3. *Sainte Périne,*

at Auteuil, contains 289 beds; the infirmary can accommodate 34 persons. It is intended for aged couples.

III.—Maison Municipale de Santé.

This is a hospital for paying patients. The number of beds is 340, and the payment varies from four to fifteen francs per head per day, according to accommodation. Those who pay the latter sum have a bed and sitting room for themselves.

The Asile de Ste. Anne.

The Asile de Ste. Anne was opened on the 1st of May 1867 for the reception of patients, and visited by many persons on the occasion of the International Medical Congress.

The site of the asylum is in the outskirts of Paris at the end of the Rue Ferrus, between the exterior boulevard and the fortifications. It is but a short distance from the Lock Hospitals and the Observatoire. The buildings cover a large space of ground enclosed by a high wall, and are somewhat removed from the thoroughfare. They consist of an admission block; another for the administration, three stories high; and eight pavilions—four for males, and four for females—two stories high, all connected by open colonnades. The latter enclose quadrangular plots of ground formed into gardens, and, being

separate from each other, are used by the different classes of patients. The patients are divided into four classes, viz. the quiet, the semi-quiet, the feeble, and the agitated ones. There is a building of one floor containing the cells, the chapel, and the usual outhouses for baths, kitchen, etc.

The administration-pavilion contains the offices of the director and steward, rooms for resident medical officers, the linen-stores (on second floor), and one room for convalescents.

The pavilions for patients contain the wards and accessories. The rooms have opposite French croiseés windows of iron, painted in imitation of wood, high up from the floor. They are locked, but can be opened by the same key that opens the door of the passage. The upper part is frequently made to incline inwards. The windows of the first floor are also secured by wire-work fastened on the outside.

The floors are parquet and lacquered. There are usually 16 bedsteads to a ward, not too close together. They have spring mattresses, but no bed curtains. The wards are warmed in winter time by calorifères, and also by hot air. The lighting is by gas. The windows serve for ventilation, as also the calorifères, into which the outer air is admitted; and there are a few ventilators in the ceiling.

A recreation-room adjoins the ward. The tables have marble slabs. There is an open fireplace, with a sliding tin plate, which can be used to moderate the draught and save fuel.

There are lavabos, with marble slabs. The water-closets are in little detached sheds in the yard.

The number of cells is eighteen—nine for males, and nine for females. The buildings, where they are, are of semicircular form, having a corridor on the concave side and gardens on the convex one. The cells contrast favourably with the dark and confined ones of former times. They are roomy, containing a space of 33 cubic metres, and light, having two windows and a skylight. The larger window (3 feet by 4) looks into the little garden, and is a sash-window; the opposite one is over the door. The walls and floors are of wood, except a few padded cells; they have the floor covered by a mattress. The door has a little eye-hole, in a brass-fitting, for observation. The furniture is composed of a bed with a spring mattress and a little table. The former has a zinc drawer underneath the mattress to promote cleanliness. The convenience is a simple chamber of enamelled iron removable from the passage. A bell is touched whenever it is used by the patient to call the attention of the attendant. The cells are sufficiently warmed (in

winter time) by hot air and ventilated. There are lanterns in the wall, throwing light both into the cell and the corridor. To each cell belongs a little garden, separated by walls from the adjoining one. The outer side of the garden is closed by a wicket; behind this the ground slopes till it reaches a high wall.

The *infirmary* contains 36 beds, including itch patients. There is a ward for males on one side and one for females on the other side. The wards have opposite windows, open fireplaces for warming, apertures for admitting warm air, and ventilators in the walls. The cubic space is very ample.

Baths.—They were built by M. Bouillon on improved principles. The common bath-room has opposite windows; they open inwards, and are high up from the floor. The lower parts of the walls are cemented. The room for sulphureous baths has cemented walls, which are oil-painted. The hydro-therapeutic appliances are similar to those in St. Louis.

The *wash-house* is very commodious, and contains similar arrangements to the Lariboisière; but the drying-stoves are on a new principle.

The *kitchen* is spacious; steam is used for cooking.

Administration.—All the asylums are under the Prefect of the Seine Département. The Asile de Ste. Anne is in a more advanced state than the others; it receives principally the curable cases. In addition to the accommodation in the asylums, insane persons will be sent to and lodged with families in the neighbouring country. The distribution of patients to the different hospitals is under a central board, the Bureau d'Examen, which is located at the Asile de Ste. Anne. The patients remain during the time needed for a correct diagnosis in the admission-wards of Ste. Anne. Some who suffer from acute diseases with symptomatic delirium are also received, as also doubtful cases, in order to avoid sending any persons to a lunatic asylum who are not insane, this being what their relations dread very much. Large farms are attached to the asylums.

The Director of Ste. Anne is a medical man. He has a private house and gardens. There are four head physicians—one being attached to the admission-wards; two *internes;* one dispenser, and two assistants. The nursing is in the hands of sisters of charity. The means for amusement are as yet scanty in Ste. Anne, such as cards, dominoes, etc.; but there will be billiards and a gymnasium. Some of the patients are employed in the workshops, others in doing housework. No patient, unless infirm, is kept in-doors in fine weather; and the strait-jacket is but sparingly used.

The Montpellier Hospital à St. Eloi,

built recently outside the university town of Montpellier on a hill at a distance of 2100 m. from the "Mairie." It stands in its own grounds of 21 acres, and consists of one-story pavilions, and may accommodate 600 patients. There are three separate divisions with separate entrances, viz. the pavilions for male and female patients connected by passages, the isolation-pavilions for patients with infectious diseases, and the maternity. Besides, there are the administrative block of higher elevation, the laundry, common baths, ice-house, and post-mortem rooms. The large wards are 30 m. long, 8 m. wide, and $7\frac{1}{2}$ m. high. On one side a verandah runs, which has a sloping roof, and is entered by seven glass doors from the ward. Its width is 3 m. The walls of the wards are constructed of iron and double hollow bricks; the inside is covered with cement. The roof is vaulted considerably, and double, in order to let the air circulate in the intermediate space and shut off the rays of the sun. The windows at the long side have at the upper part a louvre inclining inwards. There is a ridge in the centre of the roof for ventilation. The wards may be warmed by two calorifères from the cellar and a stove in the centre, where an open fire may be kept, the smoke being drawn downwards. Bad air may also be withdrawn by channels, in which a gas-burner may be lighted in summer time. The floors are made of tiles placed in cement.

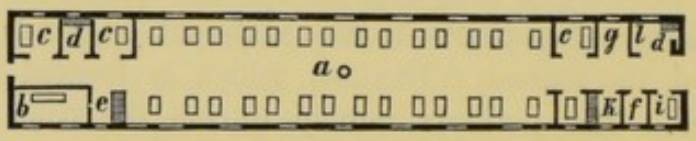


Fig. 52.—The Montpellier Hospital at St. Eloi, France.

a. Ward. *b.* Dining-room. *c.* Single ward.
d. Lavatory. *e.* Anteroom. *f.* Nurse or Attendant.
g. Linen stores. *i.* Bath. *k.* Scullery. *l.* Water-closet.

The nine isolation-pavilions contain 16 beds each, and the appendages are otherwise arranged.

One of the pavilions is reserved for convalescent patients. Lectures are given at the hospital.

French Military Hospitals.

Bayonne

has a hospital for 950 patients; it is in use since 1844; it consists of five large pavilions ranged around a rectangular yard. The

pavilions, which are situated on each side of the entrance, have two floors, the others three. The outbuildings, chapel, dead-house, vapour baths, and engine-room, lie at the back.

The principal wards are large, for 116 patients, and the beds stand in *four* rows. The cubic space for each patient would be less than 900 feet if the wards were full, but they seldom are.

Military Hospital, Philippeville (Algeria).

It was constructed in 1840 on a healthy and elevated site, on the pavilion plan. There is room for 550 patients. There are five blocks, all connected on one side by a long building, having galleries on the side facing the pavilions. The wards have opposite windows. There are day-rooms and common baths.

Military Hospital, Sidi-bel Abbas (Algeria).

It was opened nearly twenty years since, is built in horse-shoe form, and can hold 225 patients. There are large and small wards. One peculiarity is a gallery running along on the ground-floor on the inner side. It serves as a promenade, and connects the wards.

L'Hôpital du Val de Grâce, the largest Military Hospital in Paris.

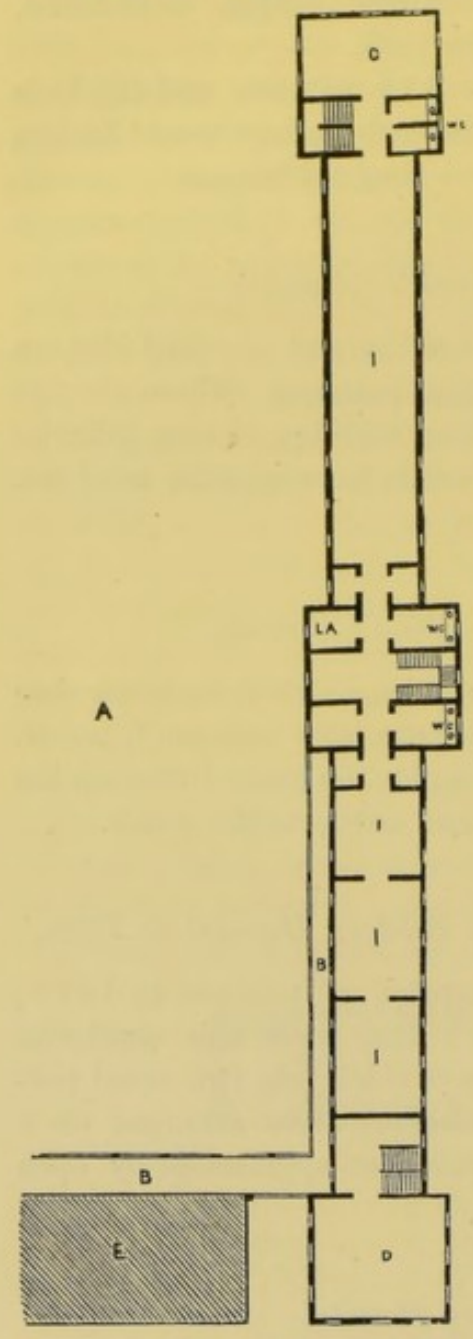
Part of it was opened for the reception of patients in 1814; three new blocks were added in 1838. They have this similarity to the Vincennes hospital, that they are divided into two equal portions by a central staircase. The *commodités* were arranged on a novel plan, being in small detached pavilions approached by open galleries from the main buildings.

The Vincennes Military Hospital

is a recent building. It was partly opened in 1859, and was considered by Dr. Larrey as almost a model hospital. It can accommodate 366 patients, including twenty-one officers. Its site is excellent. Although in close proximity to Paris, it stands in a pleasant part of the country, and opposite a beautiful park, the Parc de Vincennes. It is near the main road, but separated from it by a large yard, which is laid out with shrubs and walks.

It mainly consists of two pavilions of considerable dimensions; they stand parallel, their ends looking towards the road, and are connected by a glazed passage which runs parallel to the road. The

wards are of considerable length, and for forty patients; but some are divided by transverse partitions into two or three smaller ones communicating with each other. Each block contains an airy staircase in the centre. A different system of warming is in use in each; in one block there are stoves containing water, which can be heated by steam pipes. The wards on this side are ventilated by fires. The foul air of the lower floors is extracted by the downward draught of the fire which heats the boiler in the engine-house, but the vitiated air of the third floor is extracted by a fire in the upper part of the building. In the other block we find calorifères heated from the basement. There are no means for ventilation but the mantel of the calorifères, and one of the smoke-shafts of the calorifères is used for extracting some of the foul air.



On the scale of $\frac{1}{64}$ of an inch to a foot.

Front.

Fig. 53.—Vincennes Military Hospital (Right-hand Block).
A. Court.
B. Covered gallery.
C. Non-commissioned officers.
D. Communauté.
E. Administration.
LA. Lavatories.
I. Wards.

The surgical cases are on the ground-floor, the medical on the first and second, and the syphilitic on the third floor. Non-commissioned officers are accommodated in the square room. It contains 12 beds on the three lower, and 10 on the top floor. A few officers' rooms are on each floor; lavatory and water-closets are near the staircase.

The orderlies (120 in number) are in separate barracks; the wash-house is detached, but the kitchen is on the ground-floor. This is one of the objectionable arrangements. There are, however, only a few patients on the ground-floor, viz. eye cases, and some officers.

There is a new military hospital, at Bourges, Paris, which possesses one-storied pavilions.

Military-Naval Hospitals.

There are some large military-naval hospitals in France—at Rochefort, St. Mandrier, near Toulon, and at Brest. The Rochefort hospital is composed of pavilions connected by galleries; it can receive 800 or 900 patients, but usually has not more than 600. The pavilions have two floors, and wards for 60 beds. The first-floor wards are constructed like attics, and the cubic space for patients is, therefore, limited. Modern improvements have been lately introduced.

There is a school of medicine connected with the hospital, and the clinical wards are attached in a somewhat novel manner to the other wards; there is separate access to them.

Toulon Naval Hospital

is an old and large hospital; it can find room for 1300 patients. It contains large wards for 32 beds, and affords 1200 cubic feet to each inmate. It is so arranged that the corridors run on both sides of a ward, and also along the ends, similar to the double Indian verandahs. The climate being very hot, this seems excusable, but no modern hospital (at least in Europe) should be built on this plan.

GERMAN HOSPITALS.

Many of them are of great extent and ancient origin, and celebrated for the medical schools connected with them; but, as regards construction, many are defective. The pavilion system is not generally adopted, but as a leading feature we find the corridor with the wards opening into it. Paying patients are admitted into the charities side by side with those for whom the municipality pays. Admission is, generally speaking, free; but the patients must be provided with medical certificates, which the medical officers for the poor generally supply. The hospitals are usually managed by a director, who is responsible to a government or municipal board, and frequently assisted by a medical committee.

Lunatic asylums exist in large numbers, but are, with some exceptions, not in connexion with hospitals. Almost every system of nursing is found in the various charities. Dispensaries are not connected with the hospitals (the Jews' Hospital in Berlin, the Evangelical at Bonn, and a few others excepted), but with the universities; or they are free, and private institutions.

Aix-la-Chapelle.

This old coronation city, famous for its mineral waters, possesses a large hospital and smaller ones. The former is named Mariahilf or Catholic Hospital. It is favourably situated on a hill surrounded by extensive garden grounds outside the town; it dates from the year 1854, and is built similar to Bethanien Hospital, Berlin. It has three floors, projecting parts and turrets, a corridor in front, into which the wards open. There are windows opposite the entrance-door, with perforated zinc plates in place of the lower panes. There are 12 (wooden) bedsteads in a larger ward, iron stoves, oiled floors, and airducts in the wall, without a fire to increase the draught; there are self-acting water-closets badly placed. The corridors can be warmed by steam pipes. Number of patients in December 1880, 259. Kitchen and laundry are under the management of a sister (*Franciskanerin*). The wash-house contains wringing and other machines; the washing is put in hot ley for two hours, one ounce of soda to two pails of water.

There is a small Evangelical hospital where the nursing is in the hands of deaconesses of Kaiserswerth, supported by voluntary contributions, with an out-patient department attached.

The Military Hospital, "am Bomgart," is an old cloister, and there are sisters of mercy. The administration is in the hands of a committee composed of a surgeon-major (*Oberstabsarzt*), a captain, and an inspector.

There is a poor-law board of eighteen members, two being medical men; they are not salaried. They elect a new member when a vacancy occurs; but the latter are appointed by Government. The city is divided into districts (six or seven); for each one a commission exists, the parson being president. There are about ten poor-law medical officers, and also clubs of working-men; for each a medical man is appointed.

Altona.

The sister town of Hamburg-Altona has about 90,000 inhabitants. There is a general hospital, which contained, at the time of the visit, 220 patients. It is built of red bricks, dates from 1860, stands in large grounds of its own, has a prepossessing exterior, and contains middle-sized and many small wards opening into passages. The wards are on the first and second floors, and water-closets without lobbies are found. There are good German stoves, with air-chambers—openings in the lower part of the doors and upper parts of the walls—for ventilation. There is an out-patient department to the hospital

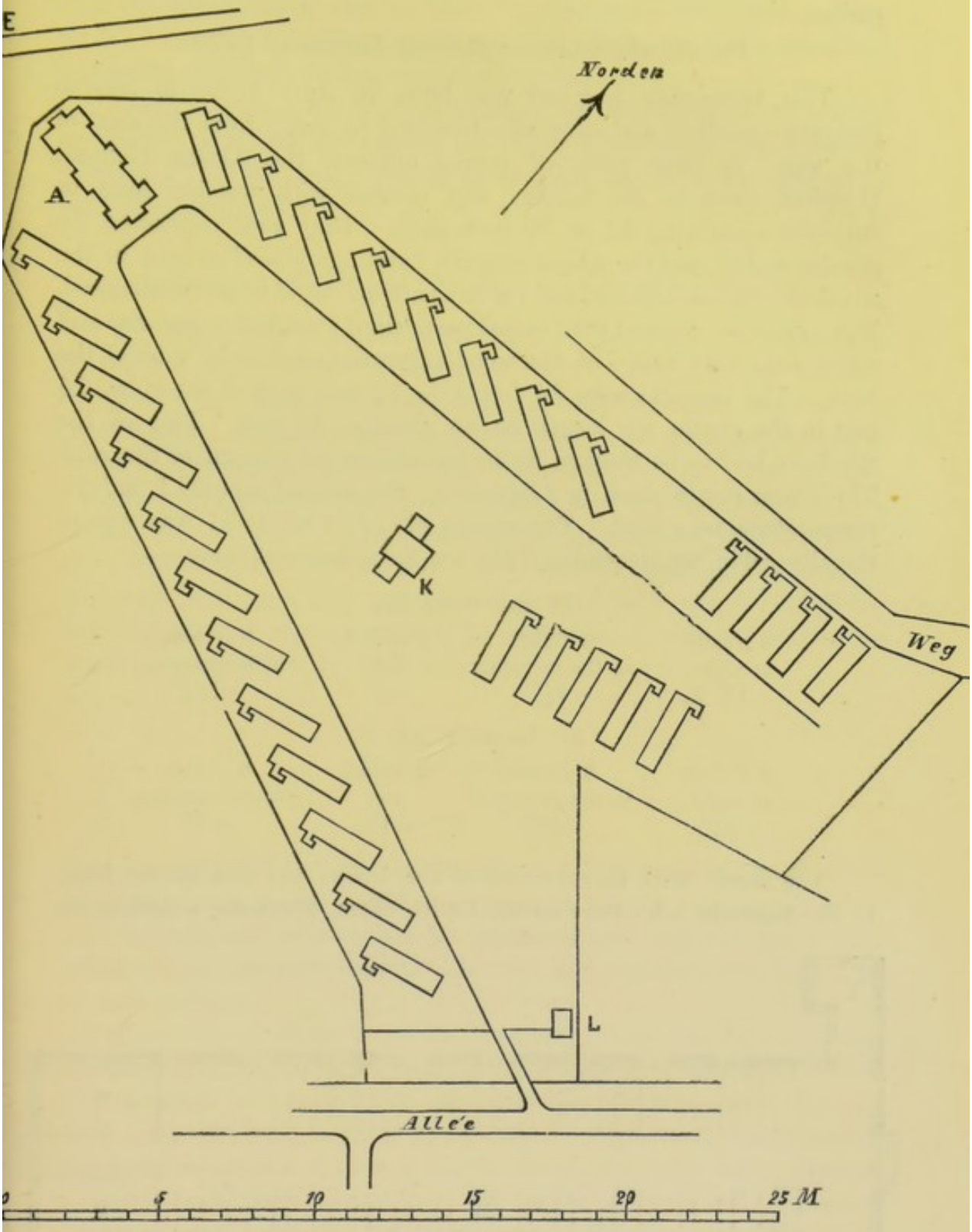


Fig. 54.—Hamburg-Altona Barrack-Lazaret (Ground Plan).

