The arrangement and construction of school sanatoria : a paper read before the Association on January 11th, 1887 / by Charles E. Paget.

Unable to display this page

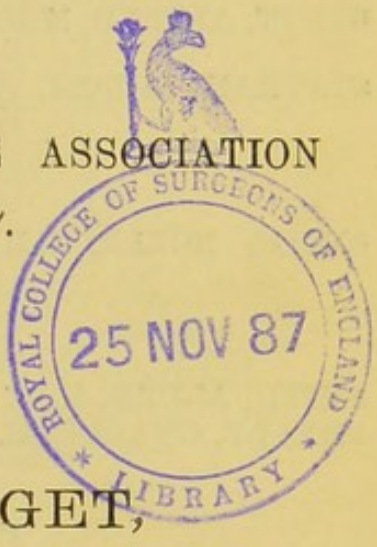
Medical Officers of Schools Association.

THE

ARRANGEMENT AND CONSTRUCTION

OF

SCHOOL SANATORIA.



A PAPER READ BEFORE THE ASSOCIATION

On January 11th, 1887.

BY

CHARLES E. PAGET,

MEDICAL OFFICER OF HEALTH FOR THE WESTMORLAND COMBINED SANITARY DISTRICT; HON. SEC. EPIDEMIOLOGICAL SOCIETY.

PRINTED BY ORDER.

"The Association is not responsible for the Opinions expressed in this Paper."

London:

J. & A. CHURCHILL, 11, New Burlington Street.

1887.

MEDICAL OFFICERS OF SCHOOLS ASSOCIATION.

President.

SAVORY, WILLIAM S., F.R.C.S., F.R.S., Consulting Surgeon Christ's Hospital, Hertford and London.

Vice-Presidents.

EVATT, Surgeon-Major, M.D., L.R.C.S.I., A.M.S., Medical Officer Royal Military Academy, Woolwich.

CLARK, SIR ANDREW, Bart., LL.D., M.D., F.R.C.P., Consulting Physician East London Hospital for Children.

FARQUHARSON, ROBERT, M.P., LL.D., M.D., F.R.C.P., late Medical Officer Rugby School.

FULLER, THOMAS, M.D., M.R.C.S., Medical Officer St. Nicholas College, Lancing.

BRETT, ALFRED, M.D., M.R.C.S., Medical Officer London Orphan Asylum, Watford.

STATHAM, HUGH, M.R.C.S., L.S.A., Medical Officer Foundling Hospital, London.

Treasurer.

SMITH, NOBLE, L.R.C.P., F.R.C.S.E., Surgeon All Saints Children's Hospital, London.

Hon. Secretaries.

SMITH, ALDER, M.B., F.R.C.S., Medical Officer Christ's Hospital, London.

SHELLY, CHARLES E., B.A., M.B., M.R.C.S., Medical Officer Haileybury College.

Members of Council.

BRIGGS, GEORGE, M.B., M.R.C.S., one of the Medical Officers Harrow School.

CLARKE, Brigade-Surgeon, M.D., M.R.C.S., A.M.S., Medical Officer Royal Military College, Sandhurst.

FLETCHER, GEORGE, B.A., M.D., M.R.C.S., late Medical Officer The College, Framlingham.

JONES, O'BRIEN, F.R.C.S., L.S.A., late Medical Officer Epsom College.

ARMSTRONG, GEORGE H., M.R.C.S., L.S.A., Medical Officer Wellington College.

CARTER, BRUDENELL, F.R.C.S., Ophthalmic Surgeon St. George's Hospital, London.

ELLISON, JAMES, M.D., M.R.C.S., one of the Medical Attendants at Eton.

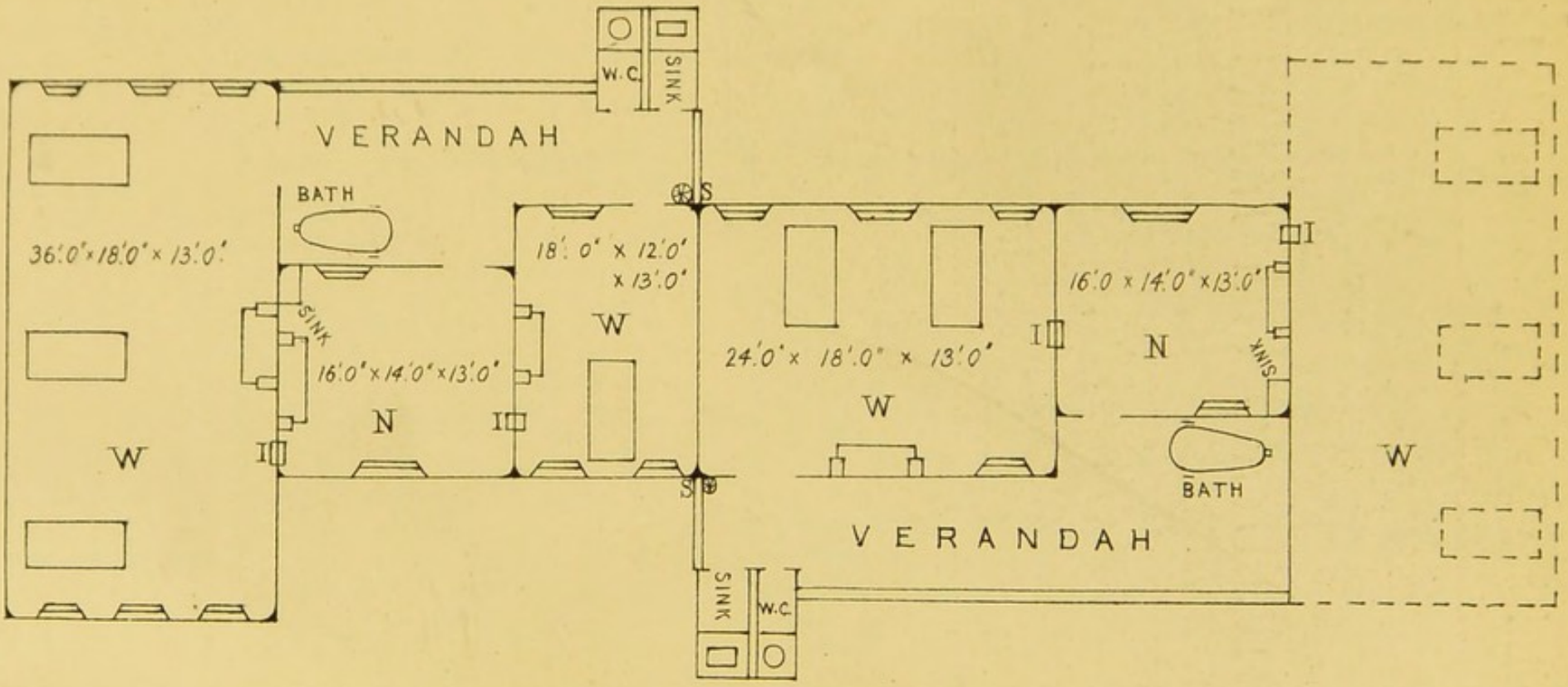
MURPHY, SHIRLEY, M.R.C.S., L.S.A., National Vaccine Establishment H.M. Local Government Board, late Medical Officer of Health, St. Pancras, London.

