

Final general report on hospital construction and management / by H. B. Allen.

Contributors

Allen, Harry Brookes, 1854-1926.
Victoria.
London School of Hygiene and Tropical Medicine

Publication/Creation

Melbourne : Robert S. Brain, 1891.

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P. 12217

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1891.
VICTORIA.



FINAL GENERAL REPORT

ON

HOSPITAL CONSTRUCTION

AND

MANAGEMENT,

BY

PROFESSOR H. B. ALLEN, M.D.

PRESENTED TO BOTH HOUSES OF PARLIAMENT BY HIS EXCELLENCY'S COMMAND.

By Authority:

ROBT. S. BRAIN, GOVERNMENT PRINTER, MELBOURNE.

No. 175.—[1s. 6d.]—2478.

APPROXIMATE COST OF REPORT.

Preparation—Not given.
Printing (1,160 copies)

Printing (1,100 copies)

£ s. d.

30 0 0

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REPORT.

University of Melbourne,
2nd November, 1891.

The Honorable the Premier of the Colony of Victoria.

SIR,

I have now the honour to submit for your consideration the Third and Final General Report concerning my visit to Great Britain and the Continent of Europe. I shall in the first place describe briefly modern methods of hospital construction, equipment, and administration; secondly, I shall examine the condition of the Metropolitan Hospital of Melbourne, and make recommendations in relation thereto; and, thirdly, I shall add some brief remarks concerning the management of hospitals.

MODERN HOSPITALS.

(a) THE NEW HOSPITAL AT HAMBURG.

The most perfect hospital which I saw during my travels was the new general hospital at Hamburg, and therefore I propose to describe it in some detail.

Hamburg is well known to be the chief commercial centre and port on the Continent. The main town contains about 300,000 inhabitants; but if the suburbs are included, and the adjacent districts of Altona, Wandsbeck, &c., the population may be estimated at about 470,000. The General Infirmary was first founded in 1606; but it was rebuilt between 1820 and 1823, with provision for 1,000 beds. From time to time additions were made, so that ultimately it contained between 1,300 and 1,400 beds. It was centrally situated, close to the Aussen-Alster, the outer lake formed by banking in the Alster River, which flows into the Elbe at Hamburg. The site—though a huge block, surrounded by streets—was not large enough. The buildings were two stories high, of corridor half-pavilion character. From a vast front building, 343 yards long, four wings ran backwards, enclosing three quadrangular courts, each shut in on three sides. From time to time other isolated buildings and barracks were added, as shown in the first of the plans at the end of this Report.

Even in comparatively recent times this was regarded as an excellent hospital. But increasing knowledge revealed its faultiness. The site was low, and largely surrounded by buildings; the area was too small for the number of patients brought together upon it; the various wards were not isolated from one another; contagia could pass from one ward into another; the closed quadrangles prevented free passage of air; the wards were overcrowded; the ward offices and appointments were unsatisfactory; and proper classification of patients could not be carried out. Admission was granted not only to cases of injury and acute disease, but also to chronic and incurable patients, infirm people, and even lunatics. The average period of occupancy of the beds was unduly high. Hence, after careful consideration, it was determined to build a new general hospital farther from the centre of the town, in more open country, where abundance of space would be available, and to reserve the old hospital for chronic cases, for the infirm, and for a limited number of cases of severe injury or acute disease which could not be transported to the new hospital. As may be seen in Plan II., old and new Hamburg and Altona form three densely-populated towns, closely grouped together on the banks of the Elbe. Garden suburbs extend for several miles around the inner city. The old hospital was at the edge of the inner city, about a mile and a quarter from the Town Hall and Exchange, which are considered the centre. The site for the new hospital was chosen at the outer margin of the garden suburbs, north of the city, nearly three miles from the centre, on the highest ground available. It consists of a block of $45\frac{1}{2}$ acres, forming part of

a State property of 136 acres. The buildings were commenced in 1885 and opened in 1889. They contain 1,340 beds for ordinary use, so that there are slightly less than 30 beds per acre. In the infectious diseases department there are also 126 emergency beds in wooden barracks, and additional beds can be introduced for children when necessary, so that the total number of beds amounts to nearly 1,500.

Some of the chief features of the hospital will be appreciated at once on reference to the ground-plan III. The territory of the institution is self-contained, and surrounded by a large open area. Brick is the general material of construction, bands of fancy bricks being introduced sparingly. The various buildings are arranged with military precision, according to a carefully-devised plan; every department, every ward, is independent, occupying its due place in the scheme, but having no direct connexion with any other part. Covered ways above ground and subways underground have been studiously avoided. In front is the administration block, including the dispensary, the rooms of the resident medical officers, and an excellent medical library for their use. A little to one side is the residence of the hospital steward. Behind the administration block, and approached by an arched entrance through it, lie the various wards arranged in successive rows, abutting on excellent driving roads and paths, the intervening spaces being laid out in lawns and gardens. The pavilions of each row are placed, not opposite, but between those of the adjacent rows. The two first rows of pavilions constitute the surgical department, the operation-house standing in the centre. Three rows of pavilions immediately in the rear belong to the physicians, and in the midst of these is the bath establishment. Behind these lies the infectious diseases department, consisting partly of permanent wards and partly of lightly-constructed wooden barracks. The right half of the entire institution is for male patients, and the left for females; the administration block, the operation-house and bath-house being centrally situated and common to the two sides. On the left of the plan, along one side of the hospital domain, lie the well-appointed residence of the director, Professor Kast, M.D., the laundry, kitchen, boiler-house, and workshops, and then the dwelling-houses of the ward attendants and overseers. At the back, around the area for infectious diseases, is a considerable belt of reserved land. On the other side of the domain, opposite the medical department, lie the house for delirious or insane patients, and the pathological department with its mortuary and chapel. Almost every part of the institution is lit by the electric light, and the various departments are connected with a telephone exchange in the administration block.

The surgical section contains 341 beds, distributed as follows:—On the women's side, three large pavilions (Nos. 4, 12, and 14), each with 33 beds; one children's pavilion (No. 6) with 36 beds; two large isolation pavilions (Nos. 2 and 8), each with 15 beds; one small isolation pavilion (No. 18), with 6 beds; and one paying patients' house (No. 10), with 19 beds—in all, eight buildings, with 190 beds; of which, omitting the paying patients, 148 are in the large wards, 17 in single-bedded rooms, and 6 in the small pavilion. On the men's side there are six large pavilions (Nos. 3, 5, 7, 15, 17, and 19), each with 33 beds; two large isolation pavilions (Nos. 1 and 21), each with 15 beds; one small isolation pavilion (No. 9), with 6 beds; and one paying patients' house (No. 11), with 17 beds—in all, ten buildings with 251 beds, of which, omitting the paying patients, 208 are in the large wards, 20 in the single-bedded rooms, and 6 in the small pavilion. All these pavilions are of one story only, and completely detached from one another.

The eye department is a sub-section of surgery, including two pavilions, with 108 beds. On the women's side, pavilion No. 16 is in two stories, providing for women and children. It contains 72 beds, of which 12 are in as many separate rooms. On the male side, pavilion No. 13 is in one story, with 36 beds, of which 6 are in separate rooms.

The medical department comprises 671 beds. On the women's side there are six large pavilions (Nos. 24, 26, 30, 32, 34, and 36), each with 33 beds; one children's pavilion (No. 22), of two stories, with 72 beds; two large isolation pavilions (No. 28 and 44), each with 15 beds; three small isolation pavilions (Nos. 38, 40, and 42), each with 6 beds; and one paying patients' house (No. 20), with 19 beds—in all, 13 buildings with 337 beds, of which 268 are in large wards, 32 in separate rooms, and 18 in the three small pavilions. On the men's side there are seven large pavilions (Nos. 25, 27, 29, 31, 37, 39, and 41), each with 33 beds; one house for the delirious and insane, with 29 beds; three large isolation pavilions (Nos. 35, 45, and 47), each

with 15 beds; two small isolation pavilions (Nos. 33 and 43), each with 6 beds; and one paying patients' house (No. 23), with 17 beds—in all, 14 buildings with 334 beds, of which 268 are in large wards, 25 in separate rooms, and 12 in the two small pavilions.

The infectious block contains permanent ward accommodation for 120 patients and wooden barracks in reserve for 126 others. On either side (male and female) there are four pavilions—two large ones with 33 beds each, one large isolation pavilion with 15 beds, and two small isolation pavilions each having 6 beds. So that the permanent beds on either side include 44 beds in large wards, 4 in single rooms, and 12 in the two small pavilions. There are two reserve barracks on the women's side and four on the men's, each containing 21 beds.

Of the total permanent accommodation of 1,340 beds, 1,082 are in large wards or large isolation pavilions, 120 in separate rooms, 66 in small pavilions of six beds each, and 72 in the four houses for paying patients.

The rows of pavilions are in general nearly 22 yards apart; and in each row the main walls of adjacent pavilions are separated by the same or a slightly greater distance. The projecting ward offices are 17 yards apart. The one-storied pavilions, which form the bulk of the institution, are nearly 20 feet high, so that the distance between two such pavilions is three and a half times their height. The two-storied pavilions are six in number, including that for eye-diseases of women and children, that for medical diseases of children, and the four houses for paying patients. These are 36 feet high, and their distance from adjacent pavilions is twice their height. The operation-house, bath-house, and house for the delirious and insane are also in two stories.

The pavilions are arranged with their long axes from N.W. to S.E., the day-rooms being at the S.E. end; the sides of the wards are thus fully exposed to the sun when it is brightest and strongest, and the day-room faces the sun directly in the winter time. The prevailing winds sweep along between the pavilions, while the coldest winds pass across them, one building sheltering another.

Each pavilion is complete in itself, having a basement containing its own heating apparatus. Its arrangement will be understood on reference to Plan IV. Its general form is that of a T, the upright being the main ward (84 x 28), the long upper limb including the day-room (28 x 16½), the bath-room (14 x 13), the scullery (8½ x 13), and the closet (23 x 13); while the short lower limb includes three isolation rooms with one bed in each, and the ward-attendant's room (each of these being 13 x 9½). The height of the wards is nearly 16½ feet. Each patient has over 78 square feet of floor and 1,290 cubic feet of air space. This floor allowance is rather small.

The floor of the ward is laid in marmor-terazzo, consisting of moderate-sized pieces of marble set in tinted cement-mortar and rendered smooth. For completeness of cleansing, the margin next the wall is rounded off into a slight gutter in cement, having doubly-trapped drains with tight-fitting covers. Such a floor is impermeable, easily cleansed, and of pleasant appearance. The heating apparatus beneath prevents it from being cold in winter. The walls are rendered with special cement below and with mortar above, and are stained yellowish-brown or grey, with darker oil-colour dado. The roof of the building is almost one with the ceiling; it is laid as nearly flat as possible, and hence the roofing is worked with special wood-cement; the roof is covered with a 2-in. layer of gravel, as a protection from the heat of summer and the cold of winter. The narrow space between roof and ceiling is well ventilated. The ceiling is lightly made of iron, doubly lined with mortar. A low louvre (dach-reiter) runs the whole length of the ward in the centre of the ceiling, having two horizontal and two vertical shutters, easily controlled from below by simple levers.

In the midline of the floor rise two heat chambers, which receive their supply of air directly from the exterior through ventilating passages built into the side walls of the ward. The windows are as large as possible, divided into an upper sash on horizontal hinges, a small middle sash, and a large lower sash with two doors which open freely. The doorways of the ward are wide, and the doors are panelled with clear glass. There is a door on every side, that through the day-room being especially wide, with easy approach from the exterior, so that patients may freely walk or be wheeled in their beds into the open air. A simple bed-carriage is provided, which can be run under a bed, a lever then raising a jointed frame on the carriage and lifting the bed off the floor. Such a carriage is very useful, and costs only five pounds. The

beds are of iron, with simple spring mattresses. The frames for bed-lifts or for suspending broken legs, &c., are of iron, and fit on to the head and foot of the bed. They can be shifted from one side of the bed to the other or removed altogether. The ward tables are made of light metal frames with glass tops. All bandages, medicines, &c., are kept on such glass surfaces under glass covers. A chair made with a minimum of dust space fits under every bed.

With regard to the accessory rooms, the closet room is not cut off from the ward by a special cross-ventilated passage, as all English authorities require; but it is spacious, well ventilated, warmed, with abundant water supply, and water-closets of a good pattern. The closets, three in number, are little rooms at the side of a large apartment (vorraum) in which basins, spittoons, urine glasses, bed-pans, &c., are kept and cleansed. The theory is that the vorraum acts as a cross-ventilated corridor.

The bath-room has tiled walls, with fixed bath and washstands, as well as a bath on wheels, which can be taken to a patient's bedside. It also is kept at a proper temperature. The scullery has all appliances for ward cookery and cleansing.

The large day-room for the patients is an important feature of every pavilion. The side looking into the grounds faces the sun, and is practically one great window. A trifling slope, without steps, leads from it into the grounds. Carriages for the patients are kept here.

At the other end of the pavilion there are three isolation-rooms, each with a single bed, and a room for the ward attendant. These rooms have wooden floors, like the day-room, of oak parquetry in the older pavilions, but of polished pine in those built later. The isolation-rooms are cut off from the ward by a cross-ventilated corridor.

These pavilions are therefore almost perfect. Each one is completely independent; no foul air can enter it from any other ward; even its own accessory wards for special cases are cut off by a cross-ventilated corridor. It is lined everywhere by smooth impermeable non-absorbent surfaces, and can therefore be kept absolutely clean. The sunlight enters freely into every part, the exterior having the greatest possible exposure to direct sunshine, and the ventilation is perfect. The provision for warmth is excellent. A large sunny day-room is available, and the removal of patients into the open air is made as easy as possible. No unnecessary furniture is allowed. All the fittings are impervious and readily cleansed. All medicines and bandages for use in the ward are protected under glass. The general appearance is bright and cheerful, and the ward atmosphere seems as fresh and pure as the open air. The only feature open to possible criticism is the connexion of the closets with the ward, and perhaps an insufficiency of floor space to each bed.

I asked whether the absence of covered ways was not found inconvenient? The reply was that the advantage of isolation was much greater than the discomfort. Again I asked whether substantial facts could be adduced in favour of such complete separation of each ward from every other, and the general limitation of pavilions to one story? The answer was that since the removal from the old to the new hospital, wounds healed in quite a different way.