. Administration. K. Kitchen. E. Railway near to back entrance. L. Entrance.

A one-floored pavilion for medical and surgical cases stands in the garden.

The Hamburg-Altona Barrack-Lazaret of 1870.

This temporary hospital was built in July 1870 to receive patients—medical and surgical—removed by train from the seat of the war. A large piece of ground opposite the Altona General Hospital, close to the railway, was covered with wooden huts or barracks containing 24 or 30 beds each. They were connected by granite walks, and the administrative buildings placed as seen in the woodcut. Seven hundred and twenty patients could be accommodated. The roofs were covered with tarred pasteboard; the latter material and straw mats were nailed on the wooden boards forming the sides of the huts. The barracks were 24 feet wide, 12 feet high at the sides, 15 feet in the centre, the length on an average 90 feet. Part of the windows had to be blocked up in the winter on account of the cold. Three iron stoves stood in a barrack. For several months I had the temperature measured. The winter of 1870 to 1871 was exceptionally cold; on December 24th the measurements were:—

In the Open Air.

2 o'clock at night.	8 o'clock in the morning.	2 o'clock P.M.	8 o'clock in the evening.
− 13° R.	− 9½°	− 8°	− 12½°

In Barrack No. 8.

2 o'clock at night.	8 o'clock in the morning.	2 o'clock P.M.	8 o'clock in the evening.
+ 5½°	+7°	+ 10°	+ 7°

The wards were therefore often very cold; but this did no harm to the patients, who were covered with extra blankets, whereas the

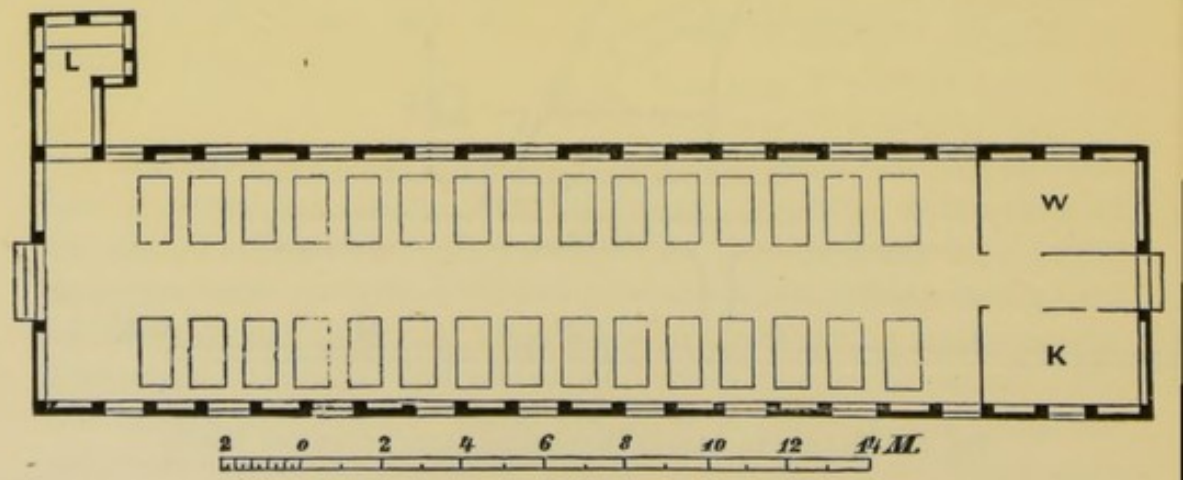


Fig. 55.—Barrack of the Altona Barrack-Lazaret.

W. Attendant. K. Kitchen. L. Privies.

abnormal humidity of the air had a bad effect. The openings in the ridges of the barracks were all closed up during the hard frost. Some cases of pyæmia happened in the surgical wards, so that a complete immunity of hospital diseases did not exist.

There is a moderately-sized military corridor hospital at Altona, the wards of which are warmed by Haag's hot-water pipes formed into coils. A fan was formerly in action; but it is not used now, for economical reasons.

Augsburger Allgemeines Krankenhaus (Augsburg Hospital).

I mention this hospital, although I do not know much about it, on account of its absurd management. It is of recent origin, warmed artificially (by Haag's water-stoves), and contains many modern improvements. A benefactor left a large legacy for building it, and it could be constructed and furnished with some luxury. But as Protestants and Catholics were both destined to receive its benefits, and as they did not agree, it was, after warm debates, determined to have the Catholic and Protestant patients on separate sides of the hospital, and each part separately managed; so that there are two kitchens, two dispensaries, etc., everything in duplicate, by which arrangement much unnecessary expense is caused.

Berlin Hospitals.

Bethanien Hospital

was founded in 1847 by the late King. It is built on the corridor plan, and has a centre building and two wings: it is situated on an elevated site, and surrounded by extensive grounds, and has a very striking and imposing exterior; it does not contain more than 300 or 350 patients.

There are three floors over a basement. The wards, which are not large, contain 10 or 14 beds, but there are also separation-rooms. The windows are on one side only, and opposite the door. (*See* Fig. 1, No. 4.) The wards allow 2000 cubic feet or more to each patient. Spacious corridors run round the whole of the inner side. Nurses' rooms and sculleries are between the wards, and hot and cold water is distributed over the different parts from the reservoirs. The water-closets are near the corridors. The convalescent-rooms are in the centre, and a large balcony adjoining the children's ward allows all of them who are able to leave their beds to enjoy the open air during the day.

The bedsteads are of iron, and have a footboard; some have curtains and feather beds.

The corridors are warmed in winter by steam, the wards by tiled stoves which stand in the middle. A singular plan of ventilation was tried, but failed. We notice green-coloured iron columns standing in the wards; they consist of two tubes, one in the other. The smoke of the stove passes through a pipe into the inner tube, which by this gets warm; the outer tube has thirteen apertures at its base, into which the foul air is expected to enter and rise by the heat of the inner tube. These apertures can be closed. Fresh air is admitted, so that it passes through the stove up to the ceiling. It was found that the effect was very slight.

The engine-rooms and kitchen are placed in the main building. Steam is used for cooking. An ice-pit and dead-house are separate and at some distance.

The following is the system of admission:—The patients generally have to pay, and there are two classes; one class pays three shillings per day, the other half as much, but sometimes they are admitted free.

The hospital is a general one for all diseases, but sometimes certain maladies are excluded for a time to prevent the outbreak of hospital diseases. The administration is peculiar; it is in the hands of a Protestant order. The pious sisters, called *Diakonissinnen* attend to the nursing and dispensing, and occupy a considerable portion of the building. They keep a school where the novices are trained, and attend to the cooking and diet. The head sister lives in the hospital, and a committee meet from time to time to assist her in managing the hospital. A clergyman, a physician, and some other gentlemen form the committee.

The *Diakonissinnen* engage themselves to attend to their duties as nurses for five years, after which time they may retire, but they may leave sooner, especially if they marry, but then they have to give a certain notice.

Catholic Hospital, Berlin.—Katholisches (Hedwigs) Krankenhaus.

This institution is situated in a crowded part of the town, Hamburgerstrasse, and has grounds of somewhat moderate extent attached to it. It consists of a centre building in front and wings extending from the sides backwards. It is three floors high, and holds about 350 beds. It is built on the corridor plan, and the wards are small, for two to seven patients each. They have windows on one side only; the door leading into the corridor is opposite.

We find the nurses' rooms interposed between the wards in a similar manner to that in the Bethanien. Water is laid on to all the floors and water-closets, but there are no lavatories.

The corridors are warmed by steam, the wards by stoves, and there is a system of ventilation by a central shaft leading to the roof, near which a ventilating fire is kept. But the effect is very limited.

The hospital is supported by voluntary contributions, and managed by the sisters of St. Charles Borromeus, whose headquarters are at Nancy, in a similar way as the Bethanien. Some of the patients pay the same amount as at Bethanien (one thaler or half a thaler).

Charité Hospital, Berlin.

This hospital consists of an old structure, to which several additions have been made. The buildings are situated near the river Spree, surrounded by large grounds, and formerly some distance from any habitations. They contain from 1000 to 1800 patients. We find the principal and older portion built on the corridor plan in the form of an open square, enclosing a large yard or garden, planted with trees and shrubs. There are three floors; the centre building contains on the ground-floor the dwelling-rooms of both directors, on each side of a spacious hall, and their offices. On the first floor, which is about 14 feet high, we find surgical cases, the males on one side and the females on the other; there are two large eye wards, clinical wards, and an operating theatre. On the second floor we find the medical clinical wards. The floors are lacquered and oiled, the windows croisées; the beds have flock or horsehair mattresses, and stand 4 or 5 feet apart. In the wings the ground-floor is mostly occupied by medical officers and the rooms of the officials, the two other floors by wards some larger, but most of them have not room for more than 6 or 8 patients. They are connected by the corridor, but mostly open into each other. The attendants' rooms are interposed between two wards.

Midwifery wards, containing 80 beds, are in a separate block, which was formerly used for smallpox patients. It is at some distance from the other parts. It is not used in summer time, as the patients are transferred to the summer lazaret.

A new kitchen was built some years ago, and attached to one of the wings of the old Charité; it has three ranges, one for the patients, the second for officials, the third for medical officers.

Summer Lazaret.

This building is situated near the oldest part, but stands perfectly free. It is one block 280 feet long, 51 deep, with portions projecting 25 feet from the centre and from both ends. There are only two floors over a cellar. The engine-room is in one of the projecting parts; it is, however, divided from the main building by the corridor, so that this arrangement is less objectionable than under other circumstances. Several rooms in the cellar, which is partly underground, are used to live in; this is an arrangement which would be objected to in this country. On the first and second floor are 4 wards—2 for males and 2 for females—56 feet long, 36 wide, and 16 high, communicating with each other. They allow a cubic space of about 1800 feet to each patient when full. They are kept empty during winter time. The walls are stuccoed; the

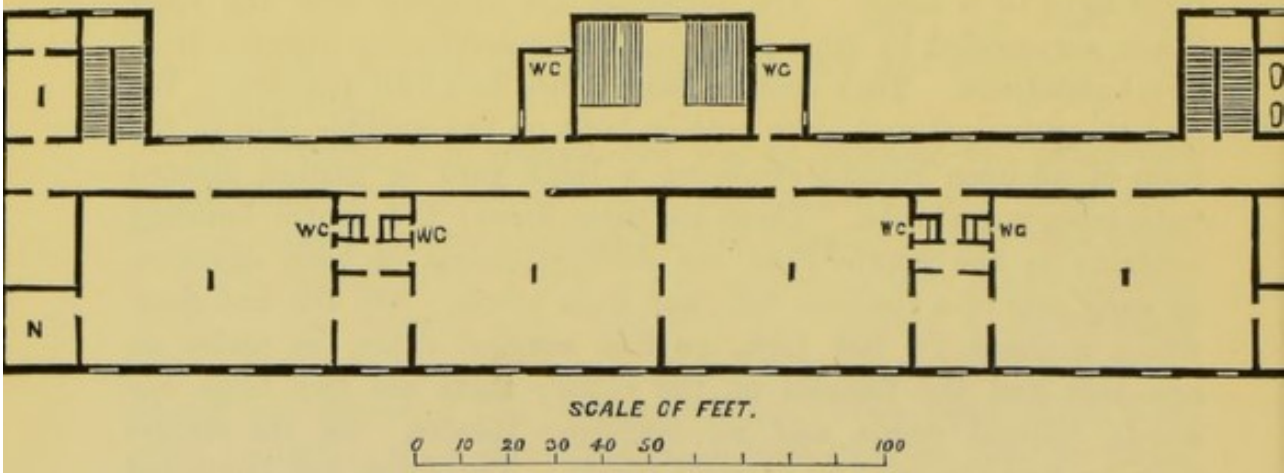


Fig. 56.—Summer Lazaret of the Berlin Charité Hospital (First Floor).

windows high, but on one side only. On the other we find the corridor (9 feet wide) lighted by twelve windows and two end windows. The projecting centre contains the spacious entrance-hall on the ground-floor, and the operating theatre on the first; besides some well-placed water-closets. The nurses' or attendants' rooms are interposed between the wards, and can be entered from them. The tea kitchens (sculleries) are arranged on a similar plan, but spaces for the water-closets are cut out of them, and these open into the wards through a small lobby. This arrangement is convenient for the patients, as they do not have to pass through the corridor, but makes it necessary to pass the drains under a part of the building.

There are no means for heating or ventilation, but in the bath-rooms there are apertures which open into the smoke-shaft.

The dead-house is situated opposite the summer lazareth on

elevated ground; it is 95 feet long and 34 deep, consists of a ground and two other floors over a high basement. There are two principal and four or five side entrances in basement and ground floor. They are well arranged, and serve for conveying in or removing corpses, and admitting visitors and mourners, the students connected with the anatomical school, the lecturers, the medical men, and others attending an inquest. The basement contains a room where the dead are exposed (morgue), another where the post-mortems are made at an inquest, and side rooms for washing, medical officer, etc. From the basement the corpse can be conveyed into an ice-cellar. We also find a kitchen belonging to the chemical laboratory. The floor is impervious. On the ground-floor we find three dissection rooms for students and clinical professor, and the private rooms of the latter and his assistant. There is a large amphitheatre, with a table with a movable top in the centre.

On the first floor we find large rooms used for microscopical instructions, and any one who attended Virchow's lectures must remember the tables with tramways on which the microscopes are moved. In addition there is a chemical laboratory. On the second floor is an anatomico-pathological museum.

As regards the construction of the tables on which the dead are placed, they have borders, so that fluids cannot run off them, but are drained off through small holes. Water may be sprinkled over the dead bodies from jets.

The Lazaret Barrack (*Lazareth Baracke*),

a wooden pavilion built 1866, and opened for patients 1867. The principal part has a length of 84 feet, a width of 29 feet, and a height at the sides of $13\frac{1}{2}$ feet, at the ridge of 19 feet. There are balconies at each small side $10\frac{1}{2}$ feet wide, and galleries at both long sides $4\frac{1}{2}$ feet wide. The whole length is therefore 105 feet, the whole width $37\frac{1}{2}$ feet. The walls are formed by a framework filled with hollow bricks, and lined by vertical boards inside and outside. The floor is 3 feet from the ground, formed by double layers of boards; the roof has three layers and ventilators in the ridge. There are 12 croisée windows at each side containing small glass *jalousies*. Twenty beds may be placed in the ward, and 10 or 12 on the balconies. The warming is at present by iron stoves lined inside with chamotte.

A new surgical hospital for light cases only stands near the above pavilion. It is built on the corridor plan, has wards for 10 or 12 patients respectively on two floors, and may accommodate

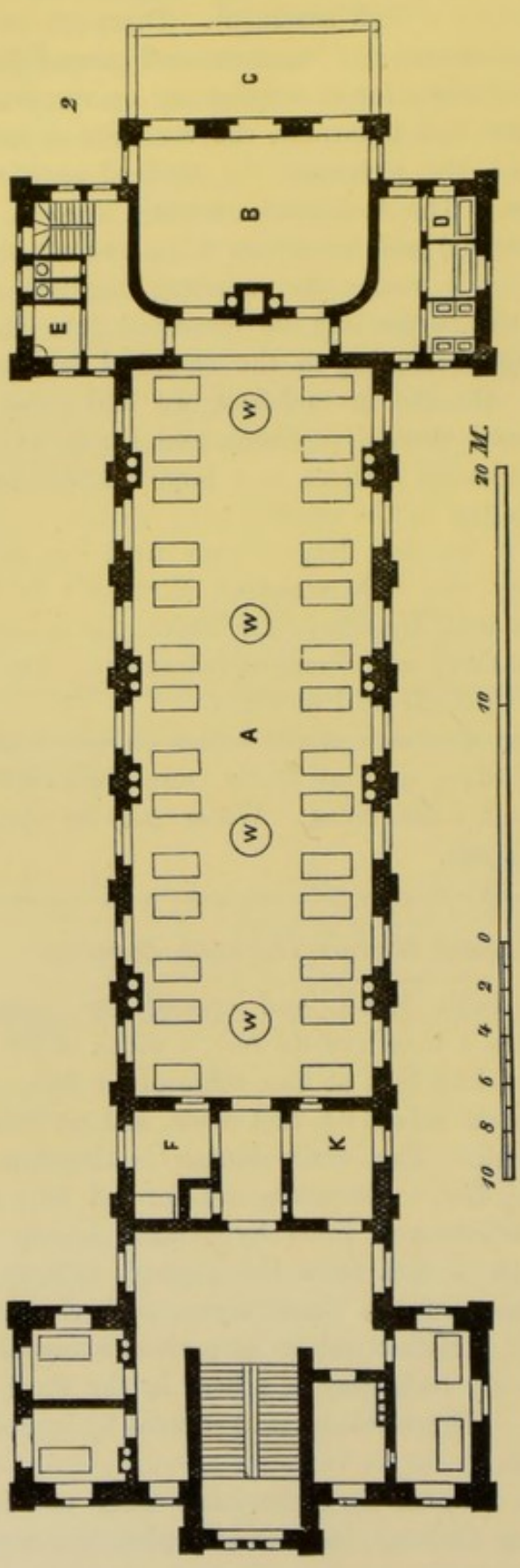


Fig. 57.—Friedrichshain Hospital, Berlin (Ground-Floor).

A. Ward.
B. Day-room.
C. Verandah.
E. Urinal.
F. Waiter or Nurse.
K. Scullery.
W. Water-stove.
L. Lavatory.

about 100 cases. It is in use little more than two years. The wards are warmed by low-pressure water-pipes formed into stoves, and the corridors by hot air from the basement. The entrance-doors have gratings, through which the corridor air may enter. Some of the water-closets open into the wards; they are ventilated by gas-burners placed into eduction-channels.

Close to this building we find new lying-in wards for 28 lying-in women. Two wards, each containing 14 beds, are adjoining a centre part where the confinements take place. The wards are ventilated in summer time by ridge ventilation.

The New Charité (Neue Charité)

is an old building, three floors high, built in the horse-shoe form; it is surrounded with and completely divided from the other parts by a high wall, and contains at times more than 500 inmates, including lunatics, syphilitic,[1] and prisoner patients. The impropriety of such an arrangement has long been felt.