HAIG-BROWN, C. W., M.B., M.R.C.S., Medical Officer, Charterhouse, Godalming.

MARSH, HOWARD, F.R.C.S., Senior Surgeon Hospital for Sick Children, Great Ormond Street.

PAGET, CHARLES E., L.R.C.P., M.R.C.S., Medical Officer of Health, Westmorland.

PENNY, EDWARD, M.D., M.R.C.S., Medical Officer Marlborough College.

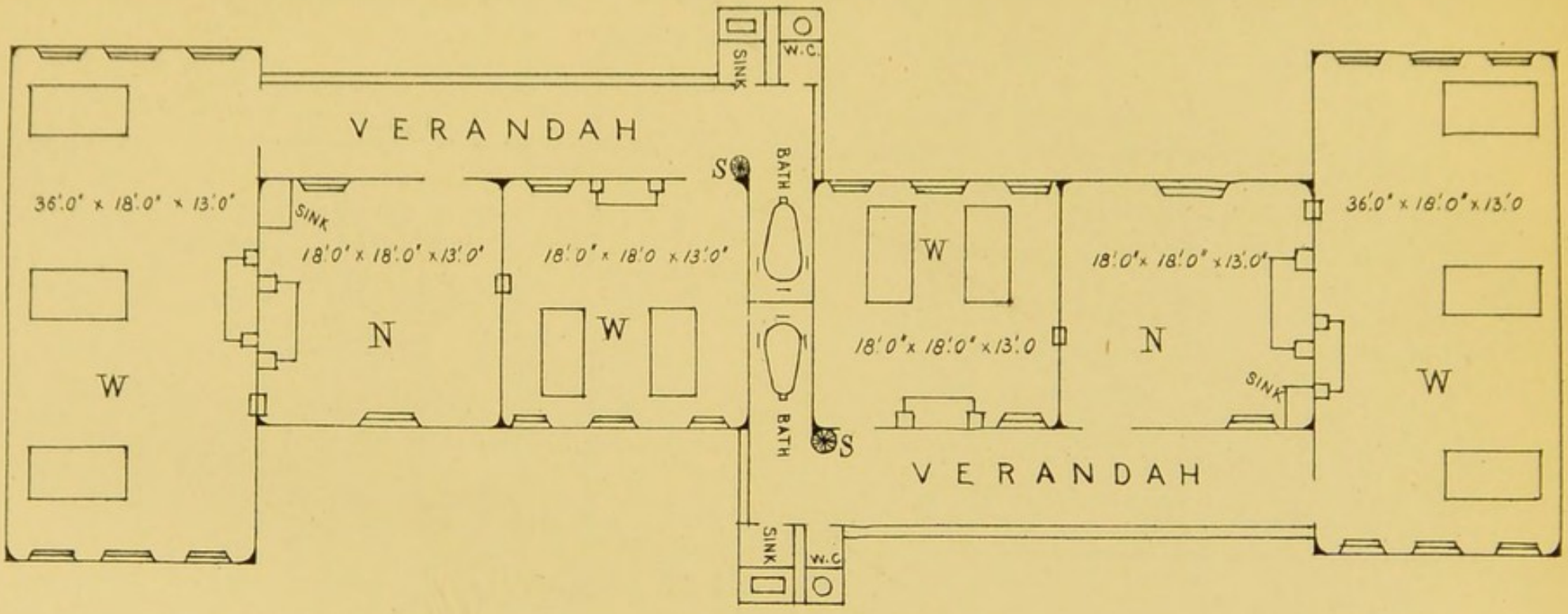


W. Wards.

N. Nurses' Day-rooms.

I. Inspection Windows (fixed).

S. Spiral Staircases leading to Nurses' Bedrooms.

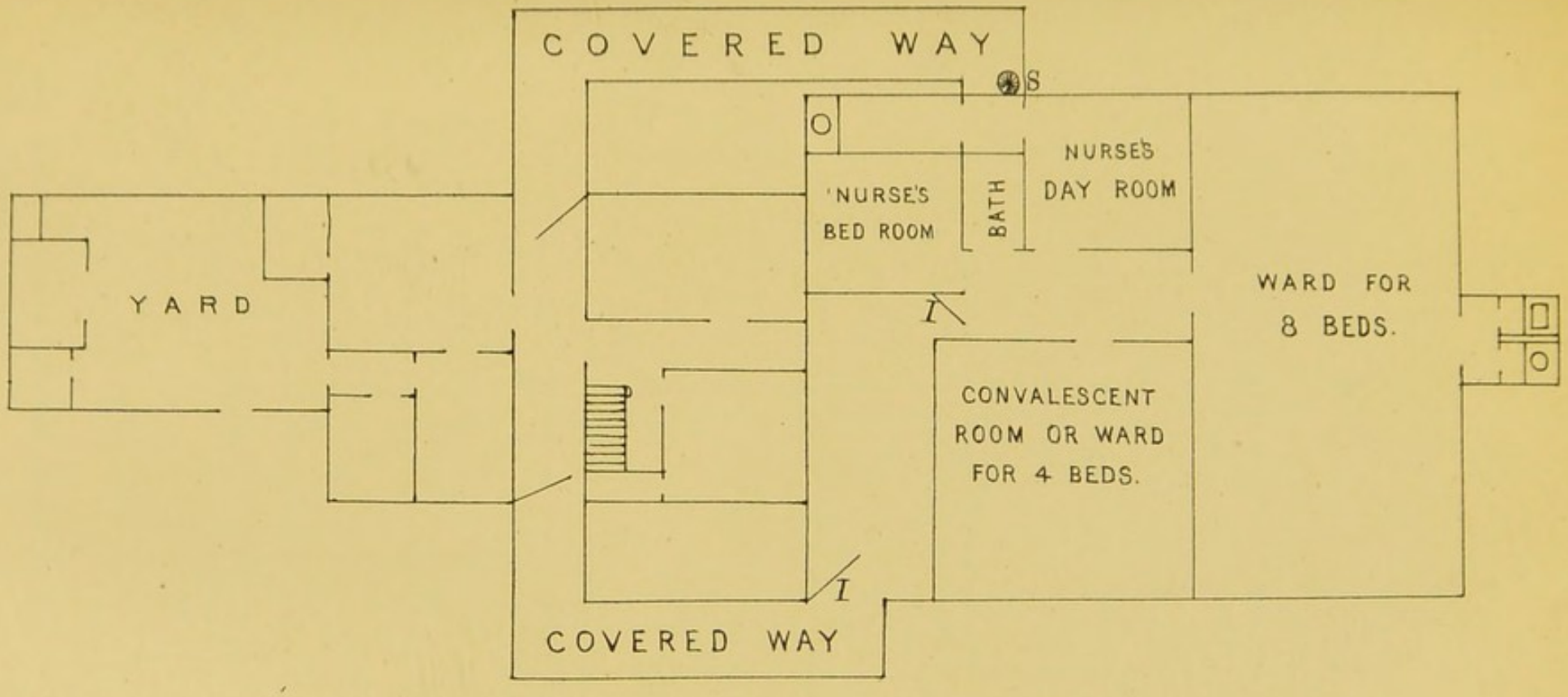