The isolation pavilions are constructed in much the same fashion, the larger ones having a general ward with fourteen beds, a special room with one bed, and a large day-room. The smaller ones have one room with four beds, and another with two. The amount of floor space and of cubic space per bed is greater than in the ordinary pavilions.

The operation-house (see Plan V.) is a two-storied building. The basement, partly under ground, contains heating apparatus, coal-room, attendant's room, and a bath-room for the surgical staff. The ground floor is approached by a wide path laid at a slope of about 18°. It is divided by a central corridor. On one side is a large operation-room, which projects boldly beyond the general line of the building in a half octagon, walled in chiefly by great windows set in metal frames. The roof of this projecting annexe is also of glass and metal. The floor is in marmor-terrazzo, and carefully drained. The walls and ceiling of the room are of glazed Mettlach tiles, and both walls and floor are warmed by steam-pipes. There are three operating tables, made of metal, with mattresses of composition material, which can be thoroughly disinfected. One of the tables is warmed by a steam jacket. The shelves are of glass, and the instrument tables, washstands, &c., of glass in metal frames. Glass jars of antiseptic fluids for irrigating wounds are borne by a high shelf on the wall, tubes and nozzles from them being attached to a movable support. Great care is taken to disinfect sponges.

A row of seven jars is kept charged with disinfectant solution, each jar being boldly labelled for one day in the week. The sponges used on that day are cleansed and returned to the jar, and remain in the disinfectant for a week before being used again.

For night work three electric lights are provided, with ten loops in each, and also a splendid Siemens' gas light in case the electric light should fail at any time.

Behind this operating-room, and forming an extension of it, is the instrument department, case following case with narrow passages between. Each case has a basement consisting of deep metal drawers lined with glass, containing bandages for immediate use; with an upper case of glass set in a light metal frame, in which the instruments are exposed to view on glass shelves. A doorway leads from the back of the instrument-room into a large magazine of splints, bandages, and dressings; the sterilized dressings are preserved in suitable bags. All splints are moulded of a composition material, which permits thorough cleansing and disinfection.

On the opposite side of the central corridor there is a second operating-room resembling the first, except in that it is reduced in size, a vestibule for the administration of anaesthetics being walled off from it. This operating-room is reserved for abdominal sections, but may be utilized in any emergency. Behind it are two waiting-rooms, and a modelling-room for making plaster casts, &c.

The upper floor contains a bandage factory, furnished with a Rietschel-Henneberg's sterilizing machine, the main bandage store, the office of Professor Schede (the chief of the surgical department), with a waiting-room, and an examination-room furnished with microscopes and all necessary apparatus.

The small pavilions nearest to the operation-house are reserved for cases recently operated upon. The isolation pavilions at the borders of the surgical section are used for cases of phlegmonous erysipelas, &c.

The general bath-house is a two-storied building with a basement. On the ground floor there is a complete installation of the Turkish bath, with sudatorium, tepidarium, lavarium, and frigidarium. Douches are provided of all kinds. There is also a steam bath and a well-equipped electric bath. Rooms are set apart for the physician in charge and the attendants. On the upper floor there are two large rooms with baths of permanent construction, in which patients can be kept for days in water at a constant temperature, the water being medicated as desired. These are called water-beds, the patients being supported in a comfortable frame. There are four such baths for men and four for women. Isolation-rooms, rooms for male and female attendants, and utensil rooms are provided. Such bath-houses are important elements of the great German hospitals.

The house for the delirious and insane contains on the ground floor two wards with their offices, and on the upper floor two wards, one isolation cell, and a day-room. An annexe at the back contains six cells.

Each of the houses for paying patients is divided into rooms with one or two beds, with a large drawing-room for the patients, and with a parlour and bed-room for one of the medical officers.

In the section for infectious diseases, separate pavilions are reserved for diphtheria, for whooping cough, for scarlatina, &c. There is also a specially enclosed department for cholera. In the absence of cholera, this department is used for convalescents. The disinfection-house is being re-fitted with apparatus of the most recent type.

The pathological department is excellently organized. The basement contains the mortuary, the stores, the warming apparatus, a room with apparatus for making frozen sections, and a room in which small animals are kept for pathological experiments. On the main floor is found the *post-mortem* room (52 x 31) with marmorterazzo floor, with high-tiled dado and cemented walls above, and with huge windows on three sides. All the fittings are metal-framed, with glass tops, except the nine tables, which are of oak, supported by frames of iron, with wash-dishes of metal attached to them. Lifts connect this room with the mortuary beneath. Adjacent to it are two rooms for microscopic work—one for the chief of the pathological service, and a very large one for his assistants. There is a private work-room for the prosector, and separate laboratories, well-equipped, for chemistry, bacteriology, and experimental physics. All matters from the wards which need examination are sent at once to the proper laboratory. Connected with the pathological department, but approached through a separate court-yard, is the chapel, adjoined by the vestry, with a room for the mourners, a room where the bodies of deceased patients are viewed,

retiring-rooms, &c. All the arrangements in this part of the institution are dictated by a thoughtful consideration which is often wanting in British hospitals. The viewing-room is soberly tiled throughout, and is decorated with plants growing in tubs and pots. No repulsive coffin-carts are seen anywhere. The conveyances which take the dead from the wards to the mortuary are built just like the ambulances for the living. The drainage of the pathological department passes into a cylindrical tank, and is thoroughly mixed with lime by a simple apparatus; after such purification it is allowed to escape into the sewers.

In the kitchens there is a room for baking and roasting, and a separate room for soup, broth, &c. Each soup boiler is used three or four times a day, and carefully cleansed each time. All scullery work, such as dish-cleaning, is carried on quite apart from the preparation of vegetables. There are casinos for the hospital attendants in connexion with the kitchens.

The laundry has tanks for preliminary soaking under the influence of steam and soap, with disinfectants when necessary. In another room are the rotating steam-washers, then the cold-water sinks, then the drying machines. In another room the mangling and folding are done; in another a staff of machinists is at work mending. Next come the stores. All clothes sent to the laundry in the morning must be finished the same day; thousands of pieces are cleansed daily. There is a special mill of wooden rollers, with a tank of disinfectants, for the treatment of woollen fabrics such as blankets.

The electric light department is very complete. There are three motors. A signal service shows whenever lights are turned on or off in any part of the institution.

When the hospital was first opened difficulty was experienced in the conveyance of patients from various parts of the city; but now there is an excellent ambulance service, with carriages at all the police stations. The police department administers this service.

This hospital—so complete in its organization, so excellent in all its equipment—was erected at a comparatively small cost. The city purchased an area of 136 acres for £39,400; so that the hospital site of $45\frac{1}{2}$ acres would represent about £13,130. For the building the total grant amounted to nearly £253,500; hence, dividing this sum by 1,340, the number of ordinary beds, not counting the 126 beds in the barracks and other emergency beds, the cost of building was £189 3s. per bed. The furnishing cost £47,378, or £35 7s. per bed. The total cost for building and furnishing was, therefore, £224 10s. per bed. Each large pavilion cost for building from £2,400 to £2,785, or from £72 14s. to £84 7s. per bed.

As far as possible all patients admitted to this hospital pay something towards the cost of their treatment. The usual payment is eighteenpence per day. Servants are commonly paid for by the clubs to which they belong. Special paying patients pay from half-a-crown to nine shillings per day. The balance of the annual cost is supplied by the municipality of Hamburg.

The Krankenhaus Collegium consists of Senator G. Von Melle (president), Senator Dr. G. Hachmann, Herr Lappenberg (finance deputy), six provisors, and the registrar, Dr. Muller.

The hospital staff consists, in the first place, of Professor Kast, the director, and Herr Schultze, the pastor. Four senior physicians are in charge of divisions of the medical service, Dr. Kast being one of them. Schede is head of the whole surgical department. Mannherdt controls the ophthalmological sub-section, and Fraenkel the pathological branch. There are two physicians of second rank, and fourteen assistant medical officers. There is no medical school attached to this hospital. The members of the staff wear a white uniform of washable stuff when on duty.

THE KRANKENHAUS AM URBAN AT BERLIN (S.)

This is an example of what can be done on a small site. The land is a self-contained oblong block, measuring a little over six acres. The number of beds is 572. The general arrangement is shown in Plan VI. The administration block is in the centre of one of the narrow sides, and is flanked by two small detached pavilions. Four large pavilions on either side run from the long sides of the oblong towards the centre, leaving a wide mid-space, in which the operation-house and an isolation pavilion are placed. The pavilions are two-storied, with a third

story over the day-rooms. At the end furthest from the administration are the boiler-house, the general economy department, the bath-house, and the pathological department. The pavilions along one side are for males, and along the other for females. The outer ends of either series are connected by covered passages, and the inner ends are connected by a subway which passes to every part of the institution. There is a staircase at each end of every pavilion. On each floor the main ward has no less than nine accessory rooms, six at the inner end, and three at the outer (day-room, bath, and closet); but the arrangement of them is not so good as at the new hospital at Hamburg. The details of construction and equipment are most excellent.

As at Hamburg, great pains have been taken to have all surfaces—whether of floors, walls, ceilings, or fittings—impervious, smooth, easily cleansed. In the boiler-house there is a large Rietschel-Henneberg disinfecting machine. Small sterilizing stoves are provided in the operating-house and each of the surgical pavilions. The warming of the whole institution is effected from a central station. The electric light is installed throughout. The cost of building and furnishing was £155,000, or £271 per bed. All the patients pay according to their means, the average payment being 1s. 8d. per day. The hospital is, as usual in Germany, a municipal institution controlled by a municipal board. The yearly cost is £23,600. The average number of occupied beds is 450; the annual cost per occupied bed is £52 9s.

THE FRIEDRICHSHAIN HOSPITAL AT BERLIN (N.E.).

The Friedrichshain Hospital, in the north-east of Berlin, is not of so recent construction. It was opened in 1874. It stands on a block of $23\frac{1}{2}$ acres, and is surrounded by park land. The normal number of beds is 620, the possible number 700, the actual average 655. The surgical pavilions are one-storied, the medical two-storied. They are completely disconnected. The total cost, excluding that of the land (which belonged to the municipality), was £235,925, or £360 per bed. The plans and description of this hospital may be seen in Mouat and Snell's work on Hospital Construction and Management. The charges paid by ordinary patients are: Adults, 1s. 9d. per day; children, 1s. 3d.; for beds not pertaining to the Berlin Commune, 2s. 6d. and 2s. respectively.

Concerning annual income and expenditure: In 1889-90 the receipts in patients' fees, burial charges, &c., amounted to £11,964. The expenditure for all purposes was £32,140. The net cost for the year, as paid by the municipality, was therefore £20,176. The gross cost per bed per day was slightly under 2s. 9d.; the receipts per bed per day were slightly over 1s.; the net cost per bed per day was under 1s. 8½d.

An immense amount of information concerning the hospitals and sanitary institutions of Berlin and of Prussia generally is published in *Die öffentliche Gesundheits- und Krankenpflege der Stadt Berlin* (Hirschwald, 1890) and the *Anstalten und Einrichtungen des öffentlichen Gesundheitswesens in Preussen* (Springer, 1890), copies of which were kindly given to members of the last International Medical Congress. A description of the new hospital at Hamburg may be found in the *Mittheilungen über das Neue Allgemeine Krankenhaus zu Hamburg-Eppendorf*, published in 1889 by Vieweg, of Braunschweig. Vieweg also published the detailed plans and specifications in several volumes. It would be well if a set of these could be obtained for the Public Library.

THE NEW HOSPITAL AT HAVRE.

The most approved methods of hospital construction in France are to be seen, not in monumental blunders like the Hôtel Dieu and the Lariboisière of Paris, but in such institutions as the new hospital at Havre. This is situated outside of the closely-built city on an area of sixteen acres, which includes the upper slope and crest of a considerable hill. It contains 312 beds. The sick are housed in brick pavilions of one story, thoroughly isolated from one another, with abundant exposure to sun and air. Each pavilion has a basement, which contains the warming and ventilating apparatus and stores, and which is also utilized as a covered promenade, with dining-room, reading-rooms, &c. At the ends of the main floor are two wards with fourteen beds in each, and in the centre are the accessory rooms, including three rooms with single beds, a bath-room, a ward kitchen, and in the surgical pavilions a small operating-room. The water-closets are in an annexe built out on one side of this central service department, while on the other side there is a wide verandah to which

patients can be removed. The wards are built so that the transverse sections form a pointed arch or ogree; the corners of the wards are rounded off; the floors are laid in mosaic, and the maintenance of perfect purity of all surfaces is made as easy as possible. The sweepings are passed by protected shoots into the basement, to be burnt in the calorifers. Warm air from the calorifers is passed into each ward in winter through two openings in the floor and two in the wall. The used air is removed by exhausts, which open at the sides of the doors and lead into lateral chimneys, enclosing also the smoke flues from the fires in the basement. In the centre of each ward there is also a double open fire-place with central flue. For summer there is a separate system of ventilators in the roof, driven by a special apparatus in the basement. The walls of the pavilion are double, having a thick outer and a thin inner brick lining, with an intermediate air space of $2\frac{1}{2}$ inches. The electric light is installed throughout. In the pavilions for males, dormitories for the servants are provided above the central ward offices.

Special provision is made for paying patients in separate buildings. There is a complete hydro-therapeutic department, with baths of every description. A large machine for disinfecting by dry air at 130° centigrade, and afterwards by steam, supplies the requirements both of the hospital and of the city.

Over the crest of the hill, and separated from the main hospital by a belt of timber, are two pavilions for infectious cases, each broken up into two wards with four beds in each, and three rooms with single beds. Opposite these, but a considerable distance away from them, is a third pavilion with 23 beds, which in emergency would be used for infectious diseases, but which in ordinary is devoted to the convalescents.

The cost of the hospital was £75,000, including land £19,000, building £48,000, fittings £8,000. The cost per bed, excluding land, was under £180. This hospital is inferior in many ways to the new hospital at Hamburg; but it furnishes a laudable attempt to carry out, at a minimum cost, the same principles which the authorities at Hamburg wrought out almost in perfection. The closets are better placed than in the new German hospitals. But I was not pleased with the results of the artificial system of ventilation. A brief description, with plans, may be found in the *Notice sur le Nouvel Hôpital*, published at Havre in 1885, at the "Imprimerie veuve Foucher jeune, Rue Thiers 30."

NEW HOSPITALS AND INFIRMARIES IN GREAT BRITAIN.

ST. SAVIOUR'S UNION INFIRMARY, EAST DULWICH GROVE, CHAMPION HILL.