The lunatic establishment contains large and small wards and cells; the latter have wooden walls, and are somewhat dark. The asylum is used for clinical instruction.

The new wash-house of the Charité Hospital, taken into use in the summer of 1882, situated outside the hospital walls, but close to it, contains a large principal room of considerable height, the walls and floor of which are constructed by porcelain tiles. The ceiling is vaulted. Troughs of galvanised iron washing-boxes, hydro-extractors, beating machines, tubs a little different from those described under Lariboisière, containing hot ley, are in use, and the machines are worked by steam. The drying process is on a new principle.

The whole is worth a visit.

The administration of the whole is in the hands of two directors, one called the medical, the other the economical director; both under the same government board. Besides the numerous medical officers living in the house, clinical professors visit the wards and give lectures, which include children's diseases and midwifery.

The nursing is principally in the hands of married couples. They are under inspectors; the latter have to superintend a certain number of wards and constantly to report to the directors, especially the economical one. A strict system of reporting is insisted upon, and perhaps a little overdone.

[1] About 200 male lock patients and about 230 female ones may be accommodated.

Jews' Hospital, Berlin,

is one of the most recent establishments in Germany.[1] It is only on a small scale, having room for 70 patients, situated in a crowded part of the city, but removed from the noise by being at some distance from the thoroughfare. It is three stories high, and contains wards for 8 beds and some smaller ones, and is partly surrounded by gardens. It is built on the plan of the summer lazaret.

The space being limited, kitchen, engine-room, and offices could not be separated from the wards, but are under them.

The height of the wards in the first and second floor is 14 feet, but in the third only 9; their length 28, width 20; each patient has a space of 980 cubic feet. In the smaller rooms for paying patients the cubic space afforded is somewhat greater.

The corridors are 9 feet wide and usually closed by glass doors. The nurses' rooms have glass windows to look into the wards.

The heating is partly by stoves, partly by hot pipes; the stoves are German tile-stoves, some built through the wall. There are foul-air shafts.

The stairs are of stone, rising easily; but the hall is not spacious enough. Closets, lavatories, and baths are in good condition, but do not offer anything of interest. Some of the former are badly placed, as they are in the middle of the building; the drains necessarily run under part of it. An operating-room is on the ground, another on the first floor.

This hospital has an out-patients' department. The patients are seen in the part that projects from the centre, on the ground-floor. The waiting-room is on one side of the hall, the consulting-room on the other, and the dispensary in the adjoining building. The prayer-room is over the out-patients' department.

Friedrichshain Hospital, Berlin.

This is a municipal hospital, which owes its existence to a legacy of a Berlin citizen, and was opened for patients, of whom more than 600 may be accommodated, in 1864. Its site in a park is favourable, and it has served as a model to some other hospital buildings in Germany, for instance at Wiesbaden and Heidelberg. It consists of single pavilions, one or two stories high, which are not connected by closed passages but only by open granite walks. The six larger pavilions, three for women and three for men, may

[1] Esse, Dr. C. H. *Beschreibung des Krankenhauses der jüd. Gemeinde.* Berlin, 1861.

accommodate 64 patients each. The axis of the buildings lies from north to south; they are constructed of red bricks with glazed terra-cotta linings. The largest distance between two buildings is 160 feet. The large wards contain 28 beds, are 95 feet long, 15 to 16 feet high, and 28 feet wide, the cubic space allotted to each inmate therefore surpasses 2000 cubic feet. The arrangements of the smaller rooms adjoining the wards may be seen in the diagram. The baths vary a little in number. In most of the wards the

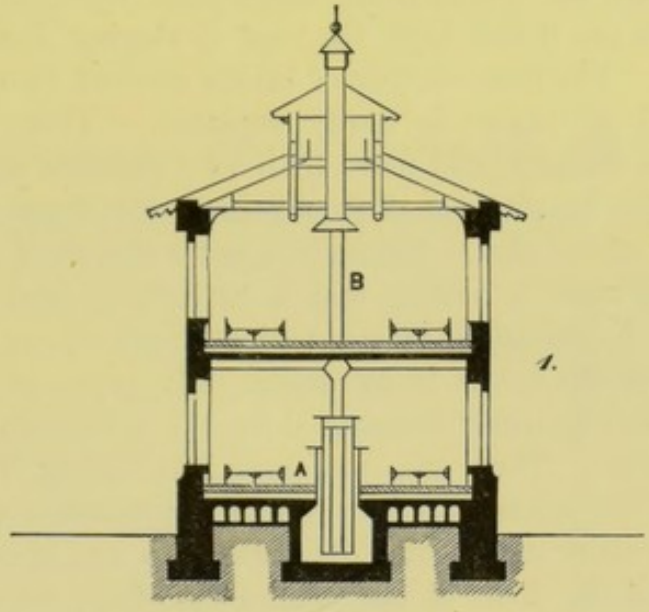


Fig. 58.—Vertical Section of a Two-storied Pavilion.
A. Stove. B. Flue.

heating is by coils of water-pipes of a large size arranged in the centre. In some wards heated air enters from below, where also water-pipes are found. There are chimneys, especially in the convalescent wards, but they are not used.

The ventilation is by a ridge in the ceiling of the single-storied pavilions, also by extraction of vitiated air into the largest flue. There are two isolation-pavilions for patients with infectious diseases; they contain a number of small wards. There you find floors made of bricks and layers of cement. Most floors are of wood, deal and oak being fitted one into the other. A new operating theatre is just finished. The wash-house and kitchen are arranged on improved principles. There are two clinical directors, one at the head of the medical, the other of the surgical department; and there is a managing director (*Verwaltungs Director*). In some of the pavilions junior medical officers are accommodated.

Moabit (Barrack) Hospital, Berlin.

This hospital was founded shortly after the Franco-German War of 1870, and occupies a large site in a densely-populated manufacturing district near the river Spree. It consists of single-storied pavilions (*Baracken*), and the usual outbuildings. The pavilions are not connected by corridors but quite separate one from the other. They have walls built of bricks and wooden frames (*see* Glasgow Fever Hospital), the inside being lined with wood and oil-painted. The side walls are 9 feet high, the roof is sloping from the middle to both sides. The floor consists of bricks covered by cement, which, when cracked at places, is easily repaired. There are 28 iron bedsteads in a barrack, and more than 700 patients may be accommodated. The hospital, at first destined for fever patients only, receives now others also. Before you enter the ward you pass by a water-closet, a store, a waiter's and a bath room, and on the other small side is a verandah, where patients may sit in the open air. The heating of the wards is by steam only, pipes of more than 5 inches (English) diameter running along the sides—two on one side, one on the other. They are iron ones, but before they enter the building they are intersected by short and narrower copper ones bent to a curve to allow extension. The windows are opposite on both long sides, and the doors at the small sides of the ward. Excepting the occasional noise the pipes are said to work well. For ventilating the wards we find inlets for the air 1 foot from the floor, which in winter is warmed by passing over the pipes. The roof serves for ridge ventilation, and the writer found on a mild winter day (in February 1882) all the valves of the ridge and the door open, the temperature being quite agreeable in the ward. The disinfecting chambers are worth a visit. Steam is used, and the experiments for ascertaining the temperature high enough to destroy bacteria were made here by the Imperial Council of Health (*Reichsgesundheitsamt*). It was found that steam vapour heated to 125° Celsius, applied during an hour, destroys bacteria.

The Garrison-Lazaret, Tempelhof, Berlin.

Berlin now possesses two garrison-lazarets instead of one and smaller ones. The new one was opened about seven years ago, and is built of red bricks with glazed terra-cotta facings and linings coloured green or yellow. The buildings stand in groups parallel to one another, not connected by corridors but by granite walks only.

The pavilions have corridors on one side, into which the wards open; the latter contain a small number of beds. The fever (isolation) pavilions are single-storied, and have, as also some others, tiled floors, the tiles (made in Mettlach) lying in cement on a treble layer of bricks. The fever wards have no basement, and the roofs ridge ventilation. The warming of the wards by large iron stoves lined with chamotte is not quite satisfactory. There are some outlets for vitiated air into the larger smoke-shafts.

The director of the hospital is a surgeon-major, *Oberstabsarzt*. He is responsible for everything, over which he is given a supreme control.

The Surgical Hospital (Chirurgische Klinik),

established 1810. There is a new building, not yet finished. It stands near the river Spree, in its grounds of 10,000 square m., and is constructed of red bricks with coloured terra-cotta facings. The principal building for administrative purposes, three stories high, looks into a street, and is 107 m. long; the wings, which recede backwards to the river, have a length of 90 m. These buildings form a yard in which three surgical pavilions stand. Two of them have one floor over a basement; the middle one called Kaiserpavilion has two floors. The large wards contain 20 beds. The warming of the single-storied pavilions is by warm water-pipes; the Kaiserpavilion has iron stoves as in Tempelhof, which are to be replaced by another system. The water-closets are ventilated by gas-burners, the wards by channels educting the bad air into the smoke-shaft. A school is connected with the hospital.

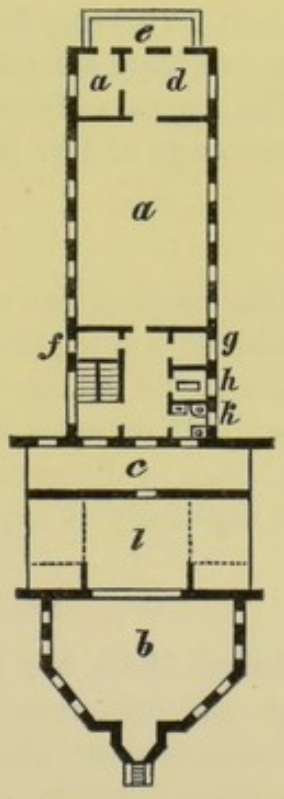


Fig. 59.—Kaiserpavilion of the Surgical Hospital, Berlin.

a. Ward. *b*. Operation-room. *c*. Corridor. *l*, Between *b* and *c*, is the outpatients' department. *d*. Dayroom. *e*. Balcony. *f*. Stores. *g*. Sister. *h*. Bath. *k*. Water-closet, Urinary, Linen-shoot, Lavatory.

The Hospital for Lying-in and Diseases of Women (Gynækologische Klinik).

This is situated close to the other, and not quite finished yet, built in the same style, for 106 inmates, with an educational

department. It consists of a principal building in front, where 40 female patients may be accommodated on two floors, and the house of the director, who lives there, is at the corner of it. Three single-storied double pavilions, standing in the yard rather close together, contain rooms for 2, 4, or 8 lying-in women. The corridors will be heated by steam, most of the wards by water. All the parts of the hospital are connected by covered passages.

The whole building expenses came to £72,000, those for the foundations being nearly £10,000, for warming and ventilation £7800.

The Lazarus Hospital,

established about twenty years ago, supported by voluntary contributions, situated in the northern part of Berlin, surrounded by manufactories; receives a great many accidents, and reserves about 30 beds for incurable cases. It is built on the corridor plan. There are about 120 beds, and the heating is by hot air from the cellar, where two large calorifères of iron are placed.

The Augusta Hospital is a similar institution, but smaller, under the patronage of Her Majesty the Queen.

Dalldorf Asylum.

This hospital lies about 6 miles (English) from Berlin, and was opened only a few years ago. It may accommodate 1100 inmates, but has to be enlarged as the applications for admission cannot be granted. It occupies extensive grounds, consists of several blocks of buildings of different height, and contains many modern improvements especially as regards heating by steam or steam and hot air.

The Elisabeth Kinder Hospital,

established 1843, is a hospital for children, which is situated in a suburb, and surrounded by gardens. It is of moderate dimensions, can accommodate about 40 patients on two flats. There are 12 wards—8 larger, 4 smaller ones—with windows on one side only. The medical officer does not live on the premises. The hospital is supported by voluntary contributions.

Bonn Municipal and Clinical Hospitals.

Bonn, well known to the tourist, is a university town on the Rhine, containing now about 28,000 inhabitants. There is a general municipal hospital built after the corridor plan, with projecting parts, for about 100 patients. The larger wards contain 12 beds;

there are also a good many small wards. Many chronic cases are admitted. A committee (*Curatorium*) manages the affairs of the hospital; it is under the supervision of a Berlin board (*Vormundschaftsgericht*), to whom once a year the accounts are sent. The sisters of Trier undertake the nursing. Medicines are made up by one of the sisters. Most patients pay (1s. a week); the municipality pays at a lower rate (7d.).

The Clinical Hospitals are situated near the Rhine. There is one for medical cases and another for surgical ones; each contains about 90 beds. The plan of building resembles that of the Bradford General Infirmary, the long corridors leading to endwards on both sides. These wards have windows on more than one side. The passage lies in front, and portions of the building project from it. The wards are warmed by tiled stoves with air-chambers; there are inlets and outlets in the walls; the eduction-channels are heated to further the draught.

The Lying-In Hospital can accommodate 72 inmates, but as it is intended to have it always nearly half empty, the highest number of beds available will be 50. The house is built in the horse-shoe form ⌐⌐, with corridors running at the inner side. Most of the wards are on the first floor, but a few beds may be occupied on the second. The wards are for 12, 10, 4 beds and 1 bed; the cubic space for 1 patient being about 3000 feet. The height of the wards is 17 feet. The injected air gets warmed by passing over five Perkins' coils; it enters the wards from the ceilings, and the vitiated air is drawn into a chamber heated by the smoke-flue.

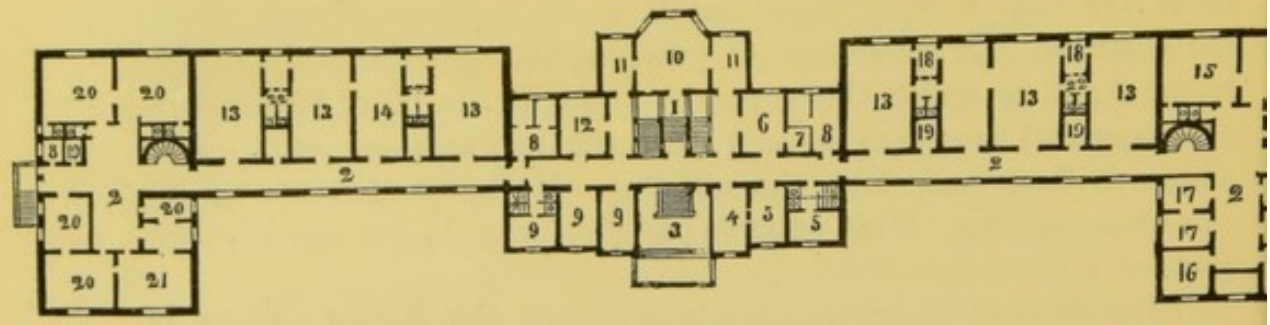
The clinical director lives on the premises.

There are no poor law medical officers for visiting the poor at Bonn, but the Clinical Institute attends to them. There is an out-patients' department to the Surgical Hospital.

Bremen Hospital

is a new building opened for patients in 1850, of imposing architectural proportions, to some extent resembling Bethanien. It is situated on the outskirts of a suburb, five minutes from the Weser river, surrounded by gardens and commons, and well supplied with water. The wards are situated to the south-east, the communicating spacious passage to the north-west. A block for contagious diseases is detached, and also the wash-house and steam-boilers.

The principal building consists of a central part and two wings in line, the former three, the wings two stories high over a *sous-sol*. The central building contains dispensary, offices, medical officers' and directors' rooms.



On the Scale of $\frac{1}{8^{4}}$ of an inch to a foot.

Front.

Fig. 60.—Bremen Hospital (Ground-Floor).

1. Stairs.
2. Corridor.
3. Hall.
4. Office for admission.
5. Medical officers.
6. Dispensary.
7. Laboratory
8. Baths.
9. Steward.
10. Operating-room.
11. Patients who have been operated upon.
12. Linen stores.
13. Wards for 10 beds.
14. ,, 5 beds.
15. Convalescent wards, 5 beds.
16. Special wards, 2 beds.
17. ,, ,, 1 bed.
18. Attendants.
19. Sculleries.
20. Children's wards.
21. Water-closet.

The total number of beds is 272, distributed as follows :—

12	Wards for	10	Beds each.
3	,,	6	,,
8	,,	5	,,
2	,,	4	,,
6	,,	2	,,
4	,,	2	,,
16	,,	1	,,
Children's	,,	30	,,
Lying-in	,,	20	,,
		272	

The wards[1] are warmed by German stoves, placed near the wall; there is no system of ventilation, but the windows are very large and high (11 feet), croisées and double; the wards are lit by lamps.[2] The floors are oil-painted, as in the Berlin Charité. Some patients pay; others do not. The wards for the insane are completely separated and at a distance from the main building.

Frankfort-on-the-Maine.

The general hospital, or Heilige Geist (Holy Ghost) Hospital. This hospital dates from the year 1267, but was completely rebuilt

[1] *See* Fig. 1, No. 4.

[2] Dr. Eduard Meier, *Notes on Hospitals.*

in 1833. It is constructed on the corridor plan for 245 patients. It stands in large grounds near the promenade, and adjoining it is a large public garden. It has three floors, a centre building, and two wings attached to it; a single-storied building closes the quadrangle. On the ground-floor of the centre building are the offices, kitchen, dispensary, and stores; on the first floor the directors' rooms and dining-room of the officials; on the second floor the resident medical officers', and some small wards for paying patients.

The wards, 3 on each floor of the wings, are 40 feet long, 30 wide, and nearly 16 high, allowing a cubic space of about 1600 feet to each patient; they contain 12 beds. The bedsteads are of wood. German stoves are found for warming. Interposed between the wards are tea-kitchens, nurses' rooms, and water-closets. The windows (three for a ward) are croisées, 9 feet high by $4\frac{1}{2}$ wide. In summer time two tents standing in the garden are used for patients—one for males, the other for females. Each contains 10 beds.

Admission is partly by payment and partly free. The hospital sends visiting medical officers to see the poor.

A convalescent house, the "Mainkur," containing 25 beds, is under the same board of management; it lies outside the town.

Dr. Senckenberg's Hospital dates from 1779, but the new building was opened 1875 for about 120 patients. There are 4 wards for 10 patients each, on three different floors respectively, and a few small isolation-rooms. The wards have three large windows on one side, and open into a corridor on the other. Warming is by German stoves; there are some ventilators in the walls. Two tents stand in the garden.

The rules for admission exclude from both hospitals smallpox patients, syphilis, itch, and incurables. The first-named hospital admits principally aliens, for instance servants; the other one those born in Frankfort, or for a certain time—at least a year—residing there.

The Asylum outside Frankfort is a municipal institution, may accommodate about 200 inmates, divided into classes (quiet ones, maniacs, epileptics, etc.), and was opened 1864.

A small Children's Hospital (girls only) was founded by Lady Carl von Rothschild in 1875, and is built after the pavilion plan. It stands on a hill surrounded by gardens; has an artificial system of warming and ventilation, earth-closets. In 1880, 128 children were admitted.

A Jewish hospital dates from 1878. It contains 18 beds; it is called Georgine Sarah von Rothschildsche Stiftung. A Jewish

hospital for 80 patients was opened 1875; it is built after the corridor plan.

A Deaconesses' hospital, *Diakonissenanstalt*, for 50 beds. Fifty-four deaconesses live there.