W. Wards.

N. Nurses' Day-rooms.

I. Inspection Windows (fixed).

S. Spiral Staircases leading to Nurses' Bedrooms.

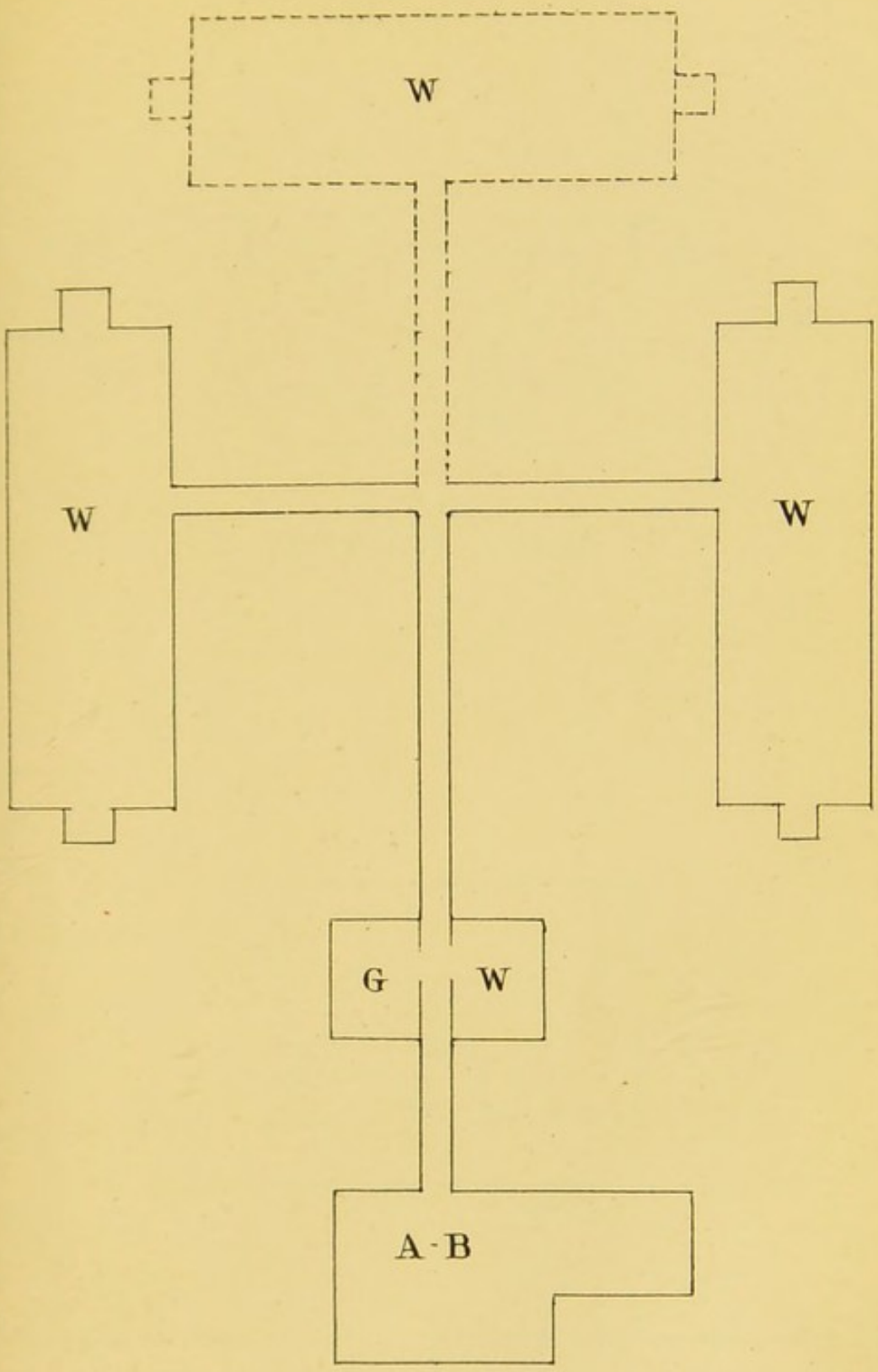


I. Isolation Doors.

S. Spiral Staircase to first floor of the infectious diseases portion of the Sanatorium.

The first floor of the administrative building is as shown in plan E.

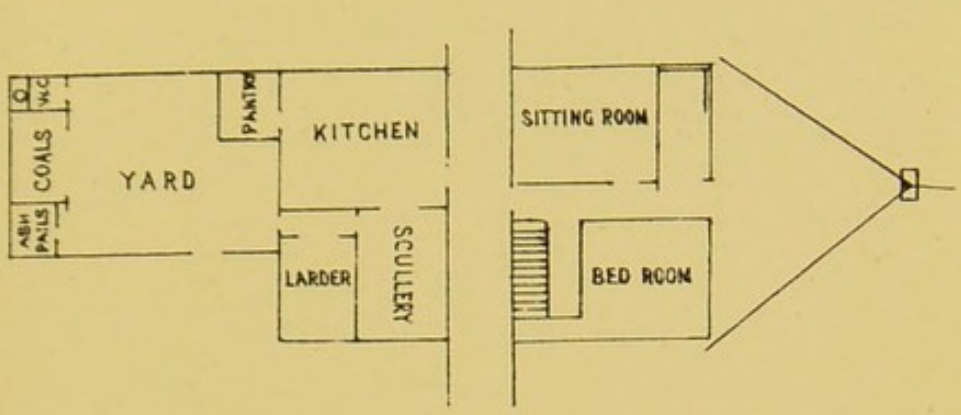
The first floor of the infectious diseases portion of the Sanatorium is practically arranged the same as the ground floor.