This is an excellent example of the infirmaries recently built under the auspices of the Local Government Board. It contains 786 beds, and consists of three-storied brick double pavilions on an irregularly quadrilateral site, six acres in extent. The main entrance from East Dulwich Grove is flanked on one side by the porter's lodge, and on the other by the receiving wards, in which dirty patients are bathed, &c. Facing the entrance is the administration block, with lateral wings projecting forwards and backwards. One of these wings contains on the ground floor the quarters of the medical superintendent, Dr. Gross, and his family; while the other contains the matron's apartments and the committee-room. Upstairs in the wings are the chapel, the nurses' quarters, &c. The kitchen is inserted between the posterior wings, with a court between it and the administration department.

On each side of this central block are two double pavilions, three stories high; and, owing to the sloping surface of the ground, some of these are partly or wholly raised on brick arches. A central corridor connects the different pavilions with one another and with the administration department, the corridor on the ground floor being enclosed, and well supplied with doors and windows, while the corridors between the upper floors are protected only by a low wall or balustrade. A small operating-room opens off the main corridor between the central block and one of the adjacent pavilions.

To the rear there is a block containing the boiler-house, workshops, and laundry, with a detached disinfecting chamber; and far away in a corner of the grounds is the mortuary.

The administration department is well fitted and furnished. Some complaints were made of extravagance in this respect. The passages are tiled in patterns. The committee-room is decidedly ornate in its equipment. In connexion with the nurses'

quarters there is a large and comfortable sitting-room. The kitchen is furnished with gas-roasters, steam warrener, four beef-tea tanks, and a small range.

Each pavilion consists on each floor of two large wards running front and back from the central corridor. In immediate connexion with the corridor lie^(a) the general staircase, surrounding^(b) a large bed-lift; ^(c)a large day-room with bow windows (common to the two wards), and ^(d)a duty-room, and ^(e) separation-room for each ward. Two service-lifts are provided. The wards have polished wooden floors, cemented walls painted with dark dado and with lighter colour above, and white cemented ceiling. The cementing is not altogether satisfactory. Each ward has two central stoves, with inlet and outlet passages laid in sand under the floor. Hot-water pipes also run round the wards opposite valved inlets for air. The nurses cannot control these air-warmers as fully as one could desire. The windows have the ordinary sashes with vertical movement, and a hinged sash above without any lateral guard. Each ward, as a rule, contains 28 beds; but some have only 24, and others as many as 32. The regulation air space per bed is 850 cubic feet, but most of the inmates have 1,000 cubic feet. At the corners of the ward farthest from the corridor there are two quadrilateral annexes—one, which opens directly into the ward, being the bath-room, while the other contains the water-closets—separated from the ward by a cross-ventilated corridor and double doors. The closets have too much woodwork, and the corridor is too narrow. At this end of the ward, also on every floor, there is a balcony, approached through three double-casement doors. Where the corridor joins the pavilions separate closets are provided for the nurses, but these are considered unnecessary.

Every precaution is taken against fire. The combustible material is as little as possible. In the lift chambers all the materials are incombustible. The stairways are of stone. Hydrants and fire-buckets are in readiness in the various blocks and floors.

The food from the kitchen is carried round on trollies, with indiarubber tires to the wheels. Dirty clothes, coals, &c., are conveyed on trollies along a subway under the main corridor.

The cost of the entire institution was between £120,000 and £130,000. Of this, £11,000 was expended in purchase of land; the contract price for building was £75,000; the estimate for fittings and furniture was £10,000, but was greatly exceeded. Excluding land, the total cost was about £150 per bed. The death rate in 1888 was 15·22 per cent. and in 1889 17·20 per cent., the chief causes of death being bronchitis, phthisis, and heart disease. Many cases came in moribund. No police cases are admitted. On each floor of each pavilion there is a sister, with two or three day nurses and two night nurses.

This is an example of the most recent methods of cheap union infirmary construction. The site is too limited; the pavilions are too close together, with too many stories; the beds are somewhat too crowded; the closets not sufficiently isolated; but still it shows how close an adherence to modern principles of hospital construction can be obtained in England at a minimum cost.

I am indebted to Mr. Gordon Smith, the architect to the Local Government Board, for a copy of the plans and elevations.

I also visited the St. Marylebone Infirmary, which is a somewhat older institution, opened in 1881. Here the general arrangement is much the same. The closets and bath-rooms are completely isolated from the wards. The general appearance is somewhat more ornate. The cost per bed was £161. In its excellences and its defects this infirmary closely resembles that just described. A description, with plans and elevations, is given in Mouat and Snell's work on Hospital Construction and Management. I am indebted to Dr. Gross, of the Dulwich Infirmary, and Dr. Lunn, of St. Marylebone, for their courtesy in conducting me over these institutions.

THE GREAT NORTHERN AND CENTRAL HOSPITAL, HOLLOWAY-ROAD, NORTH LONDON.

This hospital is worthy of careful consideration. The site is very limited, and is also irregular; hence a peculiar design has been adopted, including both oblong and circular wards. The restricted space has rendered several stories necessary. The utmost care has been taken to isolate the different wards from one another and from the closets and sinks, and all the details have been worked out with peculiar excellence. The out-patient department is a model of careful organization, and even the mortuary is not without interesting features. I am indebted to the architects

(Messrs. Young and Hall, of Southampton-street, Bloomsbury) for plans of the hospital, and in especial to Mr. Keith Young, who, with Dr. Beale, conducted me through the buildings. The general arrangement will be understood on reference to Plan VII. and the descriptive references facing it.

Hitherto the administration block in front and the block of circular wards behind are unbuilt. At present the institution consists of the central block, marked 2 and 3 in the plan, and the block of oblong wards connected thereto by a short corridor. The out-patient department and mortuary lie in a separate court, immediately behind and to the right of the block of oblong wards.

In the first place, I will briefly describe the block of wards which has been erected. It consists of a ground floor, first floor, and second floor, with an open arched sub-space. On each floor there is one ward, 88ft. x 29ft., with twenty beds. The corners of the ward are rounded off, and the walls are rounded into the floor. The doors are lofty. The windows alternate with the beds; the sills are of impervious material. The corners of the window-frames are rounded off, to prevent lodgment of dust. Simple stops are introduced to keep the windows open at any height; the upper sash hinges inwards, and is guarded laterally by a light iron frame, to prevent down-draughts. The floors are first laid in concrete, and then covered with a thin oaken parquetry under an inch in thickness, laid with a preparation of mastic. There are two stoves in the mid-line of the ward, with pipes leading from them on either side, under the floor, to lateral shafts attached to the outer wall of the ward. All gas and water pipes are exposed.

At the far end is an annexe, separated from the ward completely by double doors and a cross-ventilated passage. This annexe contains on one side two water-closets of plain but excellent make, in porcelain, with removable wooden seat; any fouling or leakage must show at once. On the other side is a sink-room, with a cupboard built into the wall and ventilated outwards, in which to keep excreta for examination during the visit of the medical officer. At the end of the annexe is a large bath-room.

At the hither end of the ward is a duty-room of convenient size (14ft. x 12ft. 4in.) and an isolation-room with one bed; between these a passage leads into the main corridor. Many conveniences for the ward are provided here—a small pantry, a linen-room, a little room for the patients' clothes, and, in a small annexe at the end of the corridor, a service-sink and nurses' closet, cut off by a cross-ventilated passage with double doors. In front of the corridor, opposite the ward, there is a balcony to which patients can be removed. Trucks are provided, by which patients in bed can be moved easily from place to place.

Each flat of this ward block is completely cut off from the other flats, and is connected with the central block by a cross ventilated corridor only.

When the circular wards are constructed, their fittings, annexes, service-rooms, and connexions will be exactly similar to those just described, and the number of stories will be the same. Each ward will be 57ft. 6in. in diameter, with central stoves and shaft, and, like the oblong wards, with twenty beds.

The central block contains on the first floor the operating theatre, with surgeons' room, ante-room, and waiting-room, and in immediate connexion with the theatre are the patients' lift and the main staircase. On the other side of the central corridor in this block are six bed-rooms, and adjoining the corridor there are two service-lifts. On the ground floor, the rooms beneath the operating-room comprise a dining-room and a sitting-room for the nurses, with pantry and sink; while on the other side of the corridor are the surgery, with two retiring-rooms, and the consultation-room.

The administration block, which is not yet built, will provide on the ground floor offices for the managers, the secretary, and the lady superintendent, and sitting-rooms for the resident medical officers, clinical assistants, and secretary. On the first floor will be nine rooms with one bed each, and two rooms with two beds each, for paying patients, the lady superintendent's private rooms, with bath-rooms, pantries, closets, &c. The second and third stories will be similarly arranged.

The out-patient department (Plan VIII.) is extremely well designed, but it is much cramped for space, being squeezed into immediate contact with the annexe of the great block of oblong wards. The mortuary is also well planned, but is pushed into a corner of the tiny court-yard of the out-patient department.

Two entrance doors (1 and 2) lead the out-patients into waiting-rooms for new cases, one for men (3) and one for women (4), between which is the office (5) of the out-patient clerk, who gives the necessary papers and instructions. The patients then pass into the main hall (6), and take their seats at the end of the queue of cases. At the other end of the hall four doors lead into four consulting-rooms, each of which opens into a small special examination-room. In the centre, opposite the end of the hall, is a dark room (11) communicating with two of the consulting-rooms. This is used for the examination of the eye or throat. A set of bells and signals indicate when a medical officer is ready for another case. The four sets of rooms are apportioned as follow:—One for the surgeons (7), one for the physicians (8), one for diseases of the eye, diseases of the throat, and for the dentist (9), and one for the obstetric physician and for diseases of women (10). Never more than two of the rooms are in use together. Patients for either room occupy seats on the corresponding side of the hall. Well-fitted retiring rooms are provided. Charitable ladies sell simple refreshments, especially tea, at minimum prices at a table in the hall. Patients who have received their prescriptions do not return into the main hall, but pass out at the other sides of the consultation-rooms into a narrow corridor (12), which leads to the dispensary waiting-room (13). After obtaining their medicine from the window of the dispensary (14), they pass out into the court-yard by a separate exit (15), which also enables the medical officers to pass to or from their consulting-rooms without difficulty. From this passage, an ante-room (16) leads to the offices of the medical electrician (17 and 18).

The pathological block (Plan VIII.) includes the mortuary (1), from which one door leads into a viewing-room (2) nicely walled with tiles, and another door into the *post-mortem* room (3). From this, another door leads into a passage opening into the registrar's room (4) and the museum (5). There are separate entrances from without to the mortuary, the viewing-room, and the scientific department. The museum serves also as the curator's work-room, and is furnished with a good microscope by Leitz, with oil immersion lenses, and with incubators and other appliances for bacteriological work.

This hospital is a model of excellence in details. But it is spoilt by the crowding of the parts together. No excellence in construction can atone for the radical evils which must arise from building on a site too small for the number of beds.

A similar criticism applies to the otherwise admirable hospital at Hastings built by the same architects. This is erected on a small site, with steep slopes. It consists of a central block (containing the administration department, the living rooms of the staff, and special small wards), connected at either end by a cross-ventilated corridor with a circular ward 42ft. 8in. in diameter. These wards contain twelve beds each, and are in three stories. The administration block is connected in the rear by ventilated corridors with isolated separation wards on each floor.

MIDDLESEX HOSPITAL (LONDON).

The new Pathological Department.

Owing to limitation of ground space this has been built with a basement and two upper floors, and is approached from the hospital by a subway. The basement contains the mortuary, which is provided with cleansing apparatus. The ground floor is devoted to the viewing-room for the friends of deceased patients. The walls are tiled, and the floor is in impermeable marmor-terazzo. On the upper floor is the *post-mortem* room, also with tiled walls and marmor-terazzo floor. The corners of the walls are rounded off, both into one another and into the floor. The tables are of Belgian marble, with deep lateral channels discharging into a central drain along the floor of the room. This drain is covered by a removable grating, and commanded by a flushing tank on the wall. There is a water jet over each table connected with hot and cold taps on the wall. The hot and cold water-pipes join together soon after passing the taps. Marble tables, excellent sinks, and a well-designed instrument case all contribute to the cleanly management of the room.

THE LIVERPOOL ROYAL INFIRMARY.

The new Royal Infirmary at Liverpool, opened by the Duke of Clarence and Avondale on 29th October, 1890, is an excellent example of the corridor-pavilion hospital. It is in the centre of the city, in immediate proximity to the medical school.

The site of the old infirmary has been used, but enlarged by taking in an adjoining thoroughfare and a strip of purchased land beyond it as far as the next main street. As the rough plan (IX.) shows, it consists of an administration block facing Pembroke-place, from which a connecting corridor and then a terrace run backwards to join a great main corridor running transversely. This main corridor is 12 feet wide and 324 feet long. The wards are arranged in six blocks, running north and south from this corridor. The three south wards and the central north ward (which adjoins the connecting corridor) are of oblong form, while the lateral north wards are of circular pattern. The operating theatre and the lecture theatre are connected with the main corridor on its north side between the central and eastern blocks. The mortuary, the laundry, and the nurses' home are at the extreme eastern edge of the hospital site, and are connected by a covered way with the main corridor between the wards. The out-patient department and the dispensary are in the basement, or ground floor, under the northern central ward. The chapel is on the ground floor, and is entered from the west end of the main corridor. The basement of the central south ward has been equipped as a recreation hall.

The administration block comprises five stories. The ground floor is devoted to offices—the first floor to the officers of the staff, the second to the lady superintendent and nurses, the third to the maid servants, and the fourth to the kitchen and its adjuncts.

The ward blocks have a basement and two ranges of wards above. The wards on the first floor are reserved for females, and those on the second floor for males. The oblong wards, as a rule, are 134ft. long, 28ft. wide, and 14ft. 6in. high, and accommodate 32 patients each. But those on the first floor in the south-eastern and south-western blocks have been curtailed so as to provide in the former a number of small wards for paying patients and for sick nurses, and in the latter (which is the gynaecological department) two special operating-rooms and separate rooms for operation cases. The circular wards are 56 feet in diameter, and contain 18 beds each. Every ward has at the end next the main corridor a number of service-rooms, including a bed-room for the head sister, a scullery, a room for the doctor (in which he makes special inquiries, examinations, or notes), a separation ward with two beds, a sitting and dining room for convalescents, and a small room with galvanized iron racks for patients' clothes. At the other end of the ward furthest from the central corridor are one or two towers, isolated from the ward by cross-ventilated passages and doors. In the southern blocks these towers are two in number, one at each corner—one containing the bath-room and the lavatory, the other the closets and urinals. A balcony is built in between the two towers. In the northern blocks there is a single terminal tower, mesial in the circular wards, lateral in the oblong central ward, so as to allow in this case also the provision of balconies. Bath-room, lavatory, and urinals are brought together in this single tower.