Dr. Bockenheimer's Chirurgische Klinik is a surgical hospital in Sachsenhausen, opened a year ago. About 50 beds. The nursing is in the hands of sisters of mercy.

A new municipal pavilion hospital for 350 patients is now being built, and to be opened in October 1883. There will be found four two-storied pavilions with 42 beds each, and two single-storied pavilions for infectious diseases. But there will be a separate smallpox hospital standing near the principal hospital, but separated from it by a high wall, and administrated separately. Syphilitic patients will be admitted into a separate block containing 134 beds. The wards will be warmed by stoves, and ventilation will be in some of them ridge ventilation; in others the smoke shafts will withdraw the foul air.

Göttingen.

This is one of the smaller universities in Germany. The town has from 12,000 to 13,000 inhabitants, and boasts of fine surroundings. The Clinical Hospital, lying near to a gate, may accommodate 100 patients. It is a corridor building, not considered healthy. A corridor runs at the back of the house, and the wards, for 4 or 5 beds, open into it. A central staircase divides the house into a male and a female department. Small wards and nurses' rooms are arranged in parts projecting at the back of the building.

Acute cases are on the ground-floor, lighter ones on the first floor. Tents are used in summer time; they stand in a beautiful park which lies opposite the hospital. The patients who leave the hospital do not always seem to settle their accounts very regularly, as they are occasionally reminded in the Göttingen daily paper to do so.

The Lunatic Asylum near Göttingen is beautifully situated and of a pleasing exterior. It accommodates more than 200 patients. It is also a corridor hospital, with passages 13½ feet wide, and used as day-rooms. The dormitories are 29 feet long, 21 feet wide. The waiters' rooms are arranged between two dormitories. Isolation-cells are placed between two passages, whence the waiters may watch them.

This hospital had D'Arcet's system of removing the fæces, but it was given up.

Hamburg General Hospital.

This is a large hospital, situated near the Alster-basin, where the latter is joined by a wide canal. It stands at some distance from the thoroughfare, but not far enough removed to prevent the noise being heard. It was opened in 1823, and is composed of a central building and four wings, two old and two new ones, added in 1848. The central portion is three stories high, the wings only two. The outbuildings — kitchen, wash-house, drying-house, post-mortem rooms, ice-cellar, bed-carding rooms, and fire-engines—stand separate in the grounds. Male and female patients are on different sides of the hospital. The large yard is used as a promenade by both, being divided by a granite causeway.

The wards of the old part are of various sizes. The small ones are reserved for paying patients; the large ones are 40 feet long, 24 wide, 13 feet high, and receive beds for 12 patients and a *male attendant;* the patients have about 1000 feet of cubic space. All the wards communicate with a passage, and have three windows opposite the door which leads to the passage. The windows are of the croisée type, 8 feet high, $4\frac{1}{2}$ wide; smaller panes can be opened separately. The ceilings are whitewashed, the walls oil-painted; the German stoves—generally two—stand in the middle of the ward.

The new wings contain 480 beds; some are in the basement. The wards are a little higher. They are warmed by stoves as in the old part, but there are more inlets for fresh and outlets for foul air. the bedsteads are of wood.

The water-closets are on the English pattern, and are properly drained. Baths are numerous, and there are also lavatories.

There is a detached Smallpox Hospital built on the corridor plan; there is a disinfecting house; and there are, since 1872, two single-storied pavilions (*barracks*) for medical cases, each containing a large ward for 40 patients over a sunk basement, and appurtenances, as baths, closets, etc.; also a surgical pavilion.

Steam is used in the kitchen and other parts. It was also used for washing, but as it did not answer, the washing is done without it. Every single piece of washing is boiled for an hour.

As builders want to know something about the amount of storage and cellar-room of larger hospitals, the following notes are given concerning the Hamburg Hospital, which can accommodate more than 1600 patients. There is surface room (space) in the cellars and underneath the roof—

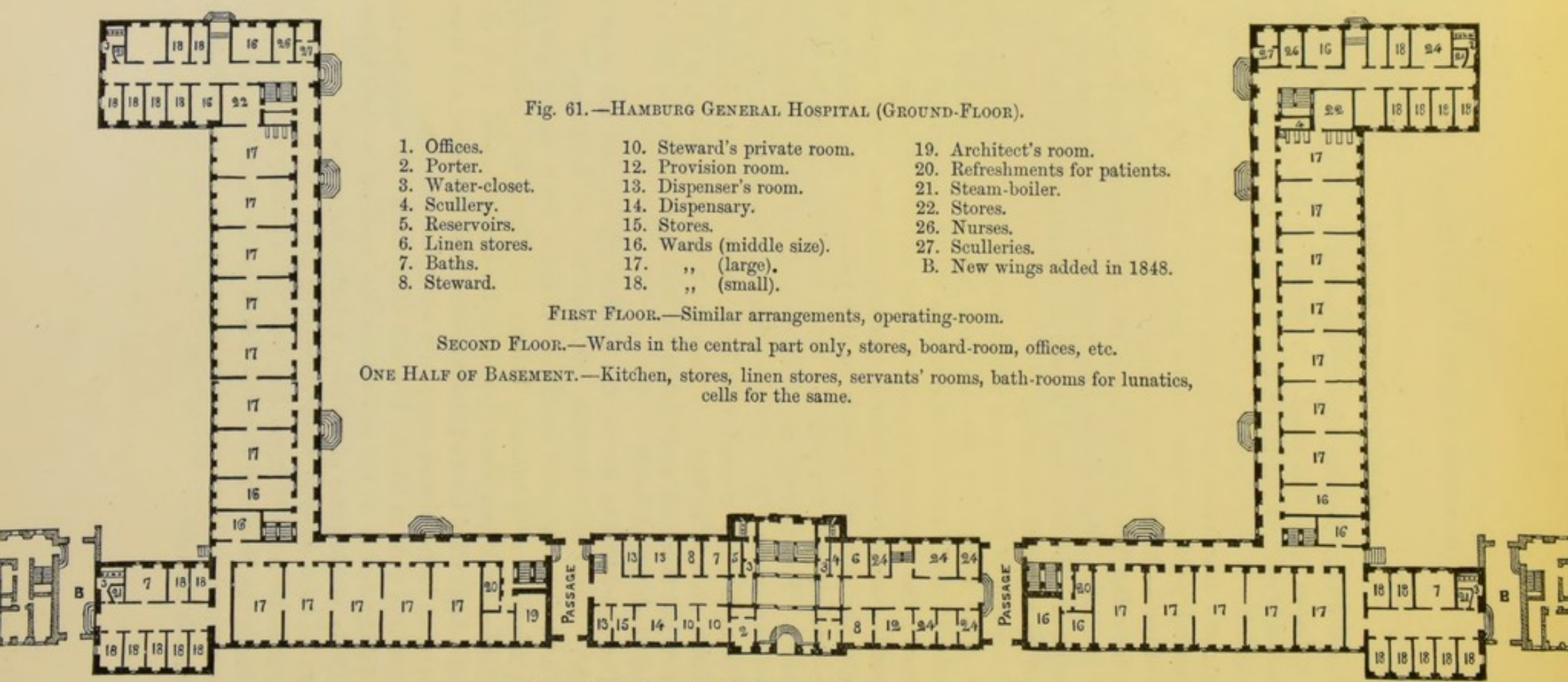


Fig. 61.—Hamburg General Hospital (Ground-Floor).

1. Offices.
2. Porter.
3. Water-closet.
4. Scullery.
5. Reservoirs.
6. Linen stores.
7. Baths.
8. Steward.
10. Steward's private room.
12. Provision room.
13. Dispenser's room.
14. Dispensary.
15. Stores.
16. Wards (middle size).
17. ,, (large).
18. ,, (small).
19. Architect's room.
20. Refreshments for patients.
21. Steam-boiler.
22. Stores.
26. Nurses.
27. Sculleries.
B. New wings added in 1848.

First Floor.—Similar arrangements, operating-room.

Second Floor.—Wards in the central part only, stores, board-room, offices, etc.

One Half of Basement.—Kitchen, stores, linen stores, servants' rooms, bath-rooms for lunatics, cells for the same.

On the Scale of $\frac{1}{3^{2}}$ of an inch to a foot.

Front.

		Square Feet.
(*a.*)	Under the roof—	
	1. For dry vegetables, flour, rice, dry fruit, groceries	8,800 (Hamb.)
	2. For linen, porcelain, glass, cloth	500 „
	3. For furniture and fittings, etc.	38,500 „
	4. For dress of patients and persons belonging to the house	10,000 „
	5. For straw, wool, grass, horse-hair, seaweed, and other material for beds	14,000 „
		Cubic Feet.
(*b.*)	On the ground-floor—	
	Linen stores	2,300 „
(*c.*)	In the wash-house—	
	For soap, soda	5,200 „
(*d.*)	In the basement—	
	1. Bread stores	1,539 „
	2. Milk „	1,800 „
	3. Meat „	5,676 „
	4. Ham	2,280 „
	5. Fresh vegetables	5,050 „
	6. Beer	1,800 „
	7. Wine	5,340 „
	8. Conserves, jellies, etc.	1,539 „
	9. Potatoes	36,000 „
	10. Ice	10,000 „
(*e.*)	In three sheds and engine-house—	
	1. For wood and peat	44,000 „
	2. Coals	17,500 „
(*f.*)	In the open yard—place for coals	6,000 sq. ft.

(*g.*) Potatoes, cabbages, turnips, celery, herbs, are stored under foliage during winter time.

The storage is said not to be at all lavish.

The medical director does not live in the hospital, but near it; the manager lives there.

Children are not admitted.

The Friedrichsberg Asylum, near Hamburg.

Asylum Friedrichsberg is a new lunatic asylum, situated outside the town, at a distance of a mile from the General Hospital. It was opened in 1864, and may accommodate 400 patients. It is in connexion with the lunatic department of the Hamburg Hospital, whence patients may be transferred to it, and is under the same board of management, the "Krankenhaus-Collegium."

The land was cheap at the time of the construction, and therefore the grounds in which the buildings stand are very large; they are partly used as a farm. The principal building has the form of a square, open at one side, with numerous projecting portions, especially in the centre, where the administration is located, and officers' dwellings, kitchen, wash-house, and baths are found. The blocks

which form this incomplete square have corridors running at one side, by which, however, they are not connected in the usual manner, but the connexion is broken at the corners. The passages are 12 feet wide, lofty, and ventilated by end windows; they are warmed by hot-water pipes.

The male patients are on the right side of the courtyard, the females on the left; and they form three divisions respectively, a fourth being accommodated in another building. The first division is formed by bedridden patients, the second by quiet patients who want a great deal of attendance, the third by quiet ones who are able-bodied and work. A number of 30 to 40 patients form, as it were, a family, with sleeping, day rooms, closets, and lavatories for common use. The sleeping rooms on the first floor are large and contain wooden bedsteads, which sometimes stand a little too close. They have windows on one side only, the door being opposite. There are no means of warming, but warm air from the corridor may be admitted through the floor, which is of deal. There are ventilators near the ceilings, and a few foul-air channels leading into the smoke-shaft. The windows are on a uniform plan, of wood and iron. The horizontal bars are of wood and the vertical ones of iron; they pass through holes drilled through the wood. The day-rooms (6) are generally placed in projecting portions of the building, and have windows on more than one side. The walls are painted a lively colour, and a door leads into the grounds. The closets generally are not water-closets but privies, ventilated by windows and by extracting the vitiated air downwards through the agency of the chimneys. The lavatories are of metal, on the lift-up principle. The baths are some of zinc, others of copper.

The central part has three floors, and contains a large hall, the chapel on the second; offices and workshops, as also some single rooms, are on the first. The wings have only two floors, and their corridor is used as a dining-room, the tables being fixed to the walls; knives and forks are of the common pattern, and no accidents are said to happen. The doors of the corridors leading into the garden are always open in summer.

Each division has a courtyard attached to it, surrounded by high walls, where the patients take exercise or work. The building containing the fourth division of refractory patients stands at the back. It contains dormitories, day-rooms, and their appendages, as also three cells on each side—one for every 40 patients. They are much more roomy than those of other asylums, have no small windows for observation, and a pretty large window opposite the door near the ceiling. The floor is of asphalt; the walls on various

plans. One cell has cemented walls, oil-painted, another wooden ones of oak planks, but they are reported as difficult to be kept clean in the joints. The cells are warmed by hot air. The part where the cells are is one floor high, the central one two floors.

All parts of the building are lighted by gas.

Another separate part of the hospital, not on the plan, is the institution for paying patients, "*Pension's Anstalt.*" It was considered better to bear with the prejudices of patients belonging to a better class and their relations, who would feel offended by seeing them in the same rooms with the poorer ones. The building has two wings, with a small connecting central portion, and is arranged in accordance with the greater pretensions of the inmates.

A porter's lodge and dwelling-house of the senior medical officer are near the entrance, the door of which is almost always open, thereby facilitating the escape of patients more than it ought to do. The junior officer is accommodated in the central part.

The kitchen contains steamers, hot-plates, and other improvements; the wash-house various machines; there is a dead-house in the grounds.

Treatment.—The restraint system is not in use; at the time of the visit only one patient was in a strait waistcoat. The cells are not much used. There are billiards to amuse the patients, also a library. Farming, tailoring, sewing, washing, and, recently, basket-making, occupy the time of some of the patients. The hydrotherapeutic remedy is frequently resorted to. A great many patients suffering from delirium tremens are admitted, to whom opium is very sparingly administered, but nourishing diet, wine, and rest.

Finances.—Part of the income is derived from patients' payments. More than one half pay nothing for their maintenance, but the rest either contribute themselves to the funds or others do so for them, and they form classes according to a fixed scale. The total income was some years ago about £9000—£3500 being patients' contributions, nearly £4500 subsidies by the Government, and the small rest is made up by the interest of capital. The disbursements, amounting to the same sum, included as the highest item, meat £1200, wages £1000, firing £900, medicines only £80.

A separate fund, *Juliusstiftung*, is raised by voluntary contributions, and serves as a convalescent fund, as also for providing means to amuse the patients. Furniture, pictures, etc., adorn the walls, and similar things are accepted as in English institutions.

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INDEX TO GROUND PLAN.

a.	Stores.	*m.*	Head attendant.	I.	First division.
b.	Scullery.	*n.*	Melancholy patients, most in bed.	II.	Second ,,
c.	Sitting-room.			III.	Third ,,
d,d''.	Bedroom.	*o.*	Bedridden.	IV.	Fourth ,,
e.	Separation-room.	*p.*	Medical officer.		
f.	Tea kitchen.	*q,q''.*	Admission rooms.	1.	Cells.
g,g''.	Courtyard.	*s.*	Inspector.	2.	Bath.
h.	Single room.	*t.*	Officials.	3.	Attendant.
i.	Quiet working patients.	*u.*	Low court.	4.	Refractory patients.
		v.	Boiler.	5.	Corridor.
k.	Workshops. Above *h*, *i*, *k* are bedrooms.	*w.*	Closet.	6.	Lavatories.
		x.	Vapour bath.	7.	Lobby.
		z.	Wash-house.		
l.	Day-room.	*z''.*	Kitchen.		

A Jews' Hospital was opened eighteen years ago in Hamburg. It can accommodate 100 patients, is built on the corridor plan, two stories high over a basement.

A Lying-in House was opened in 1863, where 40 beds can be placed. And there are a few other small hospitals—the catholic one, the freemasons', the seamen's, also private eye infirmaries; a large workhouse for more than 1200; almshouses for the aged. Poor law medical officers attend to the visiting of the poor.

Hanover.

The former residence of the deposed King of Hanover, with about 120,000 inhabitants, possesses numerous charitable institutions.

The General City Hospital

lies in the suburb Linden, and is of modern origin. It is favourably surrounded by large garden-grounds, and has an imposing exterior. It is built after the corridor plan, and 250 beds may be placed in it. Its length is 247 feet, and it consists of a central building, which is 180 feet long, and two wings, each one being 50 feet long and 85 feet deep. The central one is the administrative block, where only a few private wards are found. The four-storied wings have wards with 10, 6, 4, 2 beds and 1 bed respectively. Baths and nurses' rooms are generally in projecting portions of the building. It was a mistake to have small closets interposed between the wards and corridors, which are situated at the side of the entrance-doors. The water-closet is at the left, a room for utensils at the right. The closets are almost dark, the light falling through darkened windows. For ventilation louvres are found in the lower

part of the entrance-doors to admit air from the corridor. There are also air-channels in the wall to let the foul air escape, but they lead up directly to the roof, and there may be no draught in them. 108 was the number of patients at the time of the visit. There are wards for insane patients, as also cells and lying-in wards. There is also a department for syphilis, and one for eye diseases. The director is appointed by the city authorities. There are male attendants and nurses. Physicians and surgeons visit the patients. No patient is admitted without a medical certificate. Patients belonging to clubs have to produce an application or written order of the club committee. Paying ones must have a certificate warranting payment.

A Smallpox Hospital stands separate in the grounds.

Henriettenstiftung, Hanover,

is a deaconesses' hospital for less than 100 patients. It dates from 1860. It has corridors and small wards. The deaconesses must be aged between 18 and 36, of Evangelic-Lutheric confession, and in possession of the usual testimonials.

Hanover Lying-In Hospital.

This is a recent building dating from 1862. It is a corridor hospital on a small scale and well arranged. The wards are small, and open into the common corridor; they were warmed formerly in winter time by hot air, which was forced in by a fan, and had to pass over hot coils before it was admitted. The pipes were of wrought-iron, their diameter being 5/4 inches, the thickness $\frac{1}{4}$ inch. Now we find the German stoves with cast-iron plates round the lower part.

Military Hospitals, Hanover.

The garrison lazaret, an imposing structure in the Byzantine style, was opened 1856. It has a long front of 226 feet, and two wings. There are 38 wards in four floors, with baths and attendants' rooms attached.

It lies low in marshy ground, therefore a layer of asphalt 1 foot thick was needed; nevertheless hospital diseases are not rare. The number of beds is 200; the cubic space for a patient 1000 feet, but the hospital is never full. The closets are situated the same as in the City General Hospital. There are iron and tiled stoves; ventilation is similar to that in the General Hospital.

In summer time a tent is usually found in the garden for surgical cases.

The post-mortem house and ice-cellar are the best part of the building. The post-mortem room is high and lofty, and the table is covered with a movable marble plate. The ice-house has double walls with a small passage between them, at the end of which lies the entrance-door.

A smaller supplementary lazaret for about 30 patients lies opposite, where steam is used for heating.

There is an Eye Infirmary, a Children's Hospital; a few smaller charities are found, and also a Poor-House.

KIEL.

Kiel, now a town of 80,000 inhabitants, situated on the beautiful arm of the sea, possesses charitable institutions worthy of notice. They are situated nearly half an hour outside the town near to Düsterbrook, a famous sea bathing establishment, on the confines of a forest, which is close to the water. The buildings stand in large elevated grounds, so that the sea may be seen from the upper stories. The buildings are educational establishments, built after the corridor plan, excepting the recently-constructed one-story pavilions (*Baracken*). A General Hospital stands separate, not far from the Lying-In Hospital. The former may accommodate 200 patients, and the wards, with windows on one side only, are small, and open into the corridor, which is at their back. It had two wings added eight years ago.