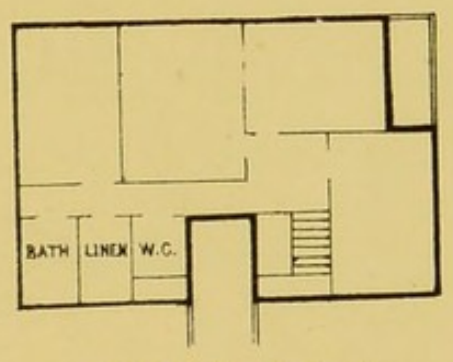
A—B. Administrative Building, as in plan E.

G. W. General Wards.

W. Ward Buildings for infectious diseases, as in plan F.

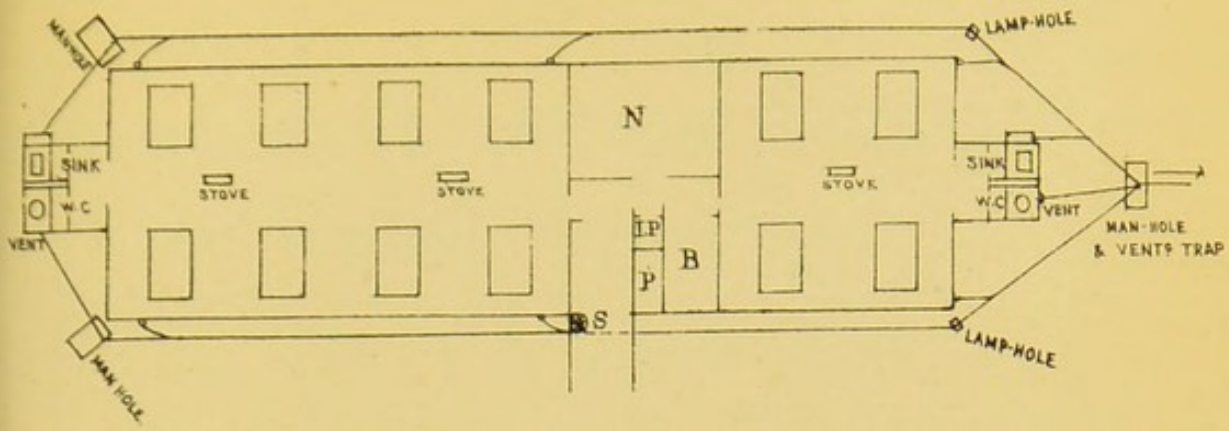


GROUND FLOOR



FIRST FLOOR

ADMINISTRATIVE BUILDING FOR SCHOOL SANATORIA, WITH TWO SMALL GENERAL WARDS AND A CONVALESCENT ROOM ON THE FIRST FLOOR.



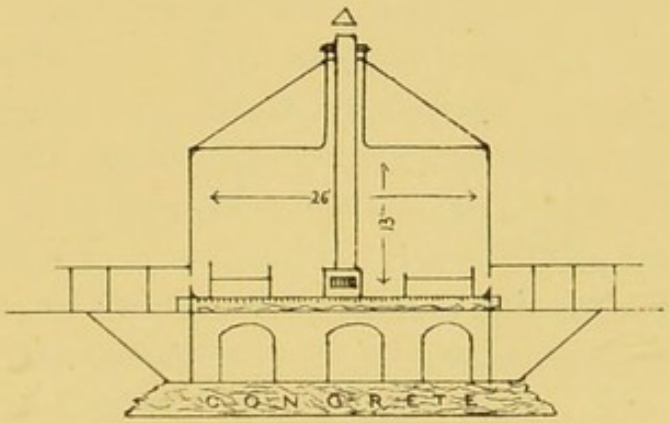
N. Nurses' Day-room.

L. P. Linen-press.

P. Ward Pantry.

B. Bath-room.

S. Spiral Staircase to Nurses' Bedroom.



Transverse section of above Ward, showing arches built on a concrete bed, railed way over excavated ground, position of beds to the walls and the air-brick to the beds, the curved corners of the Wards, and the arrangement for the passage of the stove chimney through a funnel in the roof for ventilation purposes. The joists of the Ward are laid in concrete on the top of the arches.

ARRANGEMENT AND CONSTRUCTION OF SCHOOL SANATORIA.

Mr. President and Gentlemen,

Provision by school authorities for the isolation and treatment of cases of infectious diseases in schools is only called for when the latter are of the nature of "boarding-schools."

Schools of this kind in England are generally known as "Private," "Grammar," and "Public" schools, and on the Head-master or the Governing Body of any of these falls the responsibility of protecting against the spread of infection from and within the schools. This responsibility is incurred on behalf of the public who may be unconnected with schools, quite as much as in respect of the boarders and their families, so readily may the infection of some diseases be conveyed for great distances and in the simplest of media. The community of a boarding-school, of whatever size, is a special one. The adult portion of the community is, as a rule, smaller in proportion to the younger element than is the case in communities not specially situated; and though the influence of the older part cannot be overlooked, yet it may be separated in health and in sickness more completely from the younger part than is usually possible in ordinary life. Thus, the illnesses which may occur among masters and their families ought to be provided for and treated separately from and independently of the sicknesses of the schoolboys; and, as this principle is usually recognised and in force at boarding-schools, the question of provision for the boarders alone is brought within

fairly definite limits. A boarding-school community is a special one in another sense—the liability to accidents and infectious ailments is larger than in a mixed community.

Of all illnesses that may seriously affect the well-being of a school, quite apart from the dangers that may attend them, the chief are the infectious febrile disorders; and of these the most important and most liable to occur in epidemic form are scarlet fever, diphtheria, whooping-cough, measles, epidemic roseola, mumps, and chicken-pox. All of these, however mild the attacks may be, are apt to spread rapidly through a susceptible community, and seriously to interfere with school work. An outbreak of enteric fever may occur, and yet not be more mischievous in its effects on school-work than these more common ailments often are. For checking their spread, special provision is undoubtedly necessary, and should be quite equal to average requirements.

The scope of this paper limits me to the recognition of schools which should have distinct Infirmary buildings; but it may not be amiss to mark the point at which the need commences.