As regards details of construction, the infirmary is built of local grey brick, with dressings of Ruabon terra-cotta, and roofed with Westmoreland slate. All the wards and corridors are lined with glazed bricks of various colours, skilfully arranged; in the corridors a specially light effect has thus been attained. The ceilings are of Keene's cement. The floors are of waxed and polished oak, laid on concrete. In the wards the windows are very large, the windows alternating with the beds. The wards are bright and cheerful. At night the wards are lit with gas, but possibly the electric light may be introduced. The warming of the wards is effected by central fire-places with central chimneys, which are enclosed in extracting ventilating shafts. Provision is made at the top of the buildings for warming the air in these shafts. There are two central fire-places in each long ward, and one in each circular ward or short oblong. Steam-pipes are also fitted throughout the institution. The windows in the disconnecting passages leading from the wards to the towers are louvred, so as to insure a constant current of wind. The closets are wash-out basins, with polished hinged seats. The flush empties itself when once the chain is pulled. Special provision has been made for the emptying and cleansing of bed-pans; and a cupboard, ventilating outwards, has been constructed in the wall, in which to keep excreta for inspection by the medical officer.

The operating-room is on the second floor, and is splendidly lighted. There is a gallery for the students; a room in which anæsthetics are administered; an ante-room, with lavatory, &c.; and also a small operating-room, with special light, for delicate or prolonged operations. On the first floor, under the operating-room, is the

lecture theatre; hence it is not necessary to use the operating theatre as a clinical lecture-room. As already mentioned, there are special operating-rooms in connexion with the gynæcological department.

The chapel is the only part of the institution in which money has been spent for purely decorative effect. It is tiled throughout in subdued colours. The cost of the chapel was defrayed by special subscriptions.

At the intersection of the main corridor with that which leads to the administration block lie the central staircase and lift. A tramway runs from the kitchens in the highest flat of the administration block to the head of this lift. Other staircases and lifts are provided in suitable places. The kitchens are worthy of special study, but space will not permit me to describe them here.

The total number of beds in the hospital is 290. The cost of building was about £110,000; that of the furniture about £10,000; and the cost of land, charges, extras, &c., was, I understand, about £50,000. The total expenditure was, therefore, about £170,000. The building and furnishing alone amounted to at least £400 per bed. The *Lancet* speaks of the infirmary as—"Characterized on the one hand by the absence of all unnecessary external adornment, and on the other by an excellence and a completeness of internal arrangement, which make the new institution at once one of the cheapest and most perfect hospitals in the kingdom."

I question greatly the propriety of building corridors between the pavilions, at all events on the scale adopted in this infirmary. The *Liverpool Daily Post* describes the main corridor as a magnificent passage, forming a striking feature of the interior, and giving one an idea, from its loftiness and grandeur, of the *Salle des Pas Perdus*. Such corridors add very greatly to the cost of construction. They are not absolutely necessary, as is shown by the experience of the new hospital at Hamburg, in which the pavilions are completely detached, though the winters are severe. A lightly-constructed passage on the ground floor, with open galleries above, would certainly fulfil all requirements. Corridors like those found in the Liverpool Infirmary defeat, in some measure, the primary purpose of the pavilion system, by establishing communications between the wards and encouraging traffic between them. The great corridor at Liverpool was, in my experience, draughty and cold, with patchy heating from the steam-pipes.

Objection may be taken to the great multiplication of small rooms, especially in connexion with some of the pavilions. When paying patients are admitted, it is better, in my opinion, to have them in a separate block, so that their rooms may not complicate the general system; that a separate resident medical officer may be in charge of them; and that they may, without difficulty, call to their aid such special medical attendants, whether on the staff or not, as they may desire.

It was interesting to compare the oblong and circular wards. The latter look less monotonous, the beds are seen at various angles, the large central shaft breaks up the view, and hence the barrack-like appearance of the oblong wards is absent. Yet the unbroken openness and the preciseness of the ordinary oblong ward are not without their advantages. I questioned one patient who was indicated to me as having been transferred from an oblong to a circular ward. He complained of the draughtiness of the latter, and said the air streamed unpleasantly from all sides towards the central fires and ventilation shaft.

In all other respects, and especially in all matters of detail in construction and equipment, the new infirmary seemed most excellent. Not the least gratifying circumstance connected with its construction is the long list of contributions, including separate gifts of several thousand pounds, with a long succession of single thousands, column after column of hundreds, and smaller amounts in great numbers.

OUT-PATIENT WORK.

The vast increase of the out-patient departments in various hospitals in Great Britain has caused serious anxiety. At Birmingham it has led to the appointment of a special commission, whose report has already been published. Great numbers of persons present themselves in these departments who ought to provide for themselves by contribution to provident dispensaries or other self-supporting medical relief clubs. The crowds of patients who attend cannot be adequately examined or properly cared for. The fraction of time which can be given to each is very often pitifully small. Yet medicines are dispensed without stint, and sometimes costly drugs, with the

minimum of probability that any substantial good will be done. Patients drag on from week to week and month to month in such attendance, the strong losing valuable time in waiting, while the weak are perhaps made worse by the exposure entailed.

It is difficult to utilize the out-patient departments for teaching purposes. At St. Bartholomew's the mass of the sick who crowd into the main hall are dealt with in the simplest fashion by the medical officers of the surgery and the junior students. A limited number of male and female patients, chosen partly on account of their suitability for teaching purposes, are sent daily into the out-patient department; and these are thoroughly examined by the senior assistant physicians and surgeons, in presence of the senior students who are preparing for their final examinations. Here the work and the teaching are of the most admirable character. But the excellent results attained depend altogether on the limitation of the number of cases by this method of selection.

At Westminster Hospital, lists of provident dispensaries are posted conspicuously in the out-patient rooms.

THE JOHNS HOPKINS HOSPITAL, BALTIMORE (U.S.A.).

Though, to my great regret, I was unable to visit America, I think it wise to include in my report a brief note concerning the Johns Hopkins Hospital at Baltimore, as it incorporates one of the finest conceptions of what a modern hospital should be. When I found that I could not see this institution, I sent to America for a copy of the splendid descriptive work prepared by Dr. J. S. Billings, and published by the hospital in 1890.

The whole fund for building and endowing this hospital was provided by Johns Hopkins, a member of the Society of Friends, who also, in his will, provided for the subsequent creation of a university of the highest order, with which the hospital would be in intimate relations.

The site is lofty, with facilities for drainage, and consists of a parallelogram measuring 856 feet by 708 feet, with an area of about fourteen acres. As shown in Plan X., the main, or west, front consists of an administration block in four stories, flanked on either side by a detached pay pavilion in two stories, with a basement. All architectural features are concentrated in these departments, the other buildings having plain exteriors.

A main corridor runs crosswise along the back of the administration block to the nurses' home on the extreme south and the kitchen on the north. Branches of this corridor pass forwards to the basement of the paying pavilions on either side, and to the apothecary's house, which is in the centre immediately behind the administration building. Behind the apothecary's house is a great central quadrangle, laid out as a garden. This will be flanked on either side by a series of five pavilions, but only those of the north row have yet been built. Each pavilion consists of a basement, containing heating apparatus, &c., and of a single ward with its accessory rooms. The basements are traversed by a corridor running east from the main corridor behind the administration; and under the corridor there is a pipe tunnel, partly underground. Over the corridor there is an open terrace passing through the several pavilion blocks. All the ordinary wards are thus on one floor, and no one can go from one ward to another without passing through the open air. The ward offices are all at the end of the ward next the terrace. The bath-room, lavatory, ward closets, and nurses' closet are in immediate relation with the ward; while the ward kitchen, dining-room, two private wards with two beds each, linen-room, and room for patients' clothes are on the other side of the terrace. A central six-sided hall, containing the main ventilation shaft, is formed at the intersection of the terrace with the pavilion. Each ordinary ward (Plan XI.) is 99ft. 6in. long, 27ft. 6in. wide, 15ft. high at the side walls, and 16ft. high in the centre. It contains 24 beds, so that each bed has 106.9 square feet of floor area and 1,768.9 cubic feet of air space. The floors are of specially-prepared Georgia pine, rounded up into the walls by curved hardwood. The walls are of brick, hollow, with a 2-in. air-space 9 inches from the inner surface. The corners of the walls are rounded off. The inner surface is covered with three coats of plaster, for the most part finished with hard-trowelled sand finish, and oil painted, with dark dado. The doors have no corners that cannot be kept perfectly clean, and are self-closing. There are two beds between each pair of windows. The window-sills are of slate. The windows have plain half-round heads

and mouldings. The end of the ward farthest from the entrance is prolonged in quadrangular shape, so as to form a kind of day-room, specially warmed, terminating in one great window.

The ventilation is most admirably arranged. Pure air admitted into shafts in the basement can be directed straight into the ward, or either partly or wholly made to pass over coils of hot water-pipes in the basement connected with a continuous circulatory system. The nurse can control the flow of water in each of these coils, so that the degree of warmth of the air can be regulated to a nicety without altering the quantity supplied to the ward. The air inlets to the ward for ordinary use are placed between the pairs of beds, but special ones are also provided beneath the windows. The extraction system is double: Six flues in the centre of the ceiling lead into a main foul air duct in the space beneath the roof, and this passes to the great shaft in the hall next the terrace; other flues open at the foot of each bed, and lead to a foul air duct beneath the floor, which also passes to the great shaft. The lower extractors are used alone in cold weather, the upper ones being closed by shutters. In moderate and warm weather both are open. A coil heated by high-pressure steam is placed in the main shaft just above the entry of the upper duct. Fans will also be provided whereby fresh air can be forced into the wards in the still weather of summer. The warming of the wards is said to be so perfect that any ward, or, practically, any bed, can be kept at any desired temperature.

The ward of the pavilion nearest to the apothecary's house has been shortened, and made in octagonal form with a great central shaft. The last pavilion in the series has been specially constructed for purposes of isolation, and is made up of separate rooms abutting on a central corridor, each room having a separate air supply and separate extraction shaft. Special provision is made in these rooms, and especially in a few of them, for rapid change of the air within them.

An excellent bath-house is provided with all kinds of baths.

Along the north side of the grounds are situated the amphitheatre, the dispensary, the stables, and the pathological department (this last being magnificently organized and equipped). In the south-east corner is the laundry.

The medical department of the Johns Hopkins University will be built in close proximity to the hospital.

This hospital would be open to some criticism were it not for the splendid and costly system of ventilation. The ward offices, which are 52 feet high, are only 42 feet apart. The main ward buildings, which rise over 46 feet, are only 58 feet apart. The ward offices are only about 28 feet from the amphitheatre and dispensary buildings. The octagonal ward is only 25 feet from the kitchen. More spacing out is desirable. So, also, the close relation of the closets to the ward would be very objectionable if it were not for the special precautions taken in connexion with ventilation.

The history of the foundation of this hospital is well worthy of mention. In March, 1873, Johns Hopkins informed certain trustees that he had placed in their hands, for the erection of a hospital and an orphanage, a selected hospital site of fourteen acres and a sum of £400,000, which he had invested so as to produce an annual revenue of £24,000. He trusted that the building of the hospital would be begun in the following year. He died soon after, and it was found that by his will the sum left for these purposes was increased to £600,000, bearing an annual interest of £36,000. In 1875 the building committee, following the instructions of the testator, invited plans and suggestions from five physicians in different parts of the States. Those prepared by Dr. Billings gained most favour. Ultimately Dr. Billings travelled widely, taking improved plans with him, and obtaining advice from the best authorities. The final scheme was elaborated by the architects under his instructions. The hospital was formally opened in May, 1889, when it was announced that the accumulated interest on the bequest had more than sufficed to meet all expenditure in its construction and equipment, the capital available for an endowment being £22,600 greater than the sum bequeathed by Johns Hopkins. Yet the cost of building was enormous, the original estimate being £866 per bed, and the number of beds 361.

THE PRINCE ALFRED HOSPITAL, SYDNEY.

Space will not permit me to describe in detail this splendid hospital, which was built as a national memorial of the recovery of H.R.H. the Duke of Edinburgh. It consists of an administration block in front, abutting on a transverse corridor behind;

from the ends of this corridor two pavilion ward blocks run backwards, enclosing a broad quadrangle. In the midline of this quadrangle lie the general economy department and the operation-house, the latter being connected by covered ways with the floors of the pavilions. The ward blocks consist of a basement and a lower and an upper floor of wards. On each floor there is a long ward and a short ward, separated by a well-ventilated corridor, and provided with all needful accessory rooms. At the end of the block nearest to the administration department an extra story is provided, giving accommodation to the nurses. A detached nurses' home is in process of construction. All the details of this hospital are admirable. Special care has been taken to insure perfect ventilation of the corridors. The isolation wards are at some distance from the hospital, and consist of a series of single-bedded rooms lying alternately on either side of a covered way, a room for the nurses being placed in the centre of the series.

At present there are 210 beds in this hospital. Its cost per bed was extremely great, exceeding that of any other hospital with which I am acquainted. The special circumstances under which it was founded led its projectors—chief among whom was Sir Alfred Roberts—to determine that no expense should be spared in making it a model of perfectness in construction and equipment.

THE MELBOURNE HOSPITAL.

As it is.

The Melbourne Hospital is erected on a block of about four acres, in the centre of the city. On three sides the site is bounded by broad streets, in which trams run. On the north it is separated by a narrow street from the lofty buildings of the National Picture Gallery, which rise close to the street. The ground is sloping, with facilities for natural drainage. The number of beds is about 300, or 75 to the acre. The site measures a little less than 660 x 320; but 120 feet in depth along the whole frontage to Lonsdale-street is practically unoccupied, and along the frontage to Swanston-street a like depth of 120 feet is unoccupied, except for the secretary's house, which lies in one corner. Thus almost two-fifths of the entire site form an open garden. Hence the average of 75 beds to the acre gives no idea of the crowded state of the ground built upon.