Two tents are generally used for surgical cases in summer time.

The pavilion (*Baracke*) of the *Frauenverein* (ladies' association) stands in the garden and contains 16 beds. The lower part of the structure is constructed of bricks, the upper one of wood, with roof sloping from the centre to the sides, and ridge ventilation. The floor is oiled; the windows are croisées; warming is by tiled stoves with air-channels. A nurse's room is formed by an incomplete partition; a water-closet is found. There are verandahs at both long sides.

An Eye Infirmary is not far distant.

The Military Hospital is also close by. The principal part is a corridor hospital, two stories high, three in the centre, the frontage being 417 feet.

Two one-story pavilions, built of masonry, have verandahs at the small side, seven large windows on each long side, are lofty, warmed by German stoves; and there are medical cases as well as surgical ones to be found.

Another Military Hospital lies in an opposite direction.

Kiel Lying-in Hospital.

It was opened fifteen years ago. It is a corridor hospital, and has an excellent sight overlooking the sea. It is three floors high. It consists principally of one block, but there are portions which project backwards from the centre and both ends. The wards (16 in number) lie in front of a common corridor; one window is opposite the entrance. As these rooms are 13 feet by 16 and 14 feet high, a patient enjoys nearly 3000 cubic feet of air. The wards are warmed by calorifères.

The kitchen is an outbuilding connected by an underground tramway with the main building. Sculleries and baths are in the projecting portions above mentioned.

Cologne (Köln).

City Hospital.

Cologne has now 147,000 inhabitants. There is a large General City Hospital established about thirty years ago, built in the horse-shoe form, three floors high over a basement. The neighbouring houses come up pretty close to the hospital. The inhabitants are infirm and sick ones. On the day of the visit there were 450 patients, and nearly as many invalids. A passage 12 feet wide runs through all the stories; it cannot be warmed. The wards open into it, and are similar to those of Bethanien Hospital, Berlin. Most of the windows cannot be opened, but there is one large pane which can be opened, 3 feet high and half that width. There are wards for 36, 18, 12, and 10 beds, which have spring mattresses. Iron stoves with air-chambers are found for warming. The air was not exactly sweet.

A tent was in the garden; it contained 10 beds.

The Military Hospital is an old cloister. It has corridors and large wards for 12 patients. There are air-channels in the walls. The baths are of wood. The nursing is in the hands of Catholic sisters of mercy.

Leipzig.

Leipzig was the first German place where a large one-story pavilion hospital (*Baracken lazaret*) was built. There are fourteen pavilions with ridge ventilation. The whole length of one is 131 feet, the width 35 feet (Saxon ones). A ward is 100 feet long, 32 feet wide, and 15 feet high near the wall, 20½ feet in the centre

up to the ridge. The water-closets, as seen in the cut, are not separated by lobbies from the wards. The floors are 4 feet from the ground, and the pavilions lie 60 feet distant one from the other. The walls are of masonry lined inside with wood; there are thirteen windows at each side. Tiled stoves serve for warming. There are 24 beds in a large ward. The pavilions are connected by open passages except four for infectious diseases.

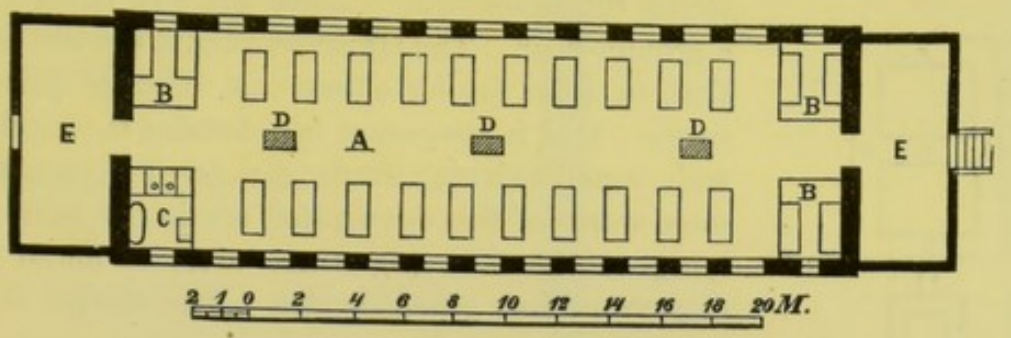


Fig. 63.—Leipzig Barrack Lazaret.
A. Ward. B. Small ward. C. Bath, W.C. D. Stoves. E. Verandah.

Leipzig Lying-in Hospital.

It was opened in 1854. The building is three floors high; a central corridor runs through its whole length, and the wards lie in front and back of it. They are about 12 feet by 15. The director is a medical man, who lives in the house.

Pupils and midwives receive a practical education here, and a policlinic is connected with the institution.

Lübeck.

Lübeck is a place of historical interest, and its charities are old. The City Hospital adjoins the cathedral. There are two wings parallel to each other, meeting the church rectangularly. They have corridors at one side. The wards have high Gothic windows. There were 50 patients in them.

The Holy Ghost Hospital (Heilige Geistspital).

This accommodates infirm paupers. It is an old lofty church, with twenty-four high Gothic windows on both long sides, and three windows at the small sides divided by numerous wooden partitions into 140 cells or closets, without means of warming excepting in a day-room.

A new General Hospital is shortly to be built after modern principles.

Munich.

The Städtisches Allgemeines Krankenhaus.

The building was founded by King Maximilian of Bavaria in 1808, and can accommodate more than 750 patients. It stands to the left of the river Isar round two square yards; the passages run round the inner side. There are two floors over a ground-floor. The transverse buildings are used that in front (A) for offices and officials' private rooms; that in the centre (K) contains the kitchen and some private wards for paying patients; more wards of this description are in the building lying at the back (B), where are also found the dispensary and amphitheatre. The chapel is in the building (C). The principal wards for females (D) are on the left, for males (E) on the right side, 9 on each floor. They open on one side into the corridor, and on the other is a large window, 11 feet by 6. The wards are 38 feet long and 24 broad, 14 high. The floors are of polished oak, and have a beautiful appearance. Six beds stand on each side. The walls are coated with Parian cement, of a light green colour. There are night-stools in place of water-closets.

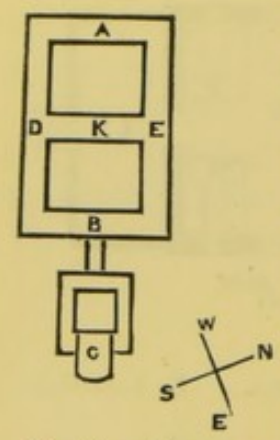


Fig. 64.—Munich General Hospital (Ground Plan).

System of Warming and Ventilation.—The lower wards have stoves standing opposite the windows, but there are not separate stoves in the upper wards; a hollow column of cast-iron ascends from the ground-floor through all the three floors, and is heated only on the ground-floor. It is surrounded by a mantel of glazed tiles, with ornamental apertures, through which the warmed air enters the wards.

There are apertures near the floors of the wards, three on each side, and from them channels for foul air lead to the stove on the ground-floor. Two air-towers are found on opposite sides, and air-channels lead from them to the wards. Large horizontal channels run through the roof crosswise, and from these branch off smaller ones, which end in the space between the column and the mantel.

This system failed; the air was often found stagnant in the foul-air channels, and even came back into the wards. The apertures had therefore to be closed in many places. The stoves are used as calorifères, being heated from the basement.

The nursing is undertaken by Catholic sisters, and the convent and chapel (*c*) lie at the back of the hospital, but connected with it.

The house of the director and that of the superintending physician are separate buildings, surrounded by gardens. The grounds are tastefully laid out, and the patients are allowed to use them for walks. Barracks were added to the hospital.

Munich Lying-in Charity.

The building, opened in 1856, stands in a street surrounded by houses, consists of a central part and two wings. There is a ground-floor, *entresol*, and two floors over it. The corridor, 10 feet wide, runs through the centre on all floors, and has rooms in front and behind. A director lives in the house (on the ground-floor), and two resident medical officers, besides some midwives.

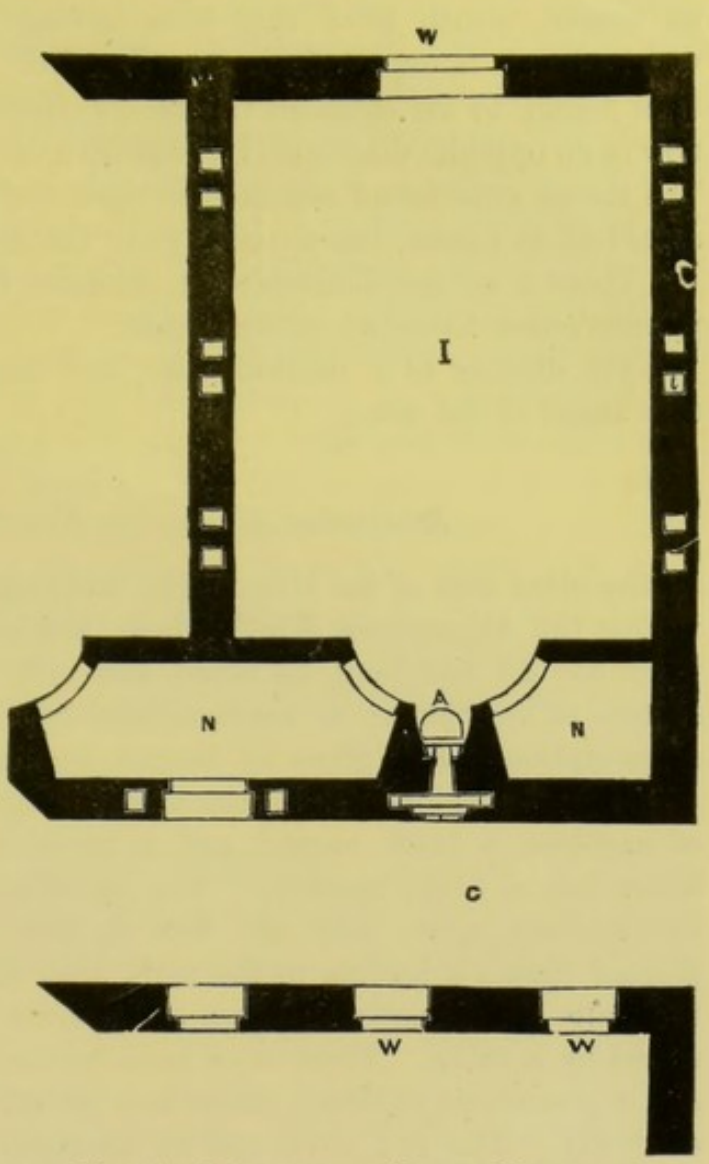


Fig. 65.—Ward of the Munich Hospital.

A. Stove.
[. Air-channel.
C. Corridor.
I. Ward.
N. Nurse and nurse's scullery.
W. Window.

The large wards in the wings are 40 feet by 24, and 16 feet high, and contain 6 beds, so that 2000 cubic feet are allotted to each patient. Each ward has one large window, 10 feet high and 6 wide. The entrance is opposite, through a lobby. The walls are stuccoed, and painted green.

A stove of considerable dimensions stands near the entrance. It is a calorifère similar to that in the Allgemeines Krankenhaus, but each is heated separately, and is supplied with fuel from the corridor; the air consumed by the fire comes from the ward. There is an air-tower in the centre of the building, from which channels or arteries lead to the wards; the channels end in the stoves at

their base, and between the inner stove, which is of cast-iron, and its mantel, which is of clay tiles, having numerous apertures by which the air is expected to enter the ward. The air has frequently been found to be stagnant (about 25 times in 100), and even to flow in an opposite direction (17 times in 100), *i.e.* back into the ward. The stoves were found sufficient to draw the air from the wards to a considerable extent, but not always in the desired quantity.

There is an amphitheatre for students, large waiting-rooms, and private rooms for secret confinements.

The director is a medical man, and member of the chief sanitary board of the town.

Städtisches Allgemeines Krankenhaus,

on the other side of the river. The building was opened 1867. It is near the Allgemeines Krankenhaus, and contains 300 beds. The wards are 40 feet long, 25 broad, and only 13 feet high. A new system of ventilation, as recommended by Dr. Böhm, is carried on; a description of it is given by Zenetti, the engineer.[1]

There are calorifères in the wards, composed of an inner stove of cast-iron, a brick mantel, and a movable top made of tin; the latter has a large aperture. The outer air is admitted into the intermediate space from the floor in the usual way. There are foul-air channels leading to the roof; they end by two apertures in the walls of the wards, an upper and a lower one, and either may be closed by a valve. There is an anemometer placed in each channel, and a permanent indicator shows how the air moves inside, if rapidly or slowly. This is a novel and an economical system; but I doubt if it will be quite satisfactory, because the draught will not be strong enough in the eduction-channels. In summer time this is to be improved by a gas-burner, which is lighted in the shaft near the roof.

This hospital affords an opportunity of transferring patients from the other General Hospital, should the latter be overcrowded or unhealthy.

There is a Children's Hospital in Munich for 90 beds, also a new Military Hospital.

AUSTRIA-HUNGARY.

This empire possesses hospitals of very different size, the largest in Vienna and Prague, smaller ones in the provinces. Nearly all the large establishments are under the management of a medical

[1] *Zeitschrift für Biologie München*, 66.

superintendent called Director, and he is responsible to a governmental board. In many cities there are, besides the State hospitals, those of charitable brotherhoods. A report of 1868 states the number of the latter as 16, and no new institution is known to have been founded since.[1] The number of patients was 768 at the time mentioned. Some of the charities have a small number of beds, for two are mentioned where only 5 patients were found on the last day of the year. The large hospitals are built on the corridor plan, more rarely on the block plan; none is constructed on the pavilion style exclusively, but the Rudolphstiftung comes already nearer to the latter. The hospitals appear to be well managed by their medical directors, and well supplied with numerous active and diligent resident medical officers. The fare supplied to the patients in some larger hospitals has been censured as insufficient in medical journals, and may want improving. There are about 170 large hospitals in the whole empire; in Bohemia one to 19 square miles, in Tyrol one to 13 square miles (exactly 12 $\frac{68}{100}$), in Cisleithania altogether one to 32 square miles, in Transleithania one to 159 square miles.

Brünn,

a city of more than 80,000 inhabitants, possesses a county hospital of 750 beds, called Mährische Landes-Anstalt St. Anna. Formerly a convent, afterwards a hospice, the establishment was rebuilt from 1865-68, and opened as a hospital in 1868. There are 28 large wards, with 20 to 30 beds, and opposite windows, and about 20 wards for paying patients or such as want isolating. There are three floors over a basement. The wards are warmed by tiled stoves with air-chambers, and there are outlets for vitiated air into the smoke-shafts. The director is a medical man; there are three visiting physicians, one prosector, and six assistants.

Graz,

with about the same number of inhabitants as Brünn, possesses also a large county hospital, Landschaftliches Allgemeines Krankenhaus. There are 542 beds in the general wards, 231 in the lunatic house, 100 in the lock-wards, 30 set apart for skin diseases, 30 for

[1] They are found at Vienna, in the district Leopoldstadt; Feldberg, in Lower Austria; Graz; Prague; Görz, in the maritime district; Neustadt a. d. Mettau, in Bohemia; Teschen; Prossnitz, in Moravia; Kukus, in Bohemia; Brünn; Lettowitz, in Moravia; Vienna Convalescent House, on the Landstrasse; Linz; Wisowitz, in Moravia; Zebrzydowice, in Galicia.

diseases of women (including the clinical department). The foundation took place in 1788. The buildings have three floors, but there are also one-floored wards. Of the 50 wards, 20 are large ones containing 20 beds, and they have windows on one side only. There are mantel stoves in which wood and coals are burned. Outlets for bad air are in the walls leading into the smoke-shafts. In some parts the floor underneath the roof is used for ventilation. The floors are waxed. The management is under the committee of physicians, who are responsible to the *Landschaft-Ausschuss* (County Board). There are two medical prime-physicians, one prime-surgeon, one obstetric physician, one for the female department, and one for the lock-wards, the same number of assistant-physicians, and six residents.

Innsbruck.

The General Hospital.

The town has about 21,000 inhabitants; the hospital, Allgemeines Oeffentliches Krankenhaus, *i.e.* General Public Hospital, 204 beds. It was established in the year 1307 by King Henry of Bohemia. It is composed of 4 three-floored blocks, one of which was opened 1871. The wards are—in three blocks—on the ground, first, and second floors; in the fourth, on the first and second floors. The inmates include lying-in women, lunatics, and paupers. The hospital is built on the corridor plan, with small wards containing 2, 4, 6, or 8 beds; windows are on one side only; the warming is by tiled stoves; there are ventilators in the walls. The hospital is divided into several departments, including one for lock patients. Four professors and three assistants attend to the visiting.

Lemberg.

Lemberg, the capital of Galicia, has about 80,000 inhabitants, the hospital 880 beds. It was established in 1715. The buildings form the letter H; they have three floors, there is a number of departments (8 *Abtheilungen*), and 2 clinics. Lying-in women and lunatics are among the patients. Of 107 wards, 82 are large ones, 25 single ones. The windows are croisées, on one side only; wood is burned in the stoves. There are outlets for vitiated air in the walls communicating with the smoke-shafts; and Dr. Berthleff wrote, twelve years ago, to the author—"This is sufficient; as through thirty years, notwithstanding the hospital was full, no cases of gangrene or puerperal fever happened."[1]

[1] To this we may say, "Audiatur et altera pars," and "Nulla regula sine exceptione"—the evidence we know of points in another direction.

The director is under the County Board; there are six prime-physicians, five assistant-physicians, and nine surgeons.

Linz.

The General Hospital.

Linz has more than 30,000 inhabitants, and a hospital for 150 patients, which was opened 1868. It is built on the corridor plan, and has three floors, 8 large wards, 2 small ones, 9 rooms, and 4 ante-rooms. The large wards are lighted by arched windows, 8 feet high, which are on one side only. The warming is after Meissner, with brown coals; also by warm air apparatus supplied by Mayr Brothers of Ludwigshafen. There are Roman and other baths, and modern water-closets. There is a department for female diseases, and another for lock patients. One medical officer resides in the house. The management depends upon the municipality.

Linz has also a hospital of the Elisabethean Sisters containing 15 beds, one of the Charitable Brothers 64 beds, one of the Sisters of Charity 52 beds, of which 12 are cribs.

Prague,

the capital of Bohemia, with 260,000 inhabitants, has a general hospital with 1111 beds, established 1790. The principal building has the form of a double horse-shoe, there being a frontal block with three wings receding backwards in a rectangle, so that two large courtyards are formed. The more recent blocks date from the year 1839, 1845, and 1851 respectively. 1858 dissection-rooms, 1864 a steam laundry, 1868 a new bath-house, 1869 a large garden, were added. The buildings have three floors. There are 126 wards—77 being large, 49 small ones. The windows are croisées, and opposite to each other in a great many wards. They are 6 feet from the floor, and used for ventilation. Iron stoves are found for warming the wards. The hospital is divided into departments, clinical and others, including a lock-department—one for skin diseases, and one for female complaints. The director depends upon a board of government (*Stadthalterei*). Patients' fare, medicines, and stores are supplied by contractors.