There are many private schools which are not large enough to need the provision of Sanatoria, and these, of course, ought to set apart *not less than two adjoining rooms*, with offices, for infectious illnesses. These rooms should be *at the top of the house*, and, if possible, *approached only by a separate staircase, which is quite shut off from the rest of the house.*

The point at which "outside provision" seems to become necessary is in the case of small grammar-schools, where the boarders may be under 50 in number, but are over 20. In such schools the risks of introduction of infection are greater than in the large public schools, because of the larger number of "day-boys" that attend them than is usual in the latter class of schools. Separate infirmaries are therefore desirable for the sake of the boarders, and for the repute of the schools as boarding-schools.

Beyond this point, *i.e.*, when there are as many as 50 boarders, a Sanatorium is, in my opinion, absolutely essential on all grounds.

Sites for Sanatoria.

These should be selected with due care.

Though, like all infectious-diseases hospitals, school Sanatoria ought to be situated so as to ensure complete isolation from school-buildings and playgrounds, and dwelling-houses of people, they must yet be in the line of easy communication with the places from which the sick have to be brought to them.

The site being selected, a good wall or fence, at least six feet high, must be placed around it to prevent such intercourse as might lead to a spread of disease. The Sanatorium ought not to occupy more than one-third of the area enclosed, so that there may be no overcrowding either of the buildings or of the patients in their convalescing stages. The limits of area may influence largely the form of building to be erected, but the rule is a sound one that there should be plenty of free air and ground-space around a Sanatorium. The site had better seem to be too large than too small in area; and if it be larger than is at the first necessary, it will allow of additions being made to the Sanatorium buildings when these shall prove unequal to the wants of the school.

Schools are now so often within easy reach of good country sites for Sanatoria that one is apt to overlook the possibility of there being some left in large towns, and still ranking as boarding-schools. A good Sanatorium site is almost impossible in a large town, and the most that can be done for the school is to fit up rooms specially as an Infirmary at the top of some building, separated from all other buildings in daily use by the healthy boys of the school.

This is no doubt the best arrangement that can, under the circumstances, be effected; but in the fitting up and arrangement of the rooms it will be well that they should be adapted on the principles submitted in this paper as requisite in the building of school Sanatoria.

An elevated site should be preferred; low hollows are, as a general rule, distinctly bad sites—they are apt to be damp, and the circulation of air within them is usually not so free,

rapid, and general as it is about raised situations. Wherever it is possible, Sanatoria should be built so that their front and back aspects face respectively S.E. and N.W., as in this way the best natural warmth and light may be secured, and direct exposure to the east wind may be avoided.

A country site should always be selected, with due regard to a suitable system of drainage, and where there is a neighbouring system of sewerage it will be best that the Sanatorium drains be connected with it. In a choice of sites, that should be selected, other things being about equal, which gives the best fall for the Sanatorium sewage. If, however, it be impossible for a Sanatorium to be connected with a proper sewerage system, it will be necessary that some other means of sewage-disposal for the Sanatorium be adopted; and, in such circumstances, as this system must be entirely controlled and managed within the area of the Sanatorium site, it is essential that the area be not a confined one. I need scarcely say that a site in proximity to a manufactory or other trade-premises is most undesirable, for the purity of air and absence of noise about any infirmary is especially necessary.

Sanitary Arrangements of Sanatoria.

Water Supply.

The water supply should be derived from a well-established and constant general supply, and there should be two systems of cisterns in the Sanatorium, unconnected with each other, for sanitary and other purposes respectively.

When the water is derived from a well or wells, it should be pumped into similar systems of cisterns, so that the supply from these in the Sanatorium may be constant; but no wells should be in use without being properly protected, thoroughly cleared out at least once in every year, and the water from them analysed during each school vacation, so that the purity of the water may be ensured as nearly as possible.

Sewerage.

As already stated, where there is an existing system of sewers within reach, the Sanatorium sewage is best dis-

charged into it. In default of such a system being within reach, the Sanatorium arrangements for sewage-disposal will have to be modified in accordance with local circumstances. It will be best to consider these things in some detail.

(i.) *Water-carriage System.* Plan (F) shows a fairly complete system of drainage for ward and administrative buildings; the whole drainage of each block is drawn to one point, and there disconnected by a trap, and an air-break in connection with the several ventilators attached to the soil-pipes, from the main drain or sewer into which it discharges.

Where there is no objection or regulation to the contrary, the storm-water from the buildings may be carried off together with the ordinary sewage in one line of drains; but it may happen that two lines of drains may have to be laid in accordance with the by-laws of particular districts. The amount of storm-water, however, from a Sanatorium would, as a rule, not be excessive, and would be sufficiently useful in helping to keep the drains in cleanliness.

Every soil-pipe ought to be properly ventilated by carrying a pipe from it above the eaves of the building from which it issues. These ventilating pipes should have a diameter of *not less* than three inches, and they should act with the ground ventilator referred to, in keeping a constant current of air passing through the drains between all the W.C.'s and the point of disconnection from the main drains or sewers. The entrance of sewer-gas into the Sanatorium building through the W.C.'s will thus be prevented, as it will be carried away with the draught in the drains, and the drains themselves will be kept from becoming foul. All waste, sink, and rain-water pipes must be disconnected individually from the Sanatorium drains in the ordinary ways as now generally understood, and as specially figured in the illustrated model by-laws of the Local Government Board * of this country.

As shown in Plan (F), where there may be curves in the lines of drainage, at such points there should be alternate

---

* Annotated Model By-Laws of the Local Government Board. Knight & Co., London, 1883

lamp-holes and man-holes, in order that blocking of the drains may be at once discovered on examination, and remedied easily when found.

(ii.) *Earth System.* When sewerage of a Sanatorium for all purposes is difficult or impossible, some other system of excrement disposal must be adopted. It may be said at once that no ordinary privy-and-midden system can be tolerated, and that the only application of earth for the deodorisation of excreta, which can be considered satisfactory, is one entailing some trouble, though not inordinate expenditure.

The earth closet, on Moule's Patent, may be used safely in a Sanatorium as the best means for disposing of the excreta, provided only that its essential points of management are properly and regularly attended to. The receptacles of the closets must be removed daily, from the outside through the walls of the closets, by the man employed about the Sanatorium, and the preparation of the earth for use in the closets must be one of his most constant cares. For this system to act successfully and to be admissible in a Sanatorium, the earth must be perfectly deodorising, and for this purpose must be thoroughly well dried, and sufficient in stock to meet all demands. The place of deposit from the closets, and for the earth-preparation, must be as far from the Sanatorium wards as may be; for, though the earth, when properly prepared, is inodorous, yet the processes in its preparation might occasion more noise than there should be in the neighbourhood of sick wards.