The whole history of the buildings is one of patchwork, and the result has been an awkward congeries of buildings, huddled together in disorderly fashion, so that the free passage of air between them is prevented as much as possible. Such a statement will surprise people who pass daily along the most frequented frontages in Swanston and Lonsdale streets. Seeing the large open garden area, they are pleased with the apparent spaciousness of the grounds. If they would correct the false impression so given, let them walk from Swanston-street along Little Lonsdale-street, and consult Plan XII. At once it will be seen that the high buildings of the Public Library and National Gallery cut off light and air from this side of the hospital. Hence it might have been expected that this part of the hospital would have been kept as open as possible. But the reverse is the case. After passing the secretary's house (A), before we come opposite the western wards, a long series of buildings commences. First the nurses' quarters (B); then, continuous with these, the kitchen buildings (C); then, separated only by a gate-way, the dispensers' quarters (D), which are continuous with the casualty (E), out-patient (F), and dispensary departments (G); then a narrow passage, closed by closets for the staff; then the laundry (H), and the boiler-house (I); then a narrow passage; and, finally, the pathological block at the Russell-street corner. Turning down Russell-street we pass in succession, without a single break of continuity, the coroner's room (K), the mortuary (L), the *post-mortem* room (M), the pathologist's room (N), the work-shops (O), and the servants' quarters (P). This series of buildings, with a short passage intervening, is continued for about 80 feet along Lonsdale-street also. Such an arrangement is eminently undesirable, as it locks up the whole northern and eastern sides of the hospital site.

Turning then to the buildings within the grounds, we shall find the same absence of any well-considered plan. The principal elements of the hospital are a central block (Q) in three stories, with eastern (S) and western (R) wings of two stories; an operation-house (T); two pavilion blocks (U U), each in two stories; and a range of isolation wards, including three tents (V) for septic cases, and a brick

building (w) containing four wards of four or five beds each for diphtheria and other diseases requiring separate treatment. In addition, a block of buildings (x), in two stories, containing the matron's quarters and rooms for nurses, resident medical officers, &c., is jammed in (no other phrase suffices) between the operation-house and the east wing of the main block on one side and the kitchens on the other side.

As will be seen from Plan XII., the western wing of the main block approaches within 18 feet of the nurses' quarters. The north-east corner of the central block is only 5 feet from the matron's quarters; these, again, are only 15 feet from the nearest part of the kitchens. Hence, there is practically a closed quadrangle locked up between these buildings.

. Proceeding onwards, we find the matron's quarters are less than 8 feet from the adjacent angle of the operation-house. This house is only 23 feet from the eastern wing of the main block on one side, and under 18 feet from the projecting part of the first pavilion block on the other side. The two pavilions are about 43 feet apart at their north ends, 60 feet in their centres, and only 30 feet at their south ends. The second pavilion block, at its north end, is only 27ft. 6in. from the fence which encloses the septic tents, and at its south end only 21 feet from the diphtheria ward. These septic and contagious wards are separated only by a narrow passage from the workshops and servants' quarters.

Again, the north ends of the pavilions are only 40 feet from the casualty, dispensary, and out-patient block, and the septic and contagious block is only 18 feet from the nearest corner of the pathological department.

How, then, did these evil conditions come into existence? As before stated, the whole history of the buildings is one of patchwork. In 1846 the east wing of the main block was erected; in 1854 the central part of the block followed; in 1857 the west wing was added. Thus the central building and its wings came into existence, compactly built according to a plan which belongs entirely to the dark ages. Next came the old laundry and old mortuary, which have been replaced by new buildings; next, the porter's lodge, in Lonsdale-street, dating from 1859. Then came the block along the Little Lonsdale-street frontage, including the out-patient department, dispensary, casualty-room, and a female ward on the upper floor. This terrible structure was erected in 1861. Some minor additions occurred during the next five years. In 1867 the two pavilion blocks were added and a new mortuary. In 1870 the west wing of the main building was re-organized. Originally it was broken up lengthwise by a partition wall, so as to consist of what are called spinal wards, in this respect resembling those of several existing hospitals in London; and the closets were formerly a conspicuous, if unpleasant, feature of the interior. The spinal wall was removed, so that wide open wards remained with four rows of beds, and new closets were built out on the western side but not disconnected from the wards. In 1871 the secretary's quarters were built, and the operation-house was inserted in cramped fashion between the eastern wing and the first pavilion. Then there was a pause for four years. But in 1875 a new start was made, and for years one new building followed another. In that year the new laundry was pushed in between the out-patient department and the mortuary. In 1876 the new kitchens were constructed; in 1877 the matron's quarters were almost wedged in between the operation-house and the new kitchens; in 1878 nurses' quarters were built, and then, once more, there was a pause from any large work. In 1883 and 1884 further nurses' quarters were built, and isolation tents. Minor patchwork followed, including re-organization of the mortuary and pathological department, extensive alteration of the windows in the main building, &c., and the complete closing in of the eastern side of the grounds. Finally, in 1890, there was added the new block of four small wards for diphtheria and other diseases needing separate treatment.

In the next place, it is necessary to study the separate parts of the hospital as now existing. Firstly, then, we may visit the central part of the main block. This is divided by a corridor running east and west into rooms or wards on the north and rooms or wards on the south. Thus on the ground floor the south side is occupied by the sitting-rooms of the medical superintendent and resident medical officers and the bed-room of the casualty officer. The north side contains the committee-room, flanked on one side by the office and secretary's room, on the other by the night casualty-room, officers' mess-room, &c. On the first floor the whole length is taken up by a medical ward (No. 4) on the south, and a surgical ward (No. 5) on the north.

On the second floor the south side is occupied by a surgical ward (No. 1), and the north side by a nurses' parlour, a spare operating-room, and a small ward. One floor ventilates into another by grated openings in the corridors. The wind passing through the building must traverse a ward, then the corridor, then the other ward. The northern rooms and wards are well exposed to the sun, and comparatively cheerful. The southern rooms are very little visited by the sun, both morning and afternoon sun being largely cut off by the projecting eastern and western wings. In the southern wards (1 and 4) the closets open directly into the wards. When I went through the hospital recently there was a slight sewage smell at the end of ward 4, and ward 1 was strongly permeated by sewage effluvia.

The western wing may be visited next. On the ground floor and on the first floor it presents a northern ward and a southern ward. The number of beds is not equal on the two floors. On the ground floor the northern ward contains 32 beds, and the south ward 20; on the first floor the numbers are 25 and 18. These wards, with their four rows of beds, do not admit of satisfactory ventilation—they are either draughty or stuffy. A room for the head nurse has been provided in the corner of each ward, and a scullery in another corner. These are simply pieces of the ward lightly framed off with wood and glass. An attempt has been made to cut off the closets by cross-ventilated passages, but the disconnexion is not satisfactory.

In the eastern wing the ground floor is occupied by a L-shaped surgical ward. In such a ward it is difficult or impossible to secure good ventilation. The closet opens directly into the ward, and air passes from the closet into the ward. On the first floor the conditions are similar, except that part of the longer limb of the angular ward is cut off, and serves as a female lock ward. The ventilation and the closets are just as objectionable as on the ground floor.

Generally speaking, I have no hesitation in condemning the whole of the central block with its wings. I recognise that great trouble has been taken and much money spent in the endeavour to make all possible improvements, but I regard all the expenditure as utterly wasted. There is no remedy but demolition. I do not believe that any competent and disinterested observer could possibly dissent from this opinion.

The operation-house is much too crowded in by adjacent buildings. It consists of a basement in which stores are kept for the dispensary, and a ground floor, including an operating-room with students' gallery, a small surgeons' room, and a small instrument-room; the operating-room serves also as a theatre for clinical lectures. The accommodation thus provided is wholly insufficient.

Each pavilion block consists of an unoccupied basement and two floors of wards. The basement is badly ventilated, and is floored by the bare ground. On each floor there is a short transverse limb at the north end, giving access to a single long ward, which runs to the extreme south of the block. At the south end there is a lateral projection on either side, containing the closet, bath-room, &c., on one side, and a separation ward with two beds on the other. The short transverse limb at the north end contains the staircase on one side, and the nurse's room on the other. The wards themselves are well lighted and airy, inclining to be draughty. The walls are not cemented, and hence are not smooth. The ceilings are wooden, and therefore not impermeable. There are interstices between the boards, so that dust can lodge. The ward offices are neither sufficient nor satisfactory. An attempt has been made to isolate the closets from the wards, but the disconnexion is not complete. The pavilions, therefore, are far better than the central block and its wings, but extensive alterations will be required if they are to attain a proper standard of efficiency.

The isolation tents and wards are far too close to the second pavilion block on one side, and to the workshops and servants' quarters on the other. The mortuary and pathological department, though much better than in former times, do not provide the requisite accommodation. The chief defect consists in the absence of a viewing-room. At present there is only the mortuary—a dismal room—in which deceased patients are placed on slabs supported by trestles. Six or seven bodies, or more, are often found together in this room. One corner is occupied by a number of spare coffins. It is in this room that visitors must see their dead relatives or friends.

The out-patient and casualty department is the worst feature of the hospital, and is shown on Plan XII. It consists of a central waiting hall for out-patients (*x*), entered from Lonsdale-street, shut in on one side by the office of the medical superintendent (*a*) and the consulting-room of the out-door physicians (*b*), on another

side by the dispensary (g), on another by the casualty department (E), and the consulting-room for the out-door surgeons (c). The general waiting-room is dark, dismal, almost destitute of any ventilation, in fact as bad as such a room can be. Closets (d e) opening from it are wedged in among the other parts of the building. The consulting-rooms for the physicians and surgeons are utterly inadequate, and so noisy that the examination of medical cases must be carried on under great distraction. The rooms for special examination of cases (fff) are insufficient in number and poor in character. In the casualty department the waiting-rooms (g h) are small and mean, and that for men (h) is dark, having only derived light. The casualty-room is too small, and is not provided with any special examination-room. The whole out-patient and casualty departments are too small for the mere administrative work, and utterly inadequate in a great teaching hospital. An upper story over the dispensary and out-patient hall contains an angular ward for female surgical cases, not fit for its purpose, and with closet opening directly into it.

A word is necessary concerning the hospital closet system. Vertical soil pipes receive the contents of closets in the various stories of the building. The closet pipes are not trapped. The soil pipe runs down into the ground, and after making a slight bend, which serves as an imperfect trap, it passes with very slight fall to an underground tank. A valve prevents the contents of the pipe from passing uninterruptedly to the tank. The excreta accumulate in the horizontal section of the pipe, giving off effluvia which are supposed to escape at the open top of the soil pipe above the roof, but which really pass largely into the closets. As we have seen, the closets either open directly into the wards (as in Nos. 1, 4, 6, 8, and 22) or are imperfectly disconnected from them. At least once in the twenty-four hours, the tank is exhausted, the valve is then raised, and the night-soil is sucked into the tank. It is very improbable that the exhaust can be so perfect as to thoroughly cleanse the walls of the soil pipe. In the new block for infectious diseases there is an earth-closet. This is infinitely preferable to the tank system now in use.

After such a description, it might be expected that I would characterize the hospital as pestiferous and death-dealing. Nothing of the kind! As regards construction, it is discreditable to Melbourne. But its management is cleanly and careful. The medical superintendent is almost savage in his determination that windows shall be kept open. All that can be said is that patients are not under the best conditions for recovery. If life or death be in the balance, the evil structural character of the hospital must occasionally determine the result against the patient. From time to time in former years, outbreaks of septic mischief among the surgical patients attracted public attention. But under a rigid pursuance of the antiseptic treatment of wounds, septic troubles do not occur. All precautions are taken in the surgical wards, and the mortality in these wards is low. Yet it is not pleasant to be aware that the hospital is built in such a fashion that if these elaborate precautions were omitted septic diseases would probably again be rife. On the other hand, the mortality in the medical wards has been very high. In 1885 the surgical death-rate was 7.43 per cent., while the medical death-rate was 23.35 per cent. A large number of cases on both sides were admitted moribund. Special attention was drawn to this year, because a Select Committee of the Legislative Council took evidence concerning the hospital in 1886.

From the official reports for the twelve months ending 30th June, 1891, it appears that 4,383 patients were admitted to the wards; 3,264 were discharged cured or relieved; 151 left as incurable or for other reasons; 671 died; and 297 remained under treatment at the close of the period. Of the deaths, 228 occurred within 72 hours of admission. The number of patients treated was 160 greater, and of deaths 91 less than in the preceding year. The general mortality, therefore, for the year 1890-91 was 15.3 per cent. The mortality in the medical wards is not stated, but it must have been very high. Several factors go to explain this—368 cases of tuberculosis were admitted, of whom 152 died; 211 cases of typhoid fever, of whom 42 died; and 91 cases of diphtheria, of whom 33 died. Thus, tuberculosis, typhoid, and diphtheria account for 670 admissions and 227 deaths, or 33.8 per cent. of the death roll of the hospital. It is greatly to the honour of the institution that it never closes its doors against hopeless cases in order to keep its death-rate low. The necessities of the sick have always been the paramount, the only consideration. At times the stress upon the available accommodation is extremely great, and patients who urgently need indoor treatment must be refused. According to the

report of the medical superintendent, 720 such cases were turned away in the year 1889-90, and 120 in the year 1890-91. I believe that these figures do not measure the inadequacy of the provision made for the sick poor of Melbourne. In addition to the urgent cases which so obviously ought to be admitted, that the reason for non-admission must be formally recorded "no beds," there must be large numbers of patients who would benefit greatly by complete rest and careful treatment in hospital, but whose illness is not immediately dangerous, so that the fact of their non-admission obtains no special record. By long custom the medical wards of the Melbourne Hospital have been reserved for very severe illness. Patients in dangerous conditions are admitted at once. The scandal of sick folk dying without relief is avoided. But a great amount of good which might be effected is perforce undone. Early stages of disease which might be remedied completely are relegated to the out-patient department, where treatment cannot be conducted to the same advantage, the visits to the hospital, the waiting and exposure being perhaps most undesirable. These remarks apply chiefly to the medical side of the hospital, for as a rule there is no such severe tax on the accommodation of the surgical side.