Salzburg.

This city, well known to tourists of the Salzkammergut, may now have about 20,000 inhabitants. The hospital called St. Johannes

Spital was founded 1695 by the Archbishop John Ernest ; it contains 230 beds. The building consists of a principal part and wings, all three floors high. The wards open into corridors. There are 4 large wards, 3 middle-sized ones, and 27 small ones. Most windows are on one side only. There are the usual departments for medical, surgical, lock patients, and for female diseases. Two prime-physicians and two other physicians visit the house ; a medical director and a managing director divide the affairs between themselves, the latter attending to the accounts.

Trieste,

with more than 100,000 inhabitants, has a hospital with 912 beds. It was opened 1841, built in the quadrangle form round a square yard laid out in gardens. The frontage measures 600 feet, the sides 480 feet, with 36 windows. The water supply is by ten pumps found in the grounds. The offices for administration are on the ground-floor ; the wards for 8, 12, 16, 20, and 24 beds respectively on first and second floors. There are 31 large, 72 small wards, and 22 single wards. The windows, $7\frac{1}{2}$ feet high, $3\frac{1}{2}$ feet wide, are opposite.

Vienna.

The Vienna General Hospital—Allgemeines Krankenhaus.[1]

It was founded in 1784 by the Emperor Joseph II., in the suburb Alservorstadt. The buildings composing it surround nine square yards, most of them laid out as gardens with fountains, one of them being nearly as large as all the others together. There are not more than two floors, except in one separate block, containing the clinical wards (*c*). Altogether there are 100 wards, excluding midwifery wards—59 for males, 41 for females. The hospital can accommodate 2000 patients, but the number is now generally under 2000, because new hospitals have been founded. There are four amphitheatres, two dispensaries, three laboratories, two large kitchens, one wash-house, several ice-pits, and many officers' rooms and offices.

The wards are lofty, and most have opposite windows, which are so high that the patients cannot look out of them. Some small wards are for 4 or 6 patients. Many of the wards had floors of red bricks. They are now of deal. The clinical wards of the late Oppolzer have nine windows on each side, and 24 beds ; those of the late Skoda,

[1] Oppert, *Med. Centralzeitung*, No. 5, 1857.

eight windows opposite each other, and 14 beds. There are separate lock-wards and for skin diseases, and large midwifery wards for 500 beds, part of them private. Some time ago the cases amounted to 8000 lying-in patients per year. There are separate children's wards and nurseries.

There are stoves for heating, but no artificial ventilation; 194

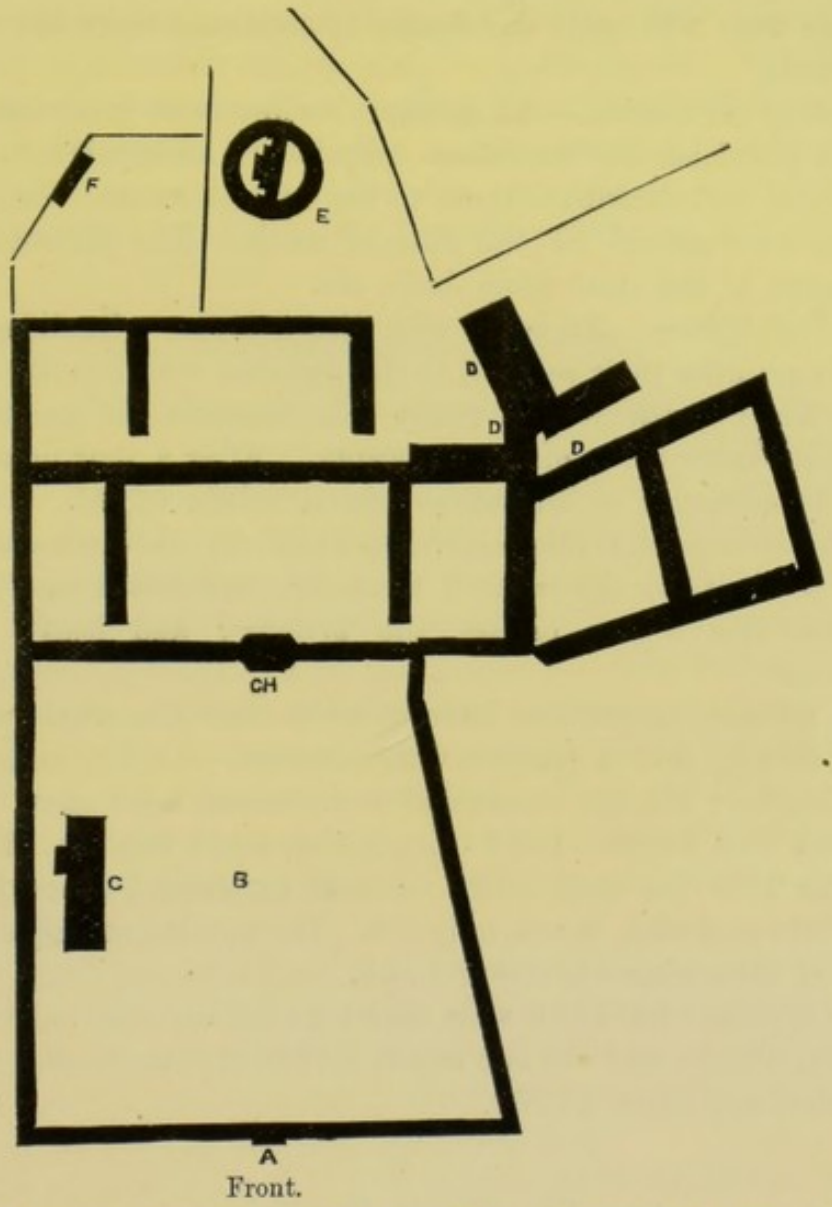


Fig. 66.—Ground Plan of the Vienna General Hospital.

water-closets have replaced the nightstools in the corners of wards, standing formerly behind curtains.

Management of the Hospital.—The government is vested in the *Stadthalterei* (a government board). To them the director is subordinate; he is a medical man (Dr. Hoffmann). He is nominated by the Emperor, and receives a salary of 3800 florins, besides free resi-

dence. Under him are the medical officers, stewards, attendants, and all officials. The director lives in the institution, and has his staff of clerks. He prepares the annual reports, and presides at the meetings of the consulting committee.

The whole hospital is divided into medical, surgical, clinical, and special divisions (*Abtheilungen*). There are nearly 100 clinical senior and junior physicians and surgeons, not including the *internes*, and more than 200 male and female attendants; there are nuns for some wards.

Mode of Admission.—All diseases are received, excepting small-pox. A physician and an *interne* (physician's assistant) examine the new-comers, and distribute them to the several wards; the interesting cases are reserved for the clinical wards. The patient is registered, taken to the cloak-room, bath, etc.

Medical Officers.—To begin with the *externes*. Qualified young practitioners offer their services to the director, who has the right to appoint them as *externes*. Usually this happens six months after application, there being many applicants. After a year or more the *externe* is advanced to an *interne* with a salary (£24). The next gradation is secundär-physician, appointed by Government; they receive some £36, others £54 annually, and board and lodging. There are two higher classes, the *primär;* and lastly, clinical physicians.

The secundär-physicians have to retire after four years' service.

In 1880, 23,249 in-patients were admitted—14,237 being males, 9012 females; a large number of out-patients were seen. Of the in-patients died 2900—1679 being males, 1221 females. The mortality was 13·4 per cent—12·7 of male patients, 14·7 of females; tuberculosis excluded, it was only 8·8. The number of in-patients at the end of December 1880 was 1761.

The expenses for 1880 were about £66,000. By salaries paid to medical officers and officials nearly £11,000; attendants, £8000; wood, coke, and coals, £2200.

The Wieden Hospital

was opened in 1848. It is built in the horse-shoe form, surrounded by gardens, and can accommodate 600 patients. Formerly a larger number was admitted. The chapel lies at the back of the yard, and ice-pits, dead-house, amphitheatre, etc., are separate buildings. There are three floors. The wards are single, and similar to those in Guy's and the London Hospitals (*accouplées*). They have windows on one side only. They are warmed by iron stoves, which

are surrounded by a mantel. Fresh air is admitted into the intermediate space to get warmed in winter time. There are ventilators in the walls, of which some are used in winter time, others in the summer. Bath-rooms, water-closets, and rooms for the attendants adjoin the wards.

The hospital is divided into six divisions; there is one chief director (salary about £300). Each division has one senior physician and three physicians; every 10 patients have one (lay) attendant, male or female; thirty-four officials also live in the house. The director is under the same board as the director of the Allgemeines Krankenhaus, and he is supported by the economical committee, consisting of the medical officers and the two *économes*. He presides at their meetings. There were 507 patients in the hospital on the last day of 1880.

Hospital Rudolphstiftung.

It was founded by the Emperor in memory of the birth of his eldest son, and having taken for its construction and fitting-up four years and three months, was opened in 1865. It has room for 860 patients. To adopt the pavilion plan, as represented by Lariboisière, was not thought compatible with the climate of Vienna, and therefore a plan which is supposed to combine the advantages of the corridor and pavilion system was preferred. The principal corridors face the north and west, and the large wards the south and east; the building (A) Fig. 67, where offices, private rooms for medical men and officials are situated, is detached. Three pavilions, containing sick wards, stand exposed to the free circulation of atmospheric air; they project 84 feet from the main building, and are 126 feet distant from each other.

The principal buildings stand around a rectangular yard, 180 feet by 330, tastefully laid out with shrubs, forming a garden. There are two floors over a ground-floor, and a basement runs under the greater part of the buildings. The hall being only one story high, the court is open at the side facing the east.

The large wards are 26½ or 28 feet wide, 17 feet or (on second floor) 16 feet high, and of different lengths, some about 80 feet; they have parquet floors, and windows on one side, excepting those in the above-mentioned pavilions. The cubic space allotted to each patient is 1480 feet. The windows are 10 feet high, and double; the lower parts open like doors, a third of the upper part inclines inward (interior and exterior windows at the same time), and can be fixed in any desired position by a screw and toothed wheel.

The corridors have glass doors, and the wards are separated by

spacious staircases. They are entered from an ante-room which communicates with the corridor. This room serves as scullery. A nurse-

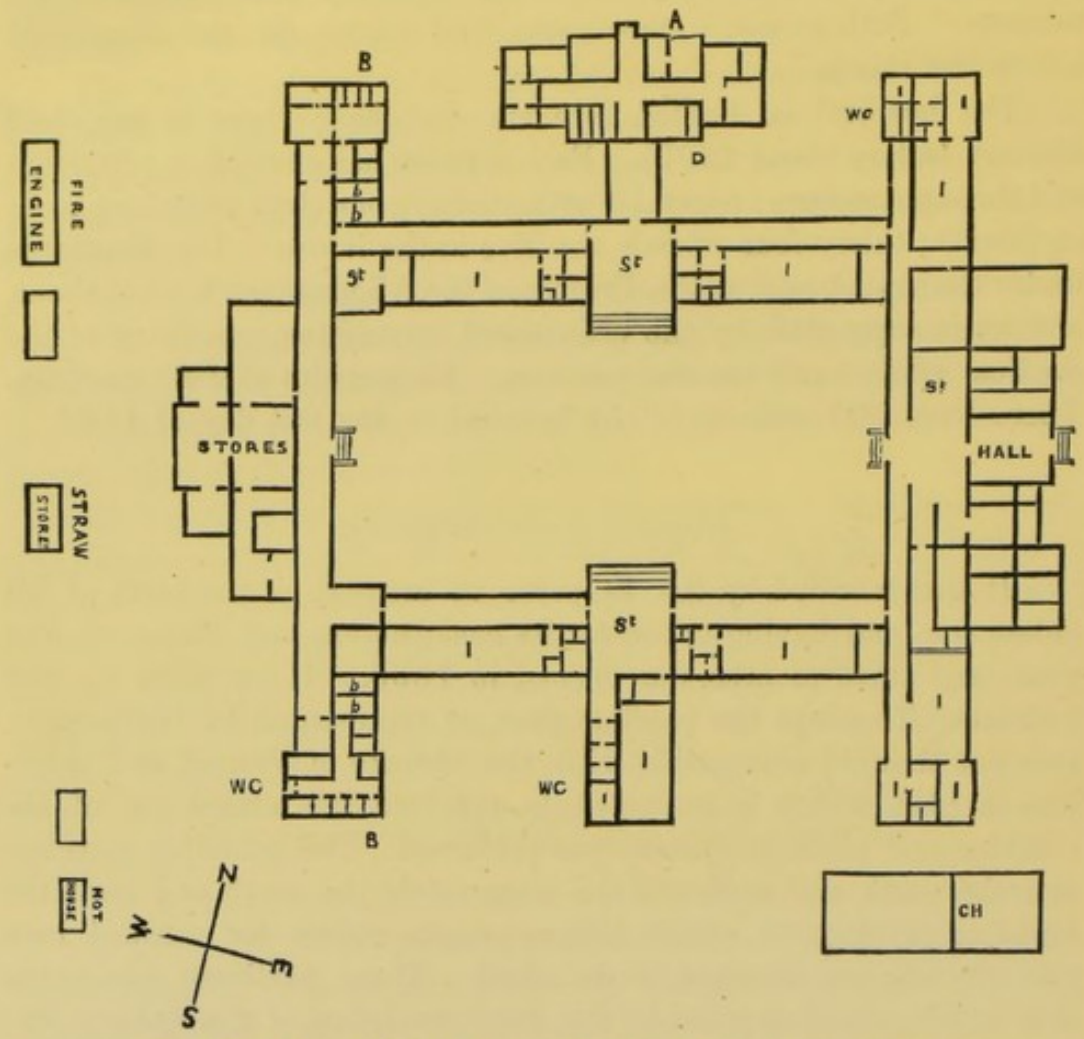


Fig. 67.—Ground Plan of the Hospital Rudolphstiftung.

A. Block for administration.
1. Wards and side wards.
Bb. Common bath-rooms.
D. Dispensary.
St. Stairs.
Ch. Chapel and dead-house.

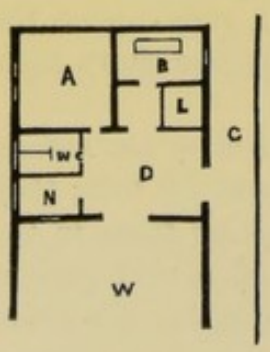


Fig. 68.—Arrangement of Baths, Water-closets, Scullery, and Nurses' Rooms in Hospital Rudolphstiftung.

A. Side-ward.
B. Bath.
C. Corridor.
D. Anteroom.
L. Lift.
N. Nurse.
W. Large ward.

room adjoins the ward; it has a window overlooking the latter. The water-closets, containing basins of enamelled iron, are next to the nurse's room, and a bath-room and lift are placed as seen in Fig. 68.

The baths are of zinc, and the bath-rooms have a window looking into the corridor; they also contain a stove. The wards are warmed by Dr. Böhm's calorifères, which are partly used for ventilating the rooms; but the principal means of ventilation are the windows. The lighting is by gas, and the globes are ventilated.

The beds stand at some distance from the walls (1½ foot), and have palliasses, flock and thin hair mattresses. There is a head-shelf of tin, painted black.

A tramway runs in the basement, and is used for conveying food, medicines, washing, and the dead.

There are a great many baths of every description in the common bath-rooms (Bb); the kitchen is in the building opposite the entrance-hall. Two large ranges stand free in the centre, and have descending flues. On the first floor over the kitchen are large linen-stores, and the chapel is on the second floor. The number of patients on the last day of 1880 was 657.

Administration.—The hospital is under the *Stadtholder;* its director is a medical man appointed by Government. There are eight departments for administration, each presided over by a primär-physician; three secundär-physicians are under the latter. The regulations are the same as in the Allgemeines Krankenhaus. The hospital is a general one, and admits all diseases, excepting smallpox. The physicians go their rounds daily, early in the morning. The secundär-physicians attend the reception-room in rotation, and their turn comes every third week. A male cook superintends the kitchen; there are one steward and seven officials. Male nurses are only for the wards where patients suffer from skin diseases, females in all the others. One engineer is kept to attend to the engine-room. The cost of construction was £250,000.

Another hospital for adults, called "Of the Brothers of Mercy," containing 200 beds, and two children's hospitals, may be mentioned —the "Joseph's Spital," containing 40, and the St. Anne's Hospital, containing 80 beds. There is also a Jewish Hospital. A new small hospital, Sophien Hospital, so named in honour of the Archduchess Sophia, was opened 1880; it contains 80 beds.

Vienna Military Lazaret of the First Army Corps.

This hospital possesses Dr. Böhm's artificial system of heating and ventilating. There are water-stoves somewhat different from those usually found. The stoves are composed of two iron boxes 4 feet high, 1 foot broad, and 4½ feet long, connected with each other by a pipe. They are surrounded by ornamental perforated

tin, and supposed to heat better on account of the large surface they form. Warm air is forced into the wards in addition by a fan—having passed through coils of pipes outside the ward; this air is presumed to be pure.

Opinions are divided about the efficiency of this system.

Hungary.

In Hungary, which has now near to 14,000,000 of inhabitants, Croatia and Slavonia being excluded, the following hospitals are found:—3 County Hospitals (*Landes* or *Comitats Spitäler*), containing 816 beds; 35 General Hospitals, with 4891 beds; 168 Private Hospitals, with 3286 beds; 5 Lock Hospitals, with 160 beds; 1 County Eye Hospital, containing 24 beds; 2 County Asylums, with 850 beds—but a third one is in course of construction. The number of beds available for patients is 10,027 in 215 hospitals. The private hospitals include special hospitals for eye diseases (4 or 5 only) and hydropathic hospitals. Not all the hospitals supply their own medicines. Poor law officers do not attend to the poor in every part of the country, but where this is not the case, medical men may send in their bills for attendance to the poor to the local authorities.

Pesth (Buda-Pest).

The capital of Hungary contains now 400,000 inhabitants (against 200,000 thirteen years ago). There we find:—

I. Three municipal hospitals: *a*, the Rochus Hospital in Buda-Pest; *b*, the St. John's Hospital (Johannesspital) in Ofen; *c*, the old Ofen Hospital.

The Rochus Hospital,

founded 1711, rebuilt 1798, contains now 1400 beds, but up to 2000 patients may be accommodated in a case of emergency. The buildings have three floors, more than sixty wards, of which more than fifty are large, the others small ones. The windows are opposite to each other; the warming is by iron stoves mostly; ventilators are found in the walls; gas and water are laid on. The hospital is divided into general and special departments (such as eye, lock, female, and for insanes). Medical officers are attached, of three degrees, corresponding to senior physicians, assistant physicians, and assistants. A medical director and economical manager live on the premises. The senior city medical officer (*Städtische Ober Physicus*) acts as comptroller of the hospital for the municipal board.

The St. John's Hospital, founded in 1727, contains 328 beds in six departments, and attached to it is the old Ofen Hospital.