The slop, sink, and waste-waters from the Sanatorium should be drained on to land at some distance; but certainly they ought not to be put into a cesspool.

All matters from the Sanatorium wards should be *properly disinfected before being discharged into any drains*, and the drains themselves should be flushed and disinfected weekly while the wards are occupied.

General Arrangements of Sanatoria.

Administrative Building.

A distinct administrative building is always desirable. In

connection with it there may be wards for accidents, for general illnesses, and for the isolation in the first instance of cases of sickness the natures of which in their earliest stages are doubtful. It must not be directly connected in any way with infectious diseases wards, unless by telephone connection with the several nurses' day-rooms. There is no objection to the administrative building being built in two stories; its being so built will serve to economise the area of the Sanatorium site, and reduce the liability to cramping of ward space. The distance of infectious diseases wards from the administrative building should be *not less* than 30 ft., and the approach from one to the other should be by an open footway, only protected from the weather by a simple roof supported on pillars.

The administrative building may be on the border of the Sanatorium area.

(i.) *Cooking.* The chief cooking for the whole establishment should be done in the kitchen of the administrative building.

(ii.) *Linen.* There should be a good linen-room in which the linen of the whole Sanatorium can be kept. It should be well warmed by hot-water pipes, and the linen constantly under watch when not in use. Some portions should be kept ready for *immediate* use in one or more wards, together with the mattresses for a couple of beds; but the rest should only be served out and kept during a term of sickness in ward premises when required or likely to be required. The linen being always well aired, it must rest with the Medical Officer and the Matron to decide at different times what amount of linen must be served out to respective wards.

After the wards have been used, the linen must be thoroughly disinfected and returned to the linen-room, with the exception of that which is always kept in particular wards ready for immediate use. The linen can thus be kept properly under control, and the wants of the whole establishment in this department be known at once at any time.

(iii.) *Coals.* The coals for the whole establishment should be kept in the yard of the administrative building, to avoid unnecessary dust and noise in the neighbourhood of the wards,

and a daily supply should be taken wherever required in the Sanatorium.

(iv.) *Refuse disposal.* There should be no ash-pit or privy-and-midden anywhere about a Sanatorium. The refuse of the establishment should never be allowed to accumulate to more than would fill a couple of tubs, which an able-bodied man could carry when full, and dispose of in some approved manner. The emanations from a cart-load of refuse are undesirable in the neighbourhood of sick wards.

(v.) *Washing.* When disinfection of linen after use in the infectious wards has been accomplished, it may be removed to the boiler in the administrative building or in an adjacent wash-house, and be there washed in the ordinary way, though separately from the other linen of the Sanatorium.

The washing of all articles used in the Sanatorium should be done upon the premises.

If the washing of linen be done in the administrative building or immediately adjacent to it, there will be practically no risk of infection to anyone coming in if only for the purpose of assisting in the washing.

(vi.) *Hot-water Boiler.* Though each nurse's day-room throughout the Sanatorium should have a small kitchener and boiler, as advised later on in this paper, yet the main boiler for the supply of bath water and hot water for general purposes throughout the Sanatorium should be placed in the administrative building. The exception to this rule would be when the whole Sanatorium is chiefly warmed by hot water pipes ; in such case a boiler-house would have to be built, and the general hot-water supply might come from the boiler in this building.

(vii.) *Ambulance.* The ambulance should be kept in the yard of the administrative building. It may be a one-horse vehicle, or if the Sanatorium be not very far from the school, and the approach to it a private one, a light covered stretcher-bed that could be easily carried with a patient on it by two men might be used. For accidents, the latter kind will probably be preferable.

Infectious Diseases Wards.

The distance of these from the border of the Sanatorium area should not be less than 40 feet. Their distance from the administrative building has been already specified.

Whatever may be the position of the administrative building, the planning of these wards must be such that there may be no necessity for anyone to pass close by their open windows.

Staff.

(i.) *Permanent.* Every Sanatorium should have a Matron. She should live in the administrative building, and have the general wards attached to it under her special control. She should be responsible only to the Medical Officer of the school: it should be the business of the latter to report her to the Head-master for incapacity, and the business of no one else. Her charge should be the entire supervision of the Sanatorium, and the care of such patients in the general wards as far as she may be able.

In large Sanatoria a permanent nurse may be very desirable. This provision must depend upon circumstances, and the advice of the Medical Officer of the school.

There should always be an able-bodied man about the Sanatorium, whose services may also be at the disposal of the Matron.

A good cook will be required, and she had better be a permanent servant rather than a temporary one.

(ii.) *Temporary.* Under the advice of the Medical Officer temporary nurses must be got from some good neighbouring nurses' institution when needed.

They must be under the immediate control of the Matron so long as they are within the precincts of the Sanatorium, and *must* conform to the rules of the particular part of the establishment to which they may be allocated.

As already stated, it may be necessary to have extra help for linen-washing purposes, but there should be no difficulty in protecting such help from risks of infection.

Sanatorium Accommodation.

School Sanatoria being desirable under some circumstances, and necessary under others, their fitness of kind with reference to the requirements of different classes of schools must be considered.

The classes of schools may for convenience be distinguished by the number of "boarders" they accommodate, irrespective of "day-boys."

I. Schools containing 20 boarders, and not more than 50.

II. Schools containing 50 boarders, and not more than 200.

III. Schools containing over 200 boarders.

Keeping the class figures the same,

I. Requires from 5 to 10 beds.

II. Requires from 10 to 20 beds.

III. Requires beds at the rate of not less than 10 per cent. of boarders.

This percentage of beds is obtained from the direct experience of the Medical Officers of most of our public schools. It is largely higher than the estimate for beds in infectious diseases hospitals in mixed communities; but then, as it has already been stated, it is very important to deal with outbreaks of measles in schools, and in a mixed community it is practically a hopeless task to attempt to deal as specifically with such outbreaks.

In addition to the provision of a couple of general wards, an essential point in the arrangement of school Sanatoria must be provision for the isolation and treatment of two infectious diseases at the same time.

I have elsewhere related an instance of the anxiety and expense occasioned by the neglect of this principle in one of the large public schools,* and other similar cases must be known to many of the members of this Association. The principle of provision for the isolation of two infectious diseases in a school Sanatorium at the same time being admitted, I shall speak in this paper of no plan for a Sanatorium which does not embrace it.