But it must be remembered that the Melbourne Hospital is not a general hospital in the full sense of the term. Elsewhere a general hospital, especially when connected with a medical school, would have departments for diseases of women, diseases of children, diseases of the eye, diseases of the skin, &c. The Melbourne Hospital has an out-patient department for skin diseases, but otherwise has no provision of the kind now indicated. Its usefulness is thereby greatly limited. The establishment of every special hospital takes from the metropolitan charity a section of its work, and renders it less and less competent to provide the necessary training for medical students. In the teaching hospitals of London, the special departments are of the greatest value. They bring the work of the specialist into close relation with the broader field of the physician and surgeon. A certain narrowness of view which is the besetting defect of the specialist is thus corrected; the physicians and surgeons are able to obtain necessary and welcome expert assistance in many difficulties; the patients benefit greatly, and the students can obtain all needful instruction. No trace of ill-will to special hospitals is implied. They have their work to do, though the general hospital is made to fulfil its name in the most complete manner. But if the Melbourne General Hospital is to undergo this necessary development it must be substantially enlarged.

From all these considerations, therefore, the question arises—"Can a hospital of good type and adequate accommodation be secured on the present site?"

AN IMPROVED HOSPITAL ON THE PRESENT SITE.

To this question I have given no small amount of time and thought, striving to find how the best result could be obtained with a minimum of alteration. The accompanying Plan (XIII.) will show what, in my opinion, might be done with most advantage.

The buildings along Little Lonsdale and Russell streets might be retained, including the secretary's residence, nurses' quarters, kitchens, matron's quarters, out-patient casualty and dispensary department, laundry, pathological department, shops, servants' quarters, septic tents, and infectious block. The out-patient, casualty, and dispensary department would be completely re-organized with a minimum of external structural change. A viewing-room would be provided in connexion with the mortuary. The results would not be satisfactory, but I cannot find any change short of utter demolition which would attain substantially better results; and, even with complete reconstruction, it is not easy to make good provision on the present restricted site for all these departments.

The two existing pavilions (A A) would be retained, but the lateral projections at the south end, which approach each other too closely, would be removed. Instead of these, an annexe (B B) would be built out from the south end, connected with the ward by a cross-ventilated passage, and containing on each floor two closets, a sink-room, and a bath-room with lavatory. Plan XIV. will show the details of this annexe. At the north end of the ward I would make the broad entrance part 36 feet deep, taking off 25 feet from the length of the ward. The present nurse's room (C) would then become a store-room for linen and patients' clothes. Two small separation-rooms (D D) would be provided, containing one bed

each; also a bed-room for the nurse (*E*) and a ward scullery (*F*). The ward itself would measure 70 feet by 26 feet, and would contain eighteen beds, each bed having 100 square feet of floor space and 1,600 cubic feet of air space. With the two beds in the separation wards, each floor would provide twenty beds, each pavilion-block 40 beds. The central block of the hospital with its wings should be demolished and also the operation-house. Where the eastern wing now stands there should be a new operation-house (*G*), which should contain two theatres, with rooms for the surgeons, for the administration of anaesthetics, waiting-rooms for male and female patients, and instrument-room. One theatre, that looking south, would be used mainly as an operating-room, the other, looking north, mainly as a clinical lecture-room. The details may be seen in Plan XIII., but they are given subject to much more prolonged consideration than I have been able to devote to the subject.

In line with the present pavilions, modified as before described, three similar pavilions would be built (*HHH*). The distance between the adjacent pavilions would be 60 feet, or between their northern projections 43 feet. The new operation-house would be 52 feet from the main wall of the adjacent pavilions, and 46 feet from their projecting north ends.

Facing Lonsdale-street, an administration block (*I*) would occupy the centre, the details of which I have not considered. It should be kept as far as possible from the operation-house. It would contain, in addition to the board-room, offices and chapel, the night casualty-room, the rooms of the medical officer for casualties, and such accommodation for nurses, servants, &c., as might be found necessary.

On each side of the administration department there would be a pavilion ward block (*KL*) resembling those in the general series, but having lateral towers for the bath-rooms, closets, &c., instead of a terminal annexe. Balconies would be inserted between the towers. The purpose of this variation is to diminish the length of these two new pavilion-blocks, and in particular to keep the eastern one (*L*) at a reasonable distance from the infectious department (*M*). These pavilions would be 50 feet from the administration building. The ward walls would be 37 feet from a line carried through the southern ends of the annexes of the main series of pavilions, but the projecting ends of the pavilions would come even nearer to these annexes.

In the south-western corner of the grounds a house should be built, resembling the secretary's residence, to serve as quarters for the resident medical staff (*N*). The casualty officer only would have rooms in the administration block.

I have not in the plan shown any covered ways between the pavilion blocks, nor have I provided balconies along the sides of the wards. These could be introduced if deemed desirable.

In connexion with the mortuary (*O*), a viewing-room should be added; but it is difficult to make this department satisfactory without re-construction.

The out-patient, dispensary, and casualty block would be remodelled in the following manner:—The outside walls of the block would be retained, and in part the walls of the out-patient hall and of other subordinate rooms. The casualty-room and rooms of the out-patient surgeons would be carried up into a second story. The dispensers' quarters would be deepened and carried up to two stories, the dispensers being housed in the administration-block. On the ground floor, as shown in Plan XIII., there would be a main out-patient hall (1), entered from Little Lonsdale-street, including the present hall and the dispensary. It would thus be lighted on two sides instead of one, and would have cross-ventilation. The part representing the present dispensary would be occupied by patients waiting for their medicines, and by a counter (2) for the dispensary clerk, with a lift (3) communicating with the dispensary above. The main hall would be a waiting-room on one side for surgical cases, and on the other for medical cases. The closet for the men (4) would be as at present. That for women (5) would be placed where the dispensary kitchen now is. A special ventilating shaft would pass from these up the main wall of the block above the roof.

The surgical side of the out-patient department would contain the following accommodation:—Firstly, a commodious theatre to serve as a consulting-room (6), occupying the sites of the present casualty-room, waiting-rooms, and closet for women. The present consulting-room would serve as a special examination-room (7). Patients sent by the surgeon to be dressed would have two waiting-rooms—one for men (8), one for women (9)—next to the casualty-room (10). The casualty-room and its special examining-room (11) would be placed in the enlargement of the present

dispensers' quarters. At the other side of the main hall would be a commodious theatre for the out-patient physicians (12), well lit by skylight and side-windows, and having two examination-rooms (13, 14).

Upstairs (Plan XV.) the greater part of the present ward 22 would be occupied by the dispensary (15), with its store (16) and kitchen (17). On the other side of the staircase there would be a waiting-room (18) above the surgeons' consulting-room on the ground floor. This would lead into two consulting-rooms (19, 20), each provided with a special examination-room. Close to the staircase there would be a recess of the waiting-room (21), in which patients would obtain from the dispensary any medicines prescribed for them. Thus the out-patient department would include two large consulting-rooms on the ground floor and two small ones above, all four provided with their special examination-rooms.

The hospital, if reconstructed in this manner, would be entirely on the pavilion system. The seven pavilion blocks would contain 280 beds; the permanent infectious block would include four wards, with four or five beds each, or eighteen beds in all; the three tents for septic cases and other patients requiring isolation would contain about twenty beds. Roughly speaking, the hospital would be one of 300 beds, so that the accommodation for in-patients would be almost exactly the same as that provided under existing conditions. The out-patient and casualty departments would be vastly improved; with two large out-patient theatres on the ground floor, and two small consulting-rooms upstairs, it would be possible to classify the out-patients to greater advantage, and to establish some much-needed special departments.

But, if my contentions are correct, the hospital would be too small to satisfy the necessities of Melbourne. My criticism of the present hospital in this respect would apply without material alteration to the institution as re-organized. No further expansion would be possible. The erection of an additional hospital would soon become inevitable. The multiplication of hospitals is not desirable. What is required is one Metropolitan Hospital, large enough to provide for the necessities of the sick poor, fully organized as a general hospital with the requisite special departments, with a range of cases sufficient for the full training of medical students, and with lecture rooms and appliances for the teaching both of students and of nurses. The hospital which I have sketched, though vastly better than the existing institution, would not satisfy these demands, nor would it be satisfactory in itself. The various pavilions and other buildings would still be far too closely crowded together. No plan of reconstruction on the present site can avoid this. I am, therefore, driven to the following conclusion:—The best scheme of reconstruction on the present site cannot provide more accommodation than there is now. The proper spacing out of the elements of the hospital is impossible. The cost of reconstruction will be very great. When the work is finished a new hospital will still be necessary. If so, surely it is far better to bend every energy to obtain at once on a larger site a hospital which would fulfil all requirements, and in which the citizens of the metropolis might take a reasonable pride.

A NEW HOSPITAL ON THE SITE OF THE HORSE, CATTLE, AND PIG MARKET.

There is one site which commends itself to my judgment, as in every way well fitted for the establishment of a general hospital, namely, that now occupied by the Horse, Cattle, and Pig Market of the Melbourne City Corporation. It is high-lying, with good slope for drainage, self-contained, in close relation with the permanent reserves of the Royal-park and the University. It can never be closely surrounded by other buildings, yet it is little more than a mile from the General Post-office. It is an irregular quadrilateral, with frontages approximately of 831 feet to Sydney-road, 630 feet towards the Hay-market, 1,095 feet to Story-street, and 381 feet to Park-street. It is, therefore, at least four times as large as the present site.

The accompanying Plan XVI. will show roughly the lines on which an excellent hospital might be erected upon it. The main frontage would be to Sydney-road, and would present in the centre the administration block, flanked on one side by the

out-patient and casualty departments, with the dispensary, and on the other side by the nurses' home. The entrance to the out-patient department would not be from Sydney-road, but from the side facing the Hay-market. Behind this range of buildings there would be eight pavilion blocks, arranged in two rows, four on each side of a broad central space, in which would lie from before backwards the operation-house, the lecture theatres, and the bath-house. The pavilions on one side of the central space would be for men, those on the other side for women. Those of the first row would be for surgical cases, those of the second row for medical cases. Still further in the rear there would be a row of four small pavilions for special departments, one pavilion being set aside for phthisis, one for diseases of the eye, one for diseases of children, and, if deemed advisable, one for diseases of women. It would, perhaps, be better to keep this pavilion in reserve, and to treat diseases of women in the general wards. In line with these small pavilions, on the north side, would be the kitchen. Behind them, in the centre, there would be an isolated enclosure containing (a) lock wards, male and female; (b) tents for septic cases; (c) small wards for noisy patients; (d) separate wards for a limited number of cases of diphtheria and other communicable diseases. At the south side of this isolation department would be the pathological building, and on the north side, behind the kitchen, would be the laundry, the boiler-house, the disinfecting chamber, and the stables.

In spacing out all these elements of the hospital the rule would be to keep all buildings 100 feet apart in the clear.

The administration block would consist of a basement with three stories. The basement would be devoted to stores; the ground floor would contain the board-room, the general offices, the office and apartments of the medical superintendent, the offices of the lady superintendent, the secretary, the medical and surgical registrars, &c. The night casualty-room and apartments of the casualty officer might also be placed here. The first story would be occupied by the library, mess-room, and apartments of the resident medical officers; the second story would provide accommodation for servants.

The nurses' home would consist of a basement and two stories. It would contain in the basement the dining-hall and lecture-room; on the ground floor, the private apartments of the lady superintendent and the sitting-rooms and apartments for the head nurses; on the first floor, sitting-rooms and apartments for the assistant nurses.

The out-patient and casualty department would consist of a basement and two stories. Its northern part would correspond in general outline with the nurses' home, but it would extend to the frontage facing the Hay-market, while the nurses' home would be surrounded by a garden. By this frontage there would be access to a broad entrance-hall, with double staircase. On either side of the entrance would be lavatories for men and for women, with closets in lateral towers, approached by cross-ventilated passages. Passing on between the lateral staircases, by a wide passage, one would enter the main out-patient hall, 80 feet x 150 feet. At the hither end would be two small consulting-rooms, each provided with an examination-room. One of these would be occupied by the medical superintendent, the other by the ophthalmic surgeon. At the far end of the hall would be two large theatres, each provided with a large and a small examining-room. One of these theatres would pertain to the physicians, the other to the surgeons for out-patients. The larger examination-room would be used chiefly by dressers and clerks, the smaller would be reserved for the physician or surgeon.

The upper floor would contain a second out-patient hall, also with four consulting rooms, two at either end. These would be appropriated to the following special departments:—Diseases of children, diseases of the skin, diseases of women, and dentistry. If other special departments were deemed desirable, certain consulting rooms could be shared. From the far end of the main hall on the ground floor a wide passage would lead to the dispensary department on one side and the casualty-rooms on the other. These would also be furnished with direct approaches from the main entrance in Sydney-road and from the other parts of the hospital. The dispensary would be provided with a large waiting-room for out-patients, a small room for servants waiting for ward medicines, and a kitchen. The casualty-room would have a waiting-room for men, a waiting-room for women, and an examination-room. The rooms above these departments would be approached by a separate staircase, and would provide accommodation for the dispensers and other officers.

The operation-house would be in one story, with two operating theatres and all needful accessory rooms, as specified in the plan for a new hospital on the present site. The lecture-house would be in one story with two theatres, waiting-rooms for male and female patients, and retiring rooms for the lecturers.

The bath-house would be thoroughly equipped on the model of the establishments found in Continental hospitals.

The pavilion-blocks would consist of an open arched basement, and two floors of wards. The long axis of the pavilions would be from east to west, so as to give a full northern exposure. There would be a verandah and balcony along each side. Each large pavilion would, as shown in Plan XVII., be constituted as follows on each floor:—An entrance hall would contain a staircase on each side, a bed-lift and store cupboards on the other side. From this hall a passage 8 feet wide would lead towards the ward, passing on one side a store for patients' clothes, 18 feet x 6 feet, with galvanized iron racks; a separation ward, 18 feet x 16 feet, with two beds, and the nurses' room, 18 feet x 12 feet; and on the other side a day-room and dining-room for convalescents, 18 feet x 18 feet; a ward-kitchen 18 feet x 8 feet, and a scullery of the same size. The ward itself would measure 100 feet x 26 feet, and would contain 22 beds, each bed having 118 square feet of floor space. Beds would alternate with windows. Warmth would be provided by two central stoves, having vertical smoke-shafts enclosed in ventilation chimneys. The floor would be of polished hardwood. The walls and ceilings would be cemented. In the walls and the fittings, corners would be avoided as much as possible. At the end of the ward there would be two lateral towers, each 12 feet x 10 feet, approached by a cross-ventilated passage with double doors; one tower would contain the bath-room and lavatory, the other the closets and the sink-room for cleansing ward utensils. Between the towers balconies would be introduced, and a lift for use in emergency might be provided with advantage. Each pavilion-block would thus contain two large wards, with 22 beds each, and two separation wards with two beds each—in all 48 beds. The length of each block would be 150 feet.