II. State Hospitals: *a*, the Asylum (Landes Irrenanstalt), for 550 males and females, founded 1792; *b*, the University clinics.

III. Military Hospitals—one for 752, the other for 520 patients, founded 1872.

IV. Hospitals belonging to religious orders: *a*, Hospital of the Charitable Brothers, with a dependency, founded 1815, 260 beds; *b*, St. Elizabeth Hospital, managed by sisters of charity, founded 1785, 51 beds.

V. Hospitals where admission depends upon the persuasion: *a*, Jewish Hospital, founded 1805, 80 beds; *b*, Bethesda, German Reform Hospital, founded 1866, 100 beds.

VI. Hospitals of private societies: *a*, Children's Hospital, founded 1839, 64 beds; *b*, Mercantile Hospital, founded 1844, 50 beds; *c*, Danube Steam Navigation Hospital, founded 1845, 64 beds; *d*, Elisabathinum, a small one.

VII. Lastly, four hospitals belonging to medical men are mentioned. Dr. Schwarzer's asylum of 150 beds, and three others, containing 30, 40, and 60 beds respectively, and two being hydropathic establishments.

A new General Hospital is in course of construction, after the pavilion style. The number of pavilions is eight; the building area is 62,000 square metres. The largest wards will contain 28 beds, the surgical ones 16 beds only, and the cubic space for each patient is to be 46 cubic metres.

HOLLAND.

Rotterdam Hospital.

It was opened 1850. Its site is bad, as it stands on humid ground, like so many other buildings in Holland. The hospital is composed of one block, which has a frontage of 250 feet, and a central portion projecting at the back. Men and women are divided only by the spacious hall, where they can meet. Two hundred and sixty-five patients can be accommodated—the paying ones in the central part. There is a spacious staircase in the centre, and well staircases are at both ends; lifts are also used.

The principal wards are situated in front of a common corridor, into which they open; a large window is opposite the entrance-door (Fig. 1, No. 4). Conveniences and lavatories are partitioned off the wards at both sides of the entrance-door, and receive light from the

corridor. The larger wards contain 10 beds, the smaller ones (for paying patients) 3 or 4. The first are 33 feet long, 20 wide, and 14 high, affording 924 cubic feet to each patient, but the top wards afford even less cubic space. The boards of the floor are of pine-wood, and kept very clean. The wards are heated by calorifères; ventilation is due to doors and windows.

Steam is used for different purposes: for the lift, in the wash-house, dispensing-room, baths, and kitchen. Much attention is paid to cleanliness, as is commonly the case in Dutch houses.

A plan of adding pavilions for infectious diseases to the hospital is under discussion.

ITALY.

The Italian hospitals are to great extent old charities, founded in the Middle Ages. In no other country have so many convents been transformed into hospitals, as the founders belonged generally to religious fraternities. In the hands of the latter the administration generally rests, but laymen are appointed as directors. In some instances the director is a medical man, as at Milan. Monks and nuns attend as nurses in most establishments. The separation of sexes and different classes of patients is much neglected, and frequently sick, lunatics, and aged are found domesticated in one and the same establishment. Some hospitals undertake to visit the patients at their homes. In the lying-in wards great secrecy is observed, and females are admitted without being obliged to give their names (Venice, Rome). Objects of art are found in many Italian hospitals.

The construction of verandahs in some of the hospitals is remarkable. Maritime convalescent homes for adults and children have lately been established at various places.

Florence.

The largest hospital is called Ospedale di Sta. Maria Nuova; it adjoins the church of the same name. It is very old, having been founded in 1289, and by the addition of several wings is now of an irregular shape. There are 600 beds for males, and as many for female patients. The number of wards is about 50. The kitchen is worth a visit. A medical school and public dispensary are connected with it.

Genova.

The general hospital is called Ospedale Grande; it is a large building constructed around five yards. It is of ancient origin.

Another, called Osp. degl' Incurabili, is of less extent, and of an irregular shape. As the name implies, it is especially intended for chronic incurable diseases.

Mantua.

The largest military hospital of Upper Italy was founded here by the Austrians. It was notorious for its unhealthiness, being badly situated on low ground, near the shore of a large lake, Lago Maggiore, where malaria is endemic. The civil hospital is an old, irregular, and defective building.

Milan Hospitals.

Grand Hospital (Ospedale Maggiore).[1]

I will give a description of this establishment, because it was many years ago considered as a model one. I was not favourably impressed by it when I paid it a visit. Many historical recollections are connected with it; and it contains, like all public buildings in Italy, objects of art; the mediæval style of the building is of interest to an architect. It was opened in the year 1456, and can contain nearly 3400 patients, but the usual number is under 2500. It is situated close to a thoroughfare, and a canal runs at its back, the water of which moves a flour-mill used to grind corn for the inmates. The buildings are one story high, over a high basement, excepting in the centre, where we find two floors. Here the offices for administration are arranged.

The buildings stand around square yards, the principal one being much larger than the others. The principal wards form a cross, in the centre of which is a cupola, with an altar beneath it, where divine service is performed daily in sight of the patients. These wards have corridors on both sides, which are not so lofty as the ceilings of the wards, and consequently there is plenty of room for windows above these passages. The height of these wards is between 30 and 40 feet at the highest point; the ceilings are vaulted, the floors covered with red bricks or flags—this being preferred for coolness. Sixty beds are found in the large wards. The outside wards are nothing but spacious corridors: the commodities are at one end, and the less said about them the better. There is no warming apparatus, but small portable stoves for charcoal; they are rarely used, the climate being so mild. The windows are used

[1] Dr. Verga, *Dell' Ospedale Maggiore di Milano e delle sue case sussidarie. Estratti delle atti del R. Instituto Lombardo Ven.* V. iii.

for ventilation. The cubic space for each patient is more than 2000 feet. (*See* Fig. 69.)

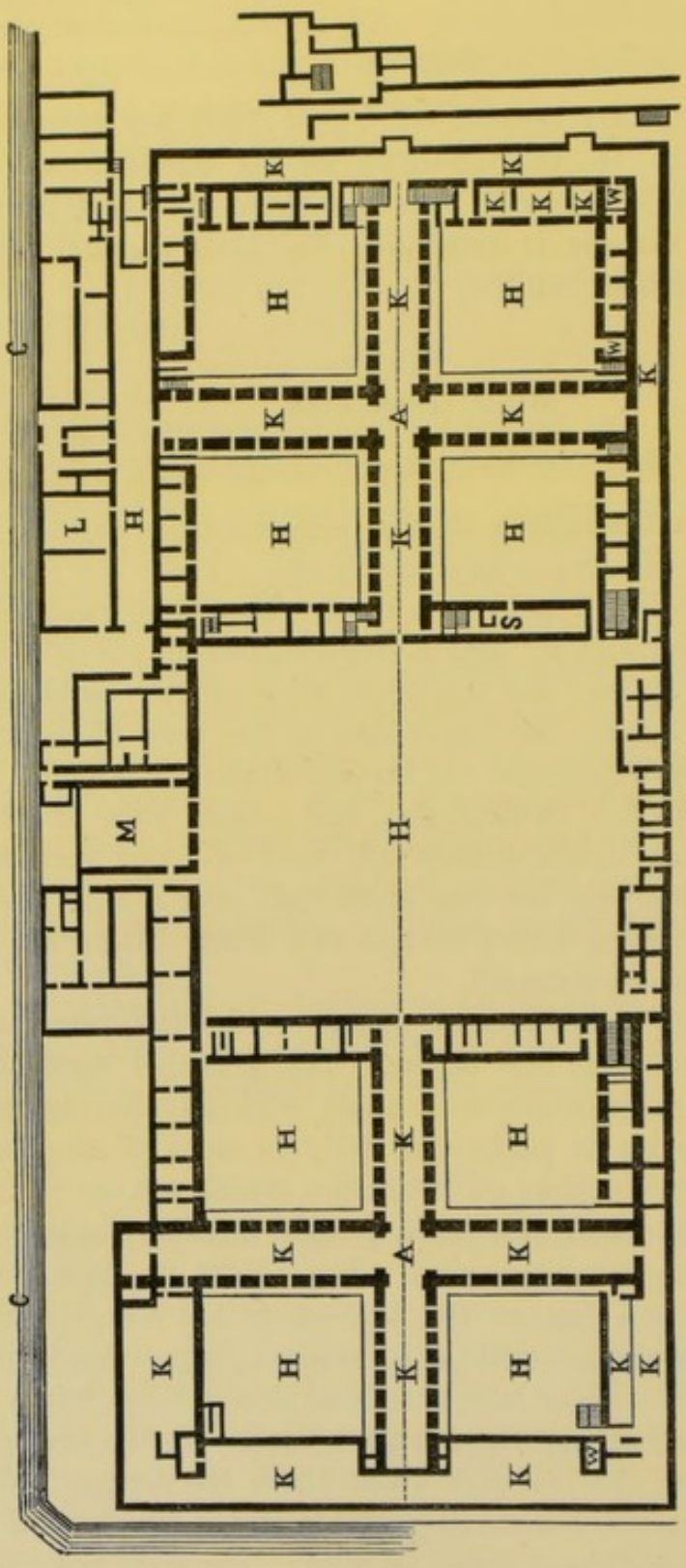


Fig 69.—Grand Hospital of Milan.

A. Cupola. K. Wards. H. Courts. W. Appendages. C. Canal.

Six other establishments distributed over Milan are in connexion with the principal one. One is for smallpox, another for syphilitic,

a third for children, a fourth for itch, a fifth for chronic cases, and the sixth is a lunatic asylum. They contain between 100 and 200 beds each, and all but one were convents.

Modena

contains a civil hospital, which is partly of modern construction, and has large airy wards.

In 1753 it had only 2 wards. In 1867 it was transferred into the Ecclesiastical Palace opposite. It now contains 300 beds, which may be increased to 500. There are three floors—male patients are on the first, females on the second. There are 18 large and 18 small wards. The former have a length of 48·15 m., a width of 16·5 m., a height of 6·7 m., and opposite croisée windows. There are iron stoves for warming. A president is at the head of the administration. Under the same is the syphilocomium, the maternity, the Brefotrophium, the clinics, which are in separate buildings. There are four senior physicians and three assistant-physicians to the hospital.

Novara.

Here we find an hospital of more modern origin; it can accommodate 300 patients, and contains lying-in, lunatic, and children's wards.

Naples

contains a great many establishments, varying in their construction. The famous Albergo dei Poveri is a compound establishment, a vast irregular building, with 2 large square yards, and 8 smaller ones. It receives sick and invalid poor. Another is called Degl. Incurabili, but it is not now used for this class exclusively. A third is the R. Osped. di San Eligio, a fourth R. Osp. di San Gennaro dei Poveri. They are all old buildings, but there is a new one of peculiar construction, called Della Pace. It was originally a palace. There is one large ward, 300 feet long, and 130 wide, with an arched ceiling supported by fine columns. It is kept scrupulously clean. There is a female Lock Hospital at Naples containing 300 beds.

Padua

has a hospital for 350 patients. The wards are arranged round a square yard with arcades and garden. The administration is

located on the ground-floor; female patients are on the first, males on the second floor.

Rome.

The capital of Italy possesses numerous charities. The following seven hospitals are under the same administration:—Commissione degli Ospedale di Roma. S. Spirito in Sassia, the largest, for males only, a general one; not favourably situated near the river Tiber, from which bad smells are stated to rise during the hot season. It existed already in 726 A.D. as an almshouse, is stated to have been founded as an hospital in 1204, and rebuilt 1717. The number of beds was at one time 3000, is now reduced to 1016. It is an irregular building; some of the wards are very large, containing more than 100 beds. A medical school is connected with it, also a museum and library. The asylum "Manicomio" is near to it. It was founded in 1561, and has 519 beds for male, and 391 for female insanes. S. Salvatore al Laterano, founded 1318, is for females only. There are 307 beds for patients, 25 for lying-in women, and 10 for the gynæcological clinique. S. Maria della Consolazione, founded 1400, for acute surgical cases only, for both sexes, contains 87 beds for males, 31 for females. It is favourably situated on the Capitoline hill. S. Giacomo in Augusta, founded in 1338, for chronic surgical cases—151 males, 95 females. Ospedale di San Gallicano in Trastevere is a skin hospital, founded in 1726—186 beds for males, 100 for females. S. Rocco is a lying-in hospital, founded 1499, transformed into a maternity in 1770; contains 12 beds. Of the others, S. Giovanni dei Fatebenfratelli may be mentioned. It dates from the year 1584. It is built on an island of the Tiber, where the temple of Æsculapius stood formerly. It contains 86 beds for surgical cases, but 50 more will be accommodated in a new building. S. Pieta dei Pellegrini is destined for chronic cases not admitted elsewhere. There are special hospitals for Poles, Germans, English, Florentines, Portuguese, etc.

Turin Hospitals.

Ospedale di S. Giovanni Baptista.

This is the largest and oldest hospital in the city. It can accommodate 600 patients. The buildings by which it is composed stand round 7 rectangular yards; the church is opposite the principal entrance. The number of patients received annually is

about 2000. The men are on the ground, and the women on the first floor; the wards are warmed by wood fires. Nursing and attendance is performed by twenty-two sisters, twenty-two *infirmiers*, and seventeen *infirmières*.

Ospedale Pazzarelli

is a long building just outside the town, for idiotic children.

Ospedale San Luigi di Gonzaga.

This is the most interesting of all, and already described by other authors. It is built in the form of a cross, and was intended for a dwelling-house of Gonzaga, a nobleman of Turin. It was finished in the year 1794, and afterwards converted into a hospital.

The chapel (Ch) is in the centre. The principal blocks are two floors high, over a basement, and contain a single ward each for

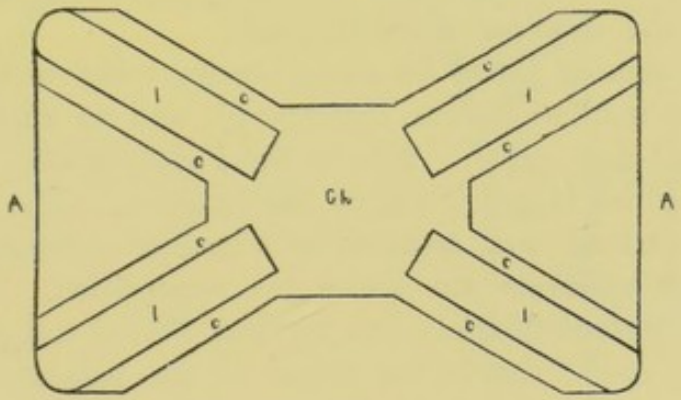


Fig. 70.—Hospital Gonzaga (First Floor).

24 beds; nurses' rooms and the usual requisites are conveniently arranged near the centre. The wards are 4,—2 for males, and 2 for females. They have corridors on each side. The beds stand close to the wall, in which is an opening over the patient's head. It serves for supplying food, medicines, etc., without any one entering the ward. Another aperture serves for a sink, to throw down the excreta. The latrines have marble seats, and a water-reservoir above. Ventilation is effected at night by six large fires in the cellars.

Large terraces close to the wards are used as walks by the patients. The outbuildings, offices, dispensary, physicians' room, dead-house, are placed at the right and left side (A, A).

The hospital was originally intended for incurables only, such as consumptive, cancer patients, etc.; but in 1833 Charles Albert added 24 new beds for skin diseases.

The Fraternita di San Luigi manages the hospital, and also takes care of the sick at their homes, by visiting them and sending a doctor.

The Regilo Manicomio

is an old lunatic asylum, built in 1728.

RUSSIA.

I am enabled, by the kind assistance of some medical friends who visited the hospitals of Petersburg and Moscow, to supply some reliable information.

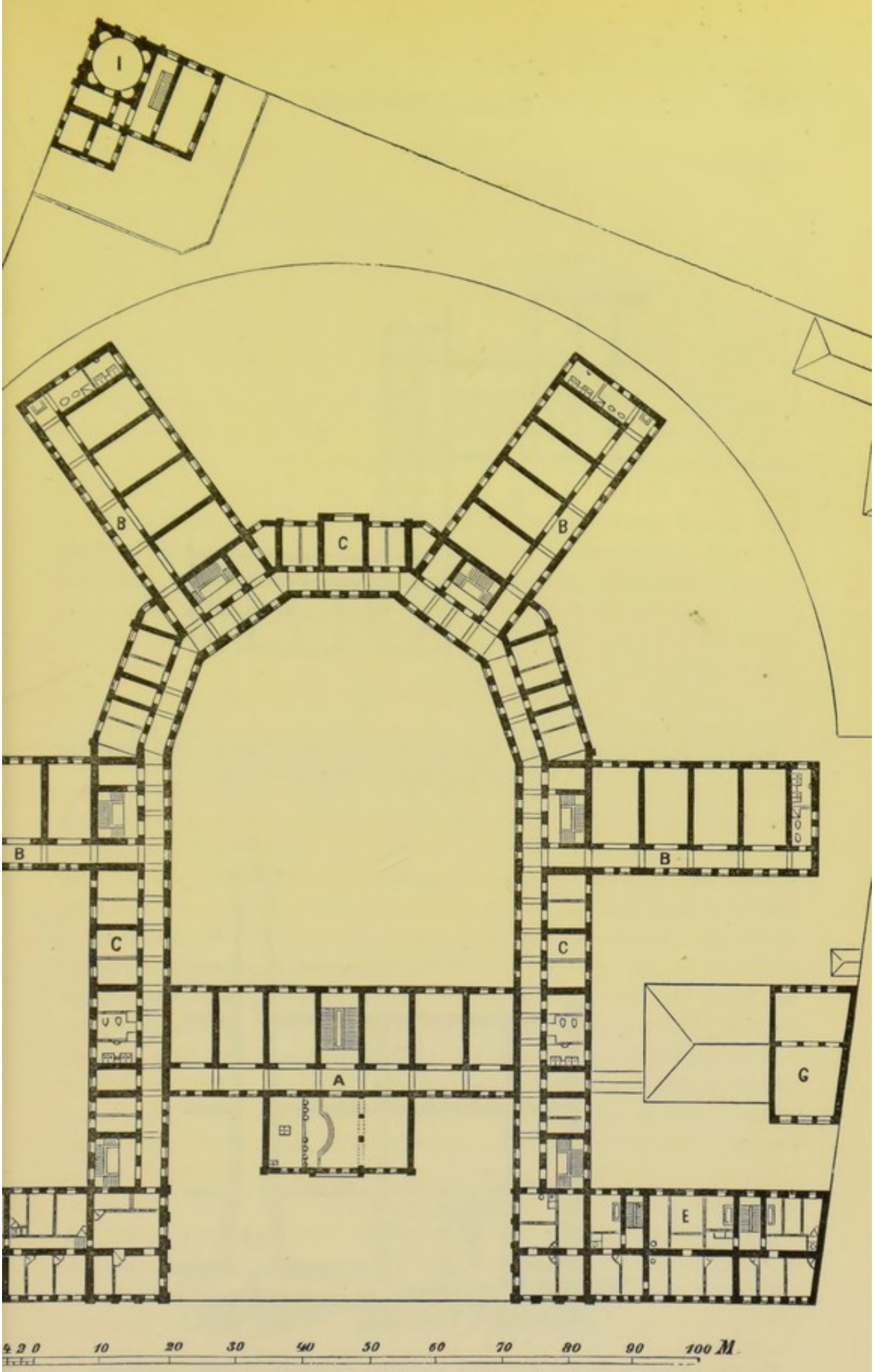
The principle of centralisation is carried further in hospital and medical matters than in any other country. The hospitals and hospices are under a Central Board, at the head of which is a medical man appointed by the Emperor. All the functionaries of the hospitals are under his control, including physicians and surgeons. He appoints the directors of the hospitals.