---

* A Plan for School Sanatoriums, *Practitioner*, vol. xxxi.

Among small Infirmaries, I know of none more admirable in arrangement than those which have been carefully described and illustrated by Dr. R. Thorne Thorne,* whose great experience in the uses and management of hospitals is above dispute, and has been permanently established by the records of his investigations.†

School Sanatoria, following the lines of these, should be recognised not so much as houses for the storage of infectious cases, but rather as isolation-buildings arranged in prospect of probable numbers of initial cases, and of those secondary cases which may occur in consequence of the accidental oversight of the earliest sources of personal infection.

Class I.

I have drawn a sketch-plan (A) of what, in addition to an administrative building (E) with two small general wards on the first floor, may be found to meet the requirements of schools of the size indicated.

The general wards may contain one or two beds each.

The infectious diseases wards contain six beds, arranged so that four cases of one disease and two of another can be isolated at the same time, with special isolation of one case more seriously ill than the other; or the whole building can be used in emergency for six cases of one disease. By dotted lines it is further shown how, with very little trouble and expense, the Sanatorium can be enlarged to the extent of three beds more, so as to make a total of nine beds—four for one disease and five for another.

The nurse for each class of disease can have her bedroom on the floor above, to be approached by a small spiral staircase fixed in each verandah.

Class II.

The administrative building and general wards being the same as in the former class, the infectious-diseases wards may

---

* Epidemiological Transactions, N.S., vol. iv.

† Supplement to the Tenth Annual Report of the Local Government Board [c—3290].

be on the enlarged plan (A), or bed-provision may perhaps be better made on the plan of (B).

These two plans are adaptations from those referred to as published by Dr. Thorne in the Epidemiological Transactions. I am directly responsible for the succeeding suggested sketch-plans.

Plan (C) is an adaptation from one that I sketched out for a grammar-school of about 120 boarders. In its present form it is applicable for such a school with the prospect of an increase to 200 boarders. It is practically the same, with the addition of the wards for general and "first isolation" purposes in the administrative portion of the building. I, however, prefer the system of separate buildings.

In the infectious diseases portion there is a permanent provision of eight beds each for two diseases, capable of being temporarily increased for each disease by four beds more, thus making a total of twenty-four beds. Each floor is devoted to one disease: the first floor has a separate entrance from the ground floor by means of an outside iron staircase and small lobby on to which the window-door of the bath-room of that floor opens. This staircase is on the opposite side of the building from the entrance to the ground-floor.

Class III.

The sketch (D) is taken from plans which I published some years ago in a paper to which reference has been made already. It is elaborated to show two extra general wards in connection with the administrative building. The ease with which it can be adapted to the growth of a school is shown in the outline sketch, and for this reason it is probably a more suitable plan in part for the largest schools of Class II.*

The sketches (E) and (F) accompanying this paper may serve to illustrate some of the details of arrangement and construction which need to be referred to.

---

* Since writing this paper, I have seen a useful model plan for a school Sanatorium, which Dr. Clement Dukes, of Rugby School, has just published in a book called "Health at School," published by Cassell & Co.; but personally I feel a strong objection to the nursing in a confined area of several infectious diseases.

The administrative building (E) is meant to be on the same plan for all the Sanatoria depicted.

Plan (F) refers particularly to the wards shown on (D); but the details are meant to be more or less applicable to all infectious diseases wards.

Ward Buildings.

The following matters, though strictly relating to infectious-diseases wards, should be held to include the general wards also, since they will not only be the better for being so constructed, but they are proposed to serve on occasion for the "first isolation" of doubtful cases of illness, which may turn out to be infectious cases, before their removal to the infectious wards.

This is an important matter, as it is being more and more recognised that some of these infectious ailments are contagious in their early stages, however much more they may be in their later ones. This is notably the case with measles, and probably also with scarlet fever and diphtheria.

(i.) *Foundation.* The foundations of the ward buildings may be on the ordinary plan of buildings which have no basements, with a concrete layer and a sufficient and well-working damp-course. But when these buildings consist of one story only—and they are best so—they may be with advantage built on arches in excavated ground (Plan F). When this is done, then the ward level should be raised a step above the general ground level, so that there may be complete circulation of air around, above, and below the whole building. The arches should themselves be built upon a sound foundation of concrete, and the ward joists laid in a bed of concrete on the top of them; they should also be built sufficiently high to enable a man to keep the space beneath them clean and free from rubbish collections.

(ii.) *Building Materials.* These may be of brick or stone as may be most convenient. They should not be of wood or iron, which do not sufficiently resist the extremes of temperature. The walls should be not less than fourteen inches thick, so that an equable temperature may be fairly maintained within the wards. The inner surface of the walls may be cemented,

painted with silica paint, tiled, or faced with glazed bricks, in order that they may be readily and completely cleansed at all times, which could not be the case if the walls were papered. Wainscoting is unsuited to the requirements of a Sanatorium for infectious sicknesses.

The roofs may be sloping and laid with slates or tiles, or else they may be flat and made with cement; but the inside ceiling must always be flat, to avoid projecting beams or the formation of ledges whereon infectious materials may be retained.

The floors of the wards should be laid with well-seasoned wood, the boards being tongued and grooved, and so made as to fit evenly and exactly and avoid having spaces between them in which infection can lurk. The floors should be polished, so that they can be at any time cleaned with a damp cloth, and remove the necessity for the noise of scrubbing and the creation of a damp atmosphere, each of which is likely to be injurious in cases of serious febrile disorders. By the floors being polished, cleanliness and sweetness of atmosphere may be maintained, and these in no way that might be detrimental to the welfare of patients. The polish got from beeswax and turpentine, I can safely recommend from my own experience.

(iii.) *Avoidance of right-angled corners.* It is quite possible to scrape with a penknife from the floor in the corner of an ordinary room an amount of dirt which is often surprising. This, placed under a microscope, is ordinarily perhaps interesting; hospital experience shows that, in its case, the dirt may consist of epithelium, fine threads of lint, and other matters equally suitable for the retention of infection.

A Sanatorium for infectious diseases, or indeed the general wards of any hospital by preference, must avoid the possibility of such a storage of contagium; and this may be done in a simple manner by replacing the right angles, made by walls with themselves and the ceiling and the floor, with quadrants, the concavities of which face the interior of the wards. The curves of the walls with the floor may be obtained by means of curved bricks, or by properly curved narrow skirting boards (Plans A, B, and F).