The small pavilions would be built in the same general style, but their length would be reduced to 100 feet. The ward offices would share in this reduction, and would be modified in accordance with the special purposes of each block. The ground floor, as a rule, would be devoted to female patients, and the upper floor to males. On each floor there would be a ward 64 feet x 26 feet, containing fourteen beds, and a separation ward with two beds. The pathological department would contain on the ground floor the coroner's court, separated by a passage from the mortuary and the viewing room. The upper floor would contain two *post-mortem* rooms and a small laboratory. A staircase and a lift would connect the two floors. One of the *post-mortem* rooms would be fitted up as a demonstration theatre.

It is not necessary that I should pursue the details further. The eight large pavilions would contain 384 beds. The four small pavilions would contain 128 beds. In the isolation department about 75 beds might be provided. The total number of beds would then be 587, of which 100 could at all times be resting beds.

I have not shown in this scheme any connexion whatever between the various buildings of the hospital. Connexions mean communication, whereas safety in hospital administration lies in the complete isolation of the elements. Opinion may vary as to the best exposure to give the wards. Some may think that I have unduly spaced out the buildings, so I add another plan (XVIII.), in which the distance between the wards has been reduced, and an eastern and western exposure given to the eight chief pavilions. These are arranged on either side of a central garden court; the operation-house, lecture theatre, and bath-house are transferred to the northern side of the site. Two additional pavilions might be introduced on the southern side; but these would not be required at present. In other respects the plans are identical.

These plans are submitted as merely crude suggestions; but they suffice to show what kind of a hospital, in my opinion, Melbourne needs. They form the best demonstration which I can give in favour of my assertion that the site of the Horse, Cattle, and Pig Market is admirably adapted for the erection of a Metropolitan General Hospital. It is idle to think that the site would be surrendered for hospital purposes by the City Council without substantial consideration. The Government might see its way to give some other site further afield for the erection of municipal markets, or the present hospital site might be given partly or wholly to the City Corporation;

but I would gladly see the proceeds of the sale of the present site devoted towards the erection of the new hospital. However this were arranged, I do not believe that money would be lacking, if representative men prepared a perfect scheme for the creation of a thoroughly efficient hospital for Melbourne.

CONCLUDING REMARKS.

I have written already at such length that my further remarks must be as brief as possible.

In constructing a new hospital, all unnecessary expense should be scrupulously avoided. The excellence of the hospital should not consist in architectural decoration, but in thorough fitness for its purpose. The essential principles of good hospital construction should be carried out in the most economical fashion. The examples of the St. Thomas Hospital in London, the Johns Hopkins in Baltimore, and the Prince Alfred in Sydney, should be avoided. Such expensive institutions are justifiable only when they take the form of national memorials or of private benefactions. In the ordinary discharge of public charity any indulgence in monumental costliness must be regarded as closely akin to breach of trust, or, at the best, it must be characterized as an exhibition of public vanity dominating all higher considerations. In pursuance of this opinion, I have in this report directed special attention to the excellent hospitals which have been erected at small cost in England, France, and Germany. I trust that, in future hospital construction in Victoria, the attempt will be to attain the same efficiency with an approach to the same minimum of expenditure.

As regards the maintenance of hospitals, I do not think that it is wise in any way to interrupt or discourage the exercise of private charity. I would not willingly see the whole burden of hospital support thrown upon the municipal ratepayer. I would gladly see more substantial sums voted to the hospitals by the municipal bodies, as in this way the discharge of charitable duty would be made in some degree more general throughout the community. I do not think that paying patients, in the full sense of the term, should be admitted to the Metropolitan Hospitals. Private hospitals can provide all that they need. But I do not see any reason why patients in the various hospitals should not contribute, according to their means, towards the cost of their treatment. As I have pointed out, such payments are made in the great hospitals of Germany, the contributions of the patients sometimes amounting to one-third of the annual expenditure of the institution. In Germany the usual payment by in-patients is about 1s. 8d. per day. Could not the vast majority of patients in our Victorian Hospitals pay this sum, or even a little more? Benefit Societies should certainly contribute on behalf of their members who are in hospital. No distinction should be made in the hospital between those who pay something towards the cost of their relief and those unable to make any contribution. If a patient can pay more than 2s. or perhaps 2s. 6d. a day, he is in the great majority of cases not a fit object for the charity of a public hospital, and he should be relieved by some self-supporting organization. If he can pay 1s. or 2s. a day, his own self-respect is encouraged by permitting him to contribute towards the cost of the relief given him, and the burden upon the charity is substantially lightened. A payment of 2s. would amount in the year to £36 10s. for a continuously occupied bed, or about half the cost of its maintenance. If such limited payments were accepted, I do not think any substantial harm would be done to medical practitioners outside. As regards out-patients, gratuitous relief should be administered as sparingly as possible. Patients even with very limited means should be able to provide themselves with the necessary medical attendance through a provident dispensary. Those presenting themselves at the public hospitals should, when possible, be referred to such dispensaries. The remainder will still be sufficiently numerous to occupy all the time which the medical officers can give, and should pay a minimum fee for attendance and medicine. I have but indicated the chief lines of my thinking on this subject. I know that the question of patients' contributions is closely akin to much larger problems of great national interest; still to a certain extent it stands alone. The practice of different nations varies. Let us not be over-obstinate in pursuing our own way, if a better be before us.

It was my intention in this Report to deal with certain matters concerning Universities and Laboratories; but I feel, Sir, that I have already taxed your patience, and my notes on these subjects may perhaps be utilized to greater advantage from time to time as occasion arises in actual practice.

For whatever useful information there may have been in these Reports, I am indebted to many gentlemen who showed me great kindness. Whether I have directly referred to them or not, I trust they will believe me most grateful; but I cannot conclude without special acknowledgment of the unvarying courtesy and ever-ready help which I experienced in my frequent correspondence and interviews with the Agent-General, Sir Graham Berry, and with Mr. Cashel-Hoey.

I have the honour to be,

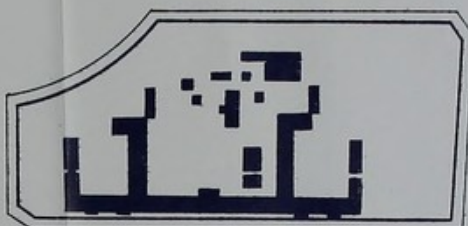
Sir,

Your most obedient servant,

H. B. ALLEN.

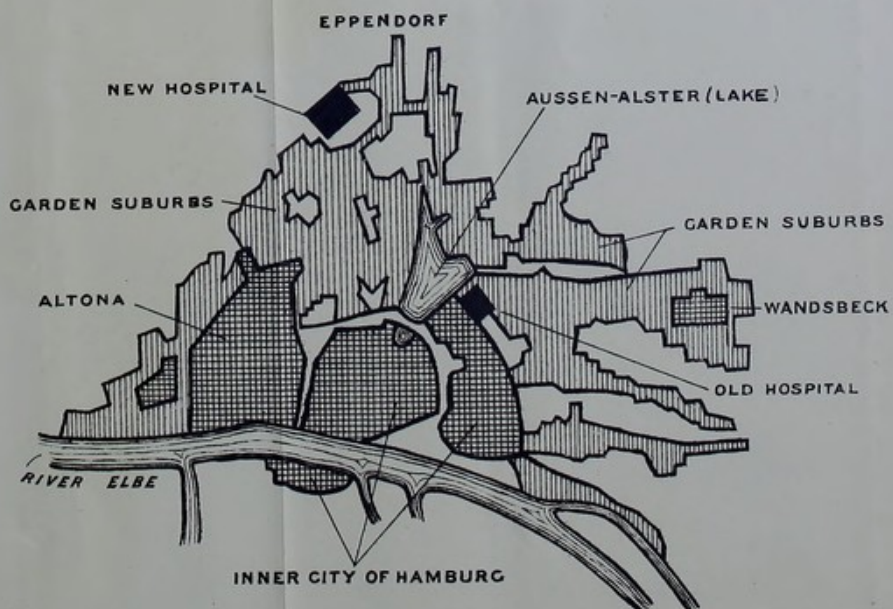
PLAN I.

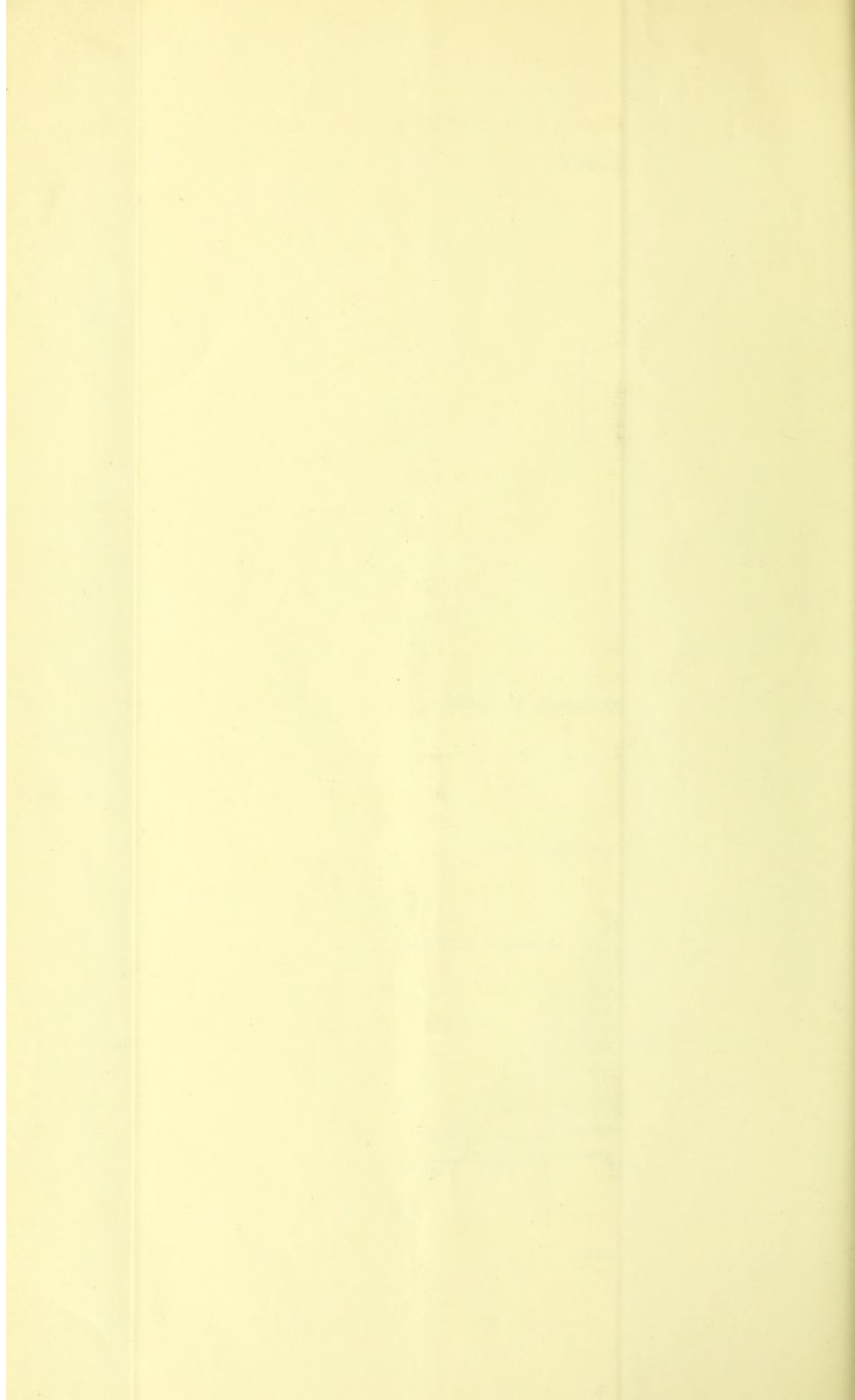
The Old General Hospital at Hamburg.



PLAN II.

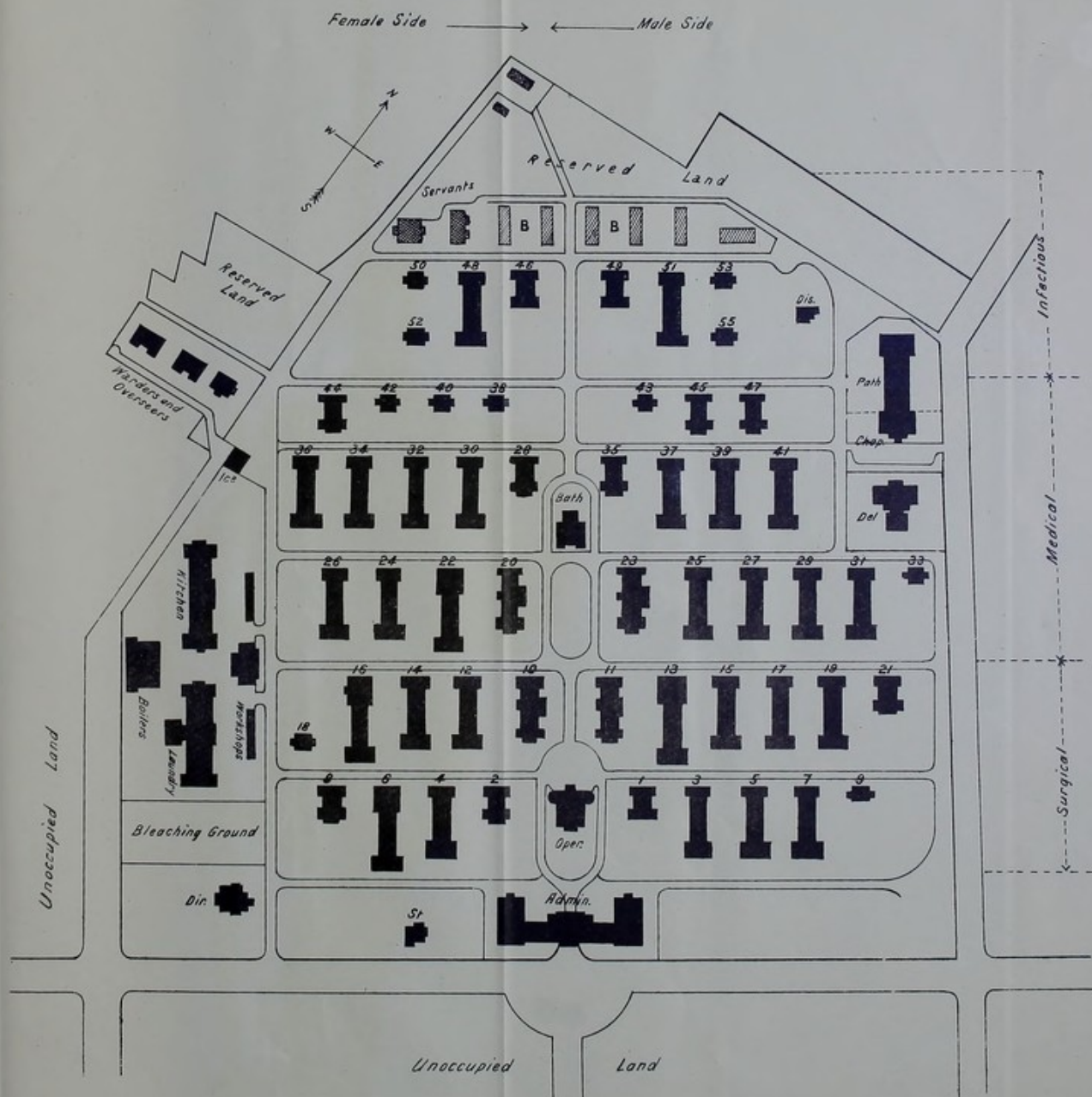
Map of Hamburg showing the Old and the New Hospitals.