There is another Board for administering relief to the sick poor at their own habitations (in Petersburg), and to superintend the system of out-door relief. This is the Philanthropic Society, the president of which is appointed by the Emperor. The president is generally a medical man, assisted by a medical committee; all the *bureaux de bienfaisance* are under his supervision. The city is divided into thirteen districts, and medical officers and midwives are appointed for each; the former attend to the patients in a similar way to the poor-law medical officers in Germany, having certain hours for consultations, twice a day, etc.

An order of Sisters of Mercy was founded in Petersburg by the Grand-Duchess Helen in 1854; its members belong to every creed.

The Hospitals of Petersburg and Moscow

are remarkable for their palatial appearance; their elevation corresponds to that of the surrounding buildings, and they are three or four stories high. They are generally built on the corridor plan, and stand in large gardens. Some have summer lazarets attached to them, like the Berlin Charité. The system of heating the wards is carried on mostly by Russian stoves heated from the basement, and the heat is occasionally very dry. Some of the stoves are similar to those used in North Germany (tile stoves). Wood is used as fuel. Some wards contain open fire-grates in addition to the stoves. The windows are used for ventilation; they are



Front.

Fig. 71.—Alexandrow Hospital, St. Petersburg (First Floor).

Centre building, containing entrance, chapel, large wards, etc. B. Pavilions. C. Corridors, with sm
wards adjoining. D. Senior surgeon, senior physician, directors, secretaries, priest and his cle
E. Dispensary and dispenser's residence, assistants, etc. F. Laundry. G. Principal kitch
I. Mortuary and chapel. H. Orderlies, attendant's quarters, stables, cellarage.

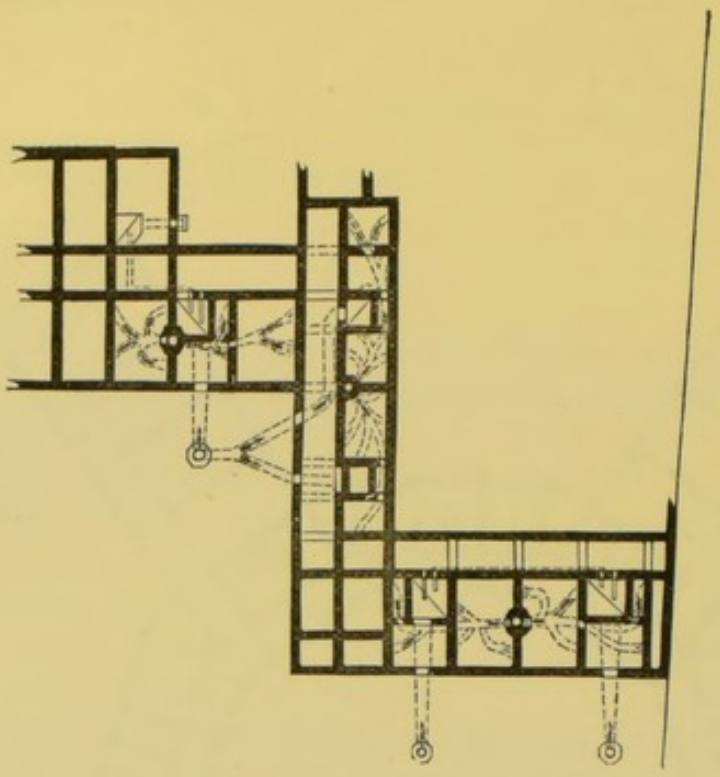


Fig. 72.—Plan Showing the Admission of Air from Outside and System of Hot Flues in the Alexandrow Hospital.

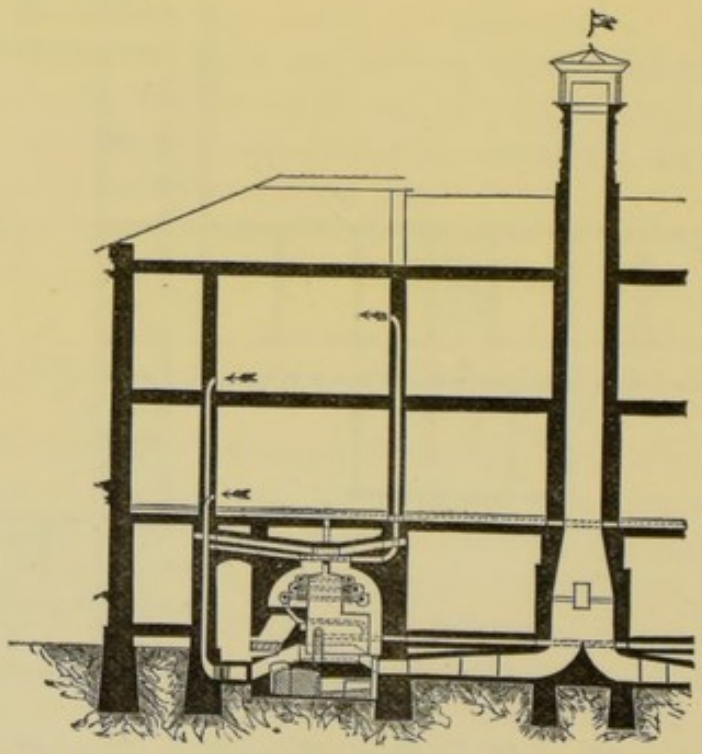


Fig. 73.—Section through Wards, Showing the Hot-Water Apparatus, and System of Admission of Fresh Air and Extraction of Foul Air in the Alexandrow Hospital.

croisées, but small casements (*Klappenfenster*) are found, which open inwards.

Special hospitals exist for children, with convalescent institutions situated in the country; they have large pleasure-grounds attached to them. There is one hospital for incurables in Petersburg.

The military hospitals are on a level with the general ones. The nursing is in some institutions (for instance, children's hospital), undertaken by the sisters of mercy, but elsewhere by male or female attendants; widows are preferred for the latter. Admission is free, and all patients have a bath before they are allowed to enter a ward. Clergymen of every denomination have free access to the hospitals.

Temporary dispensaries were opened in Petersburg during the cholera epidemic, and as a curious fact I may mention that the medicine bottles were generally without labels, because few of the applicants could read.

The Alexandrow Hospital

bears its name in honour of an Imperial Prince born 1861. The hospital is built on the corridor plan, and was opened for patients in 1866. There is a large closed yard, around which the buildings stand. The chapel and some of the large wards are in front; small wards for 1 or 2 patients are at each side, and also at the back, which is half-moon shaped. Two wings branch off from the front building, two from the sides, and two from the portion behind. These wings are exposed to the free circulation of the atmosphere, and are called pavilions; those in front are three floors high, the others only two floors; the first-named serve for offices, dispensary, private rooms, and some of the wards; the four others for patients, and contain large wards, resembling those in Fig. 1, No. 4. They contain 12 beds, and open into wide corridors. Baths and water-closets are generally placed at the farther ends of the wings. The chapel lies in front, over the principal entrance-hall.

Kitchen, dead-house, and wash-house are detached in the grounds. A director and head physician live in the hospital; house-surgeons, barbers, waiters, nurses, married and not married, attend to their duties; the number of subordinates, orderlies, etc., is about 200.

Petersburg Lying-in Hospitals.

Recently wards containing three beds were arranged, with a room adjoining for confinement of those for whom these beds were kept ready in various districts of the city, which now has 930,000 inhabitants.

There are four Lying-in Hospitals in Petersburg and four or five small infirmaries. The institution of the Grand-Duchess Helen (now Catherine Michailowna's) consists of an old part, which was built more than thirty years ago, and a new one, the erection of which was patronised by the lady the name of whom the hospital bears at present.

The whole has an irregular shape; the old part contains two floors, the new one three; about 50 beds (not including the cribs) can be placed in the wards. The old part has the shape of a letter L (reversed), and one portion contains a central corridor, into which small rooms open on each side; the other has one corridor running along the wards.

In the new part, which has the form of an open quadrangle, the sick wards are small, for 1 or 2 inmates. Most of them contain open fire-grates; there are tile-stoves in some others. The wards open into each other, and are situated back to back on each side of a central wall.

The director is a medical man, and he is helped by four assistants. Midwives live in the building.

The "new Lying-in Hospital" is three floors high, and built on the corridor plan, in the horse-shoe form. In the centre of the main building is the staircase; 5 wards lie on each side of it. These wards have two windows opposite the entrance-door. The wings contain 5 similar wards each. Sculleries, water-closets, and recreation-rooms are conveniently arranged. There is no garden to this institution.

The lunatic asylums in Russia have been reorganised. The corridor plan is adopted for that of Kasan and others. It is to be regretted that the corridor is nowhere intended to be more than 6 feet wide.

The Petersburg German *Medical Times* gives, from time to time, the number of inmates in the various hospitals.

On July 17, 1882, there were—

	Men	Women	Total
Abuchow Hospital	645	280	925
Alexandrow „	434	149	583
Kalinkin „	—	433	433
Peter-Paul „	272	99	371
Marien „	277	246	523
Ausserstädtisches Hospital (outside) . .	204	179	383
Roshdestwensky „	32	16	48
Nicolai (Military Hospital (civil department)	275	89	364
Four temporary hospitals . . .	350	169	519
Ausschlags Hospital (smallpox) . .	17	16	33
All civil hospitals .	2,662	1,743	4,405
Nicolai Children's Hospital . . .	609	19	628
Prince Oldenburg „ . . .	198	—	198
Elizabeth „ . . .	234	—	234
Total . .	3,806	1,853	5,659
Of this there were cases of—			
Typhus, typhoid, rec. fever . . .	435	157	592
Enthetic diseases	663	430	1,093

About 3000 children are seen at the Children's Dispensaries in a week.

The principal lunatic asylum, which can accommodate 300 patients, is outside the town. There are large poor-houses in Petersburg, somewhat resembling the English workhouses.

Riga Barrack-Lazaret.

About fifteen years ago a barrack-lazaret was opened in Riga. It consists of wooden pavilions and others of a mixed character, one floor high over a basement. The walls of some pavilions consist of boards, pasteboard, and tiles in alternate layers. The large wards are warmed by stoves, and hot-water pipes running at the sides. The stoves have a lower part of bricks standing in the basement, and an upper one of tiles, which is hollow, and in the ward. The air is admitted into the air-chambers formed by the stove and its mantel.

There are passages running at the sides of less elevation than the wards; they are warmed in winter.

SPAIN.

I translate from the late M. Husson's *Etude* the following notice about the Princess Hospital in Madrid:—

It is situated on the north of the town, and constructed after the

model of Lariboisière, and composed of eight pavilions, four on each side of a yard. They have only two floors, both for patients. In front and in the centre are offices, rooms for officials, and the chapel; at the back are the dispensary, baths, linen-stores, instruments, latrines, and wash-house. There are sixteen wards for 20 beds, two for 10, and one for 24. The wards are 35½ feet long, 21 wide, and 14½ high, in order to supply 21 cubic metres per bed.

The ward for 24 beds and the operating theatre are paved with blue tiles from Valence. All diseases are received, excepting syphilis, cutaneous, incurable and mental maladies.

There are between 300 and 350 beds, but not more than 300 in-patients are received annually. In summer time the hospital is nearly empty. Surgical cases have the preference. There is a singular custom here, daily reports are published about dangerous patients, and open for the inspection of the relations and the public.

The General Hospital

is a building for 1600 patients, built about 1780. The buildings stand round square yards, and have a considerable elevation; some are four floors high, others five. Men and women are in different parts of the hospital, and there are male and female children's wards.

Besides medical and surgical cases, we find eye patients', prisoners', lying-in, and lunatic wards.

The number of wards is 44. Many contain a great number of beds, more than 70 or 80; but there are smaller wards for 10 or 15. There are separate rooms for paying patients and those of position. Bath-rooms and separate operating-rooms are between the larger wards. Most wards are paved with asphalt.

The nursing is in the hands of monks and sisters.

A school of medicine is connected with the hospital.

SWITZERLAND.

Each "Canton" has a Cantonal hospital, and generally also a lunatic asylum.

Basel (*Bâle*).

The hospital is beautifully situated, and the grounds are laid out in gardens. It is a corridor hospital for 300 beds. The wards have two croisée windows opposite the entrance-door and contain 6 beds each. They are warmed by tiled stoves and hot water.

There is a ventilator in the lower part of the doors. Movable baths are in the wards. The beds have spring mattresses with straw underneath; they are therefore high. A house for invalids and incurables is in connexion with the hospital.

The hospital is divided into a medical, surgical, lying-in, lock, and gynæcological department. It is lighted by gas, and has a tramway for taking the meals to the wards. There is a medical school, three professors; then three assistant-physicians and two auxiliary physicians visit the house.

Fribourg Academical Hospital.

The town has 25,000 inhabitants, and a hospital for more than 200 beds. There are two floors over a ground floor, 24 wards with windows opposite the entrance doors, and windows looking into the corridor which connects the wards. The hospital dates from 1827. The administration depends upon the corporation and the university.

The Cantonal Hospital at Geneva

was built in 1850, and contains 350 beds. On the ground-floor are surgical wards for 16, 14, 8, and 5 beds, operating theatre, and offices. The first floor contains medical cases, the second one wards for paying patients. Baths, sculleries, and water-closets are in the long corridors. Windows are opposite the entrance-doors and on the corridor side. The floors are of polished oak and parquetted, beds of iron without curtains. The wards are warmed in winter time by hot air propelled into them after passing through calorifères by means of a fan worked by steam power. Fifteen thousand cubic metres are supplied every hour, or 47 to 48 cubic metres per head per hour. The inlets for this air (numbering one for every 4 or 5 beds) can be closed separately. Six feet below these openings and 1 or 2 feet from the floor are others which act as outlets, one underneath each bed, and communicate with a shaft making its exit on the roof.

In the garden stand nine pavilions or barracks, each for 10 or 12 patients. The sides are closed by canvas divided into panels. They can be rolled up, or opened and closed at will, like blinds or curtains. Patients are accommodated here from April to the middle of October, and cases of pyæmia or erysipelas are very rare.

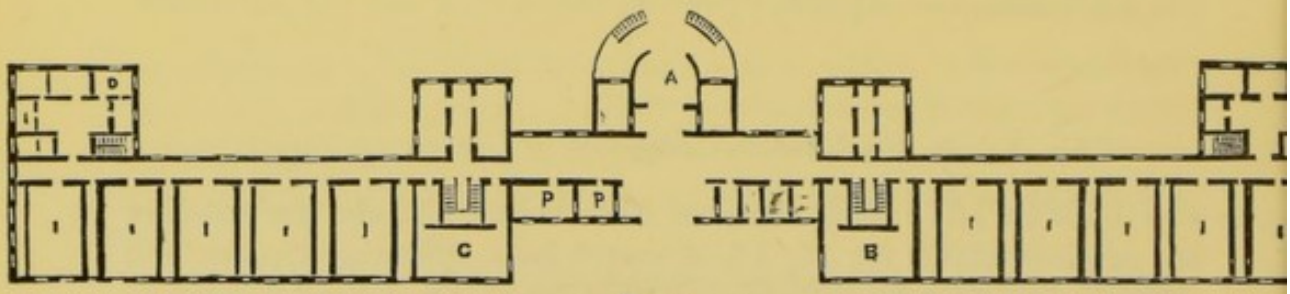
Clinical lectures are given at the hospital.

Zürich Hospital.[1]

It is composed of a principal building and detached blocks. The dead-house and school for anatomy form an important part of the whole, with which they are connected by a gallery. The two wings of the principal building are two stories high; the central pavilion between them is three stories high; the front is 589 feet long. The central pavilion contains offices, store-rooms, dining-rooms for the servants, dispensing-room, committee, medical officers', and reserve rooms.

Men are on one side of this pavilion, women on the other. There are 5 wards on each side, and altogether on each floor 20; the ceiling is vaulted, 14 feet from the floor. The wards are 29 feet broad, 42 feet deep; between two wards is a room for the nurses (male).

The cubic space of a ward is 14,112 feet. As there are only



Front.

On the scale of $\frac{1}{8}$ of an inch to a foot.

Fig. 74.—Zürich Hospital (Ground-Floor).

A. Operating-room, kitchen in the basement. B Rooms for admission.
C. Lecture theatre. D. Bath-room. P. Dispensary.

10 beds in the surgical wards, each patient is allowed 1411 cubic feet; in the medical ward only 1175 cubic feet, as there are 12 beds. The bedsteads are of wood, and placed *along* the walls; the windows open on little balconies.

This is one of the few hospitals where water-closets have been abolished after existing for a time. But they were constructed in a complicated manner (self-acting), and the pipes were not protected from freezing. They have been replaced by cast-iron vases, which have a rim for water at the top, so that the couvercle closes watertight when let down; but there is no second couvercle, so they are always wet. There are also simple night-stools near the wards.

The nurses' room is situated between two contiguous wards.

[1] Dr. Schrämli's *Beschreibung*, etc.

The front building contains tile stoves for warming; the wings hot-water pipes. They form coils, and are surrounded by perforated plates, so that they resemble stoves. Fresh air is admitted, and gets warmed by passing through these coils in the usual manner. There are also casements in the lower parts of the doors; when open, they admit the air from the corridor.

The kitchen is in the basement, in the centre of the projecting portion. It is large and airy, but the steam is sometimes unpleasant. The wash-house is separate, and the engine-room near it.

A separate building for contagious diseases stands at some distance from the principal one.

APPENDIX.

The following suggestions were printed in the first edition.

In conclusion, I venture to suggest that a commission of competent medical men should—if not appointed by authority—meet of their own accord, to decide on the following questions respecting the system of medical relief in London:—

1. How to manage the affairs of dispensaries, workhouse infirmaries, hospitals and special hospitals, so that they do not interfere with each other's interests.

2. Which of these institutions should be used as a means for medical education.

3. Which institutions should become a means for training midwives on the same principles as the Hebammen Institute. (*See* p. 64.) How long should the course of instruction last, and who should compose the board of examiners.

4. How to effect a partial change in the present system of admission into hospitals.

5. If a popular treatise could be prepared containing special instructions on ventilation for the nurses and house-surgeons.

6. Should special night-nurses exist?

7. To prepare tables of statistics respecting zymotic diseases for hospitals, workhouse infirmaries, and special hospitals, and to determine the necessary water-supply per head per day, by careful investigations made on a uniform plan.

8. To district the metropolis for dispensaries, and for the visitation of the poor in a more efficient manner.

9. To consider if it would not be advantageous to form a pauper pharmacopœia for the use of the new dispensaries.

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