(iv.) *Windows.* The windows of wards should be as much as possible on opposite sides, and directly facing each other. They should be double-hung sliding sashes for purposes of ventilation, and should not be subdivided unnecessarily. They ought not to be more than three feet from the floor, and should rise to within six inches of the ceiling. An ample window area will be provided if there be one square foot to every seventy cubic feet of ward space; a greater amount of window area will be apt to unduly lower the temperature of a ward.

(v.) *Offices.* These include the closets, the sinks, and perhaps also lavatories, all of which must, under all circumstances, be cut off from direct communication with the wards. For this purpose they may be conveniently placed together under a separate roof, and even if they abut on the ward buildings, yet still they must be cut off from the interior of the wards by a free cross current of air. The plan of grouping is practically the same in all the sketches accompanying this paper, therefore one description will suffice to explain it. The sink and closet are separated from each other by a partition six feet high, and open six inches from the ground. Ventilation above the dummy-wall is obtained through open windows on the opposite sides. In front of the sink and closet is a lobby, through which there is always a cross current of air, and which is built up to the ceiling on all four sides, except in the case of A and B, where this lobby is replaced by an open verandah. The ventilation, therefore, of the room in which the sink and closet are is quite independent of the lobby or verandah-ventilation; the latter are only meant to safeguard the wards from danger, and not actually to ventilate the ward offices.

(vi.) *Arrangement of Interior.* The advantage of having two wards for a single infectious disease has been referred to. It will be found best that the nurse in attendance on the cases of such disease should have her day-room between the two wards, and when in her room she should be able to maintain a constant supervision of them through fixed inspection-windows in the side walls between her room and the wards. Her day-room should not be her sleeping-room also. The

larger Sanatoria allow of further conveniences, than can be given in the smaller ones. An enclosed bath-room can be provided, and, in the largest Sanatoria, a small pantry and temporary linen-press may be added. For large Sanatoria these things are certainly necessary for efficiency of management; the demand for them is not so great in small ones, as the smaller quantity of necessary linen and food at any one time can be easily stored in the nurse's day-room.

The nurses' bedrooms are reached, as in all the plans submitted, by a small spiral staircase, which leads to these rooms only, except in Plan C.

(vii.) *Size of Wards.* It will generally be found very convenient to have wards differing in size. Outbreaks of disease in schools differ in extent, and this is the more likely to be the case when two diseases make their appearance at the same time. Superfluity of space for one disease and inadequacy of space for the other will tend to destroy the whole utility of a Sanatorium as a check to the spread of disease in a school, and it is, therefore, a wise precaution to estimate the probabilities of the school's wants, and to regulate the capacities of the wards in accordance with these probable requirements.

Reserve or general wards for the isolation of doubtful cases of illness until their true nature be determined, may be usefully provided in large Sanatoria, in addition to the general wards in the administrative building; at other times these might be used as convalescent rooms (Plan D).

(viii.) *Height of Wards and Bed-space.* The height of the wards should never be less than thirteen feet; each bed should have 144 square feet of floor-space, and 2,000 cubic feet of air-space allotted to it. The length and breadth of a ward must be calculated so as to let these spaces be evenly distributed to all the beds contained in it, and this calculation should also take account of the desirability of all the beds standing out a foot from the walls of the ward for the free circulation of air around them. This foot of space ought not to be included in the reckoning of square-foot space for each bed.

(ix.) *Warming and Ventilation.* The warming of small wards may be successfully accomplished by means of fire-

places, which are furnished with hot-air chambers, but I have elsewhere recommended, and can now emphasise by experience, the opinion that for large wards—especially where there are beds on two sides—stoves open on two opposite sides and placed in the middle line of the wards are the most suitable for warming purposes.

They distribute heat more equably than do fireplaces, and are besides more efficient as aids to the satisfactory ventilation of the wards than open fireplaces can be made to be at the present day. They create but little dust, and are very easily managed; and, if open on opposite sides, enable a larger number of convalescents to sit by them than can sit before a fireplace.

When fireplaces are in use they may be made to aid ventilation in various ways: when stoves are used their chimneys may be carried through open funnels in the roof (Plan F), and so, by warming the air in the funnels, aid its exit into the outer cooler atmosphere. The air-inlets should be made independent of the windows; there should either be Tobins' tubes, or openings through the walls into the outer air at a height of six feet from the floors of the wards, and protected from downward draughts.

It is also well to have under each bed a ventilating grating (Plan F), which can be shut or opened according to circumstances, so that the ventilation about each bed may be complete and separate. The general complete ventilation of wards may be best effected by throwing open all the windows and doors; but ventilation during the occupation of the wards should be independent of the windows, immediately controllable, and adaptable to particular circumstances at all times.

(x.) *Furniture.* The furniture of the wards and the nurses' rooms should be plain and simple, without fluting or carving. The bedsteads should be of iron, and furnished with a wire-wove spring mattress, and a single additional hair-mattress, so that their cleansing and disinfection may be easily accomplished. The nurses' day-rooms should be furnished each with a small kitchener, for the warming of beef-tea, milk, and the like should be done on the spot, and be under the immediate supervision of the nurse in attendance.

The wards should be furnished with a moveable bath on noiseless wheels, so that it may be brought to the bedside of a patient when necessary, and yet be used in the bath-room under ordinary circumstances. In its regular place it could be made to discharge conveniently over a floor sink.

A thin glazed drugget may be pinned down on the floor when it is particularly desirable to avoid noise in the wards; but no other sort of carpeting ought to be permitted, as it cannot be properly disinfected.

Disinfecting House.

Every Sanatorium should be provided with a disinfecting house, so that all disinfection may be done within the area of the establishment, and it is best placed at some distance from any of the ward buildings.

The recent experiments of Dr. Parsons* on behalf of the Local Government Board, have practically established the fact that the best disinfector is heat, and that the application of this is best in the form of steam under high pressure.

When articles are liable to be injured by steam, they must be subjected to dry heat of 240° F. sufficiently prolonged—from two to three hours at least.

Mortuary House.

It need not be considered necessary to have a mortuary house, as a part of the establishment of a school Sanatorium; but there can, however, be no doubt that it is very desirable to build one when the Sanatorium is of a large size. It may be built adjoining the disinfecting-house, or separately; but it should, like the wards, not be within 40 feet of the boundaries of the Sanatorium site. Its only furniture need be a raised marble or slate slab, and a small sink to which water is laid on.

Printed in accordance with a resolution passed at the Annual General Meeting of the Medical Officers of Schools Association on January 11, 1887.

Alder Smith,
Charles Shelly, } *Hon. Secs.*

---

* Report of the Medical Officer to the Local Government Board, 1885 (C. 4,516).