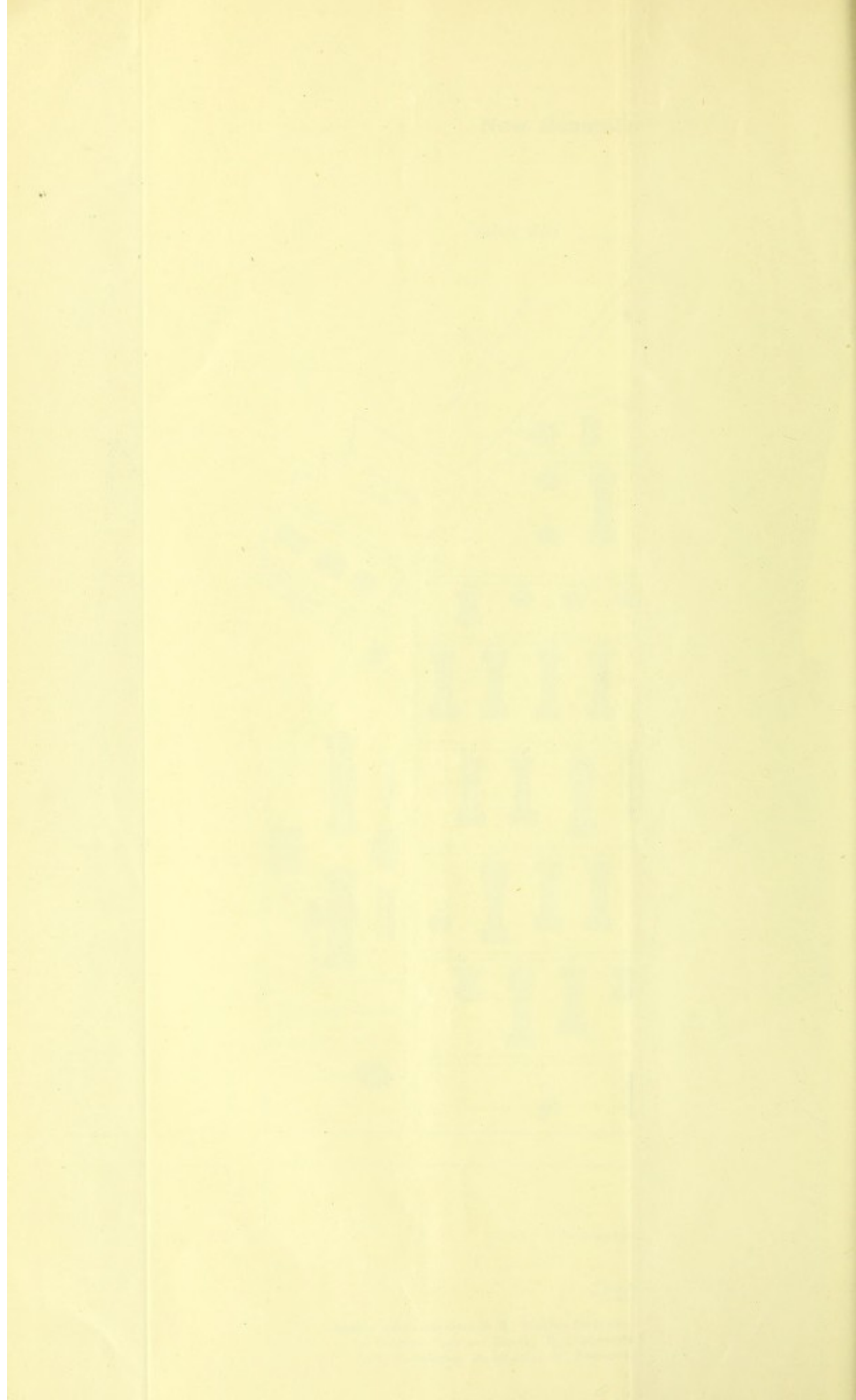
PLAN III.

New General Hospital at Hamburg, Eppendorf.



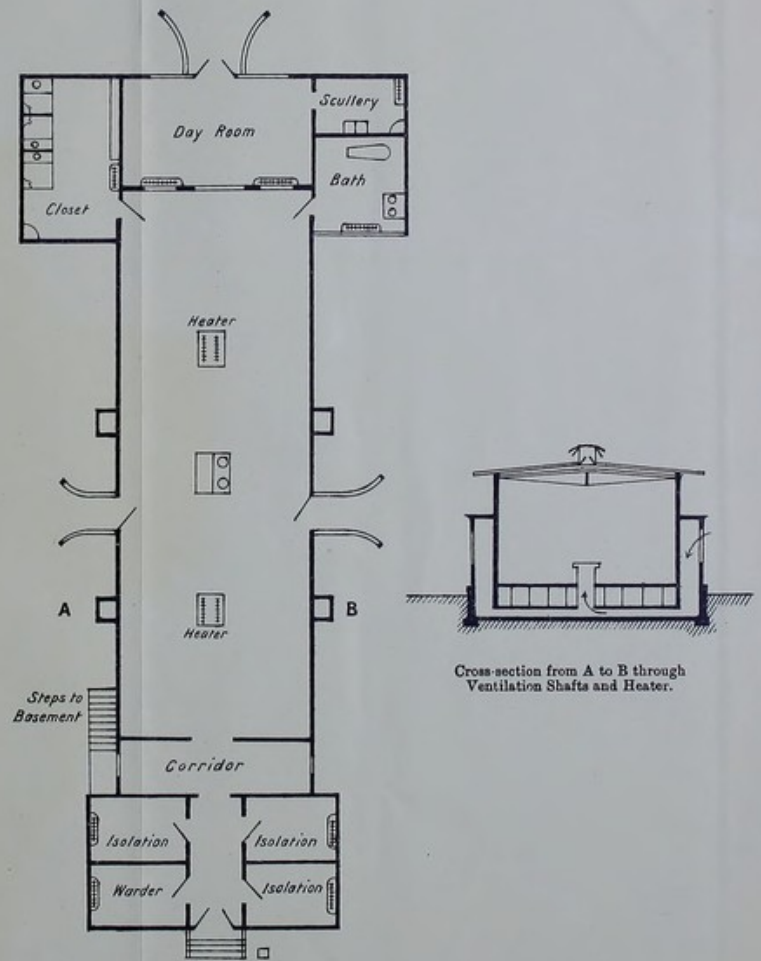
Scale, 1:2500

Admin., Administration; B. B., Wooden Barracks; Bath, General Bath Establishment; Chap., Chapel; Del., Wards for Delirious Cases and Insane; Dir., Director's Residence; Dis., Disinfection House; Oper., Operating Rooms; Path., Pathological Department; St., Steward's Residence.

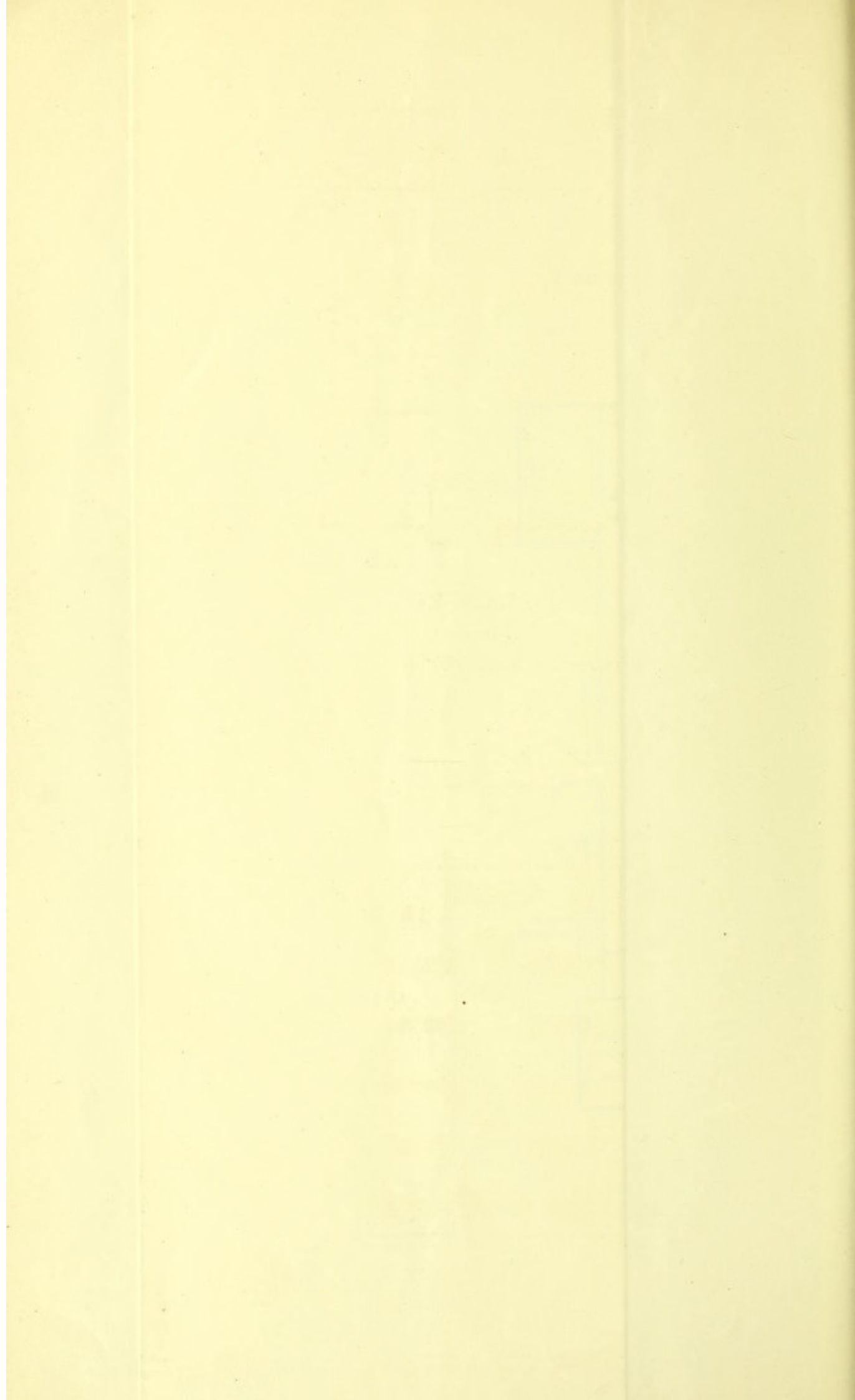


PLAN IV.

Plan of a Large Pavilion for 30 Beds.

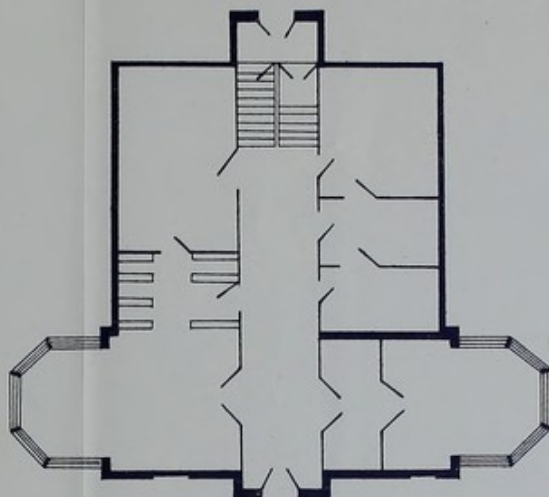


Scale 1:250



PLAN V.

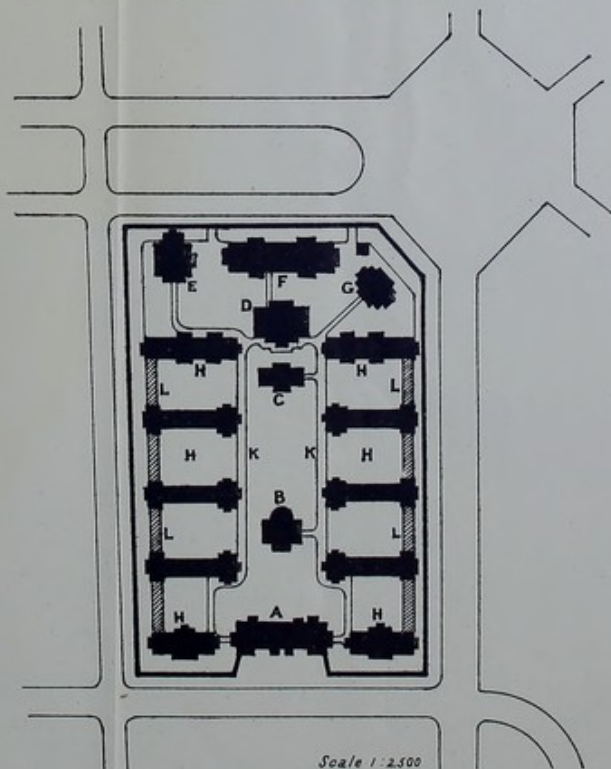
Ground Floor of Operation House.



Scale 1:250

PLAN VI.

Krankenhaus am Urban (Berlin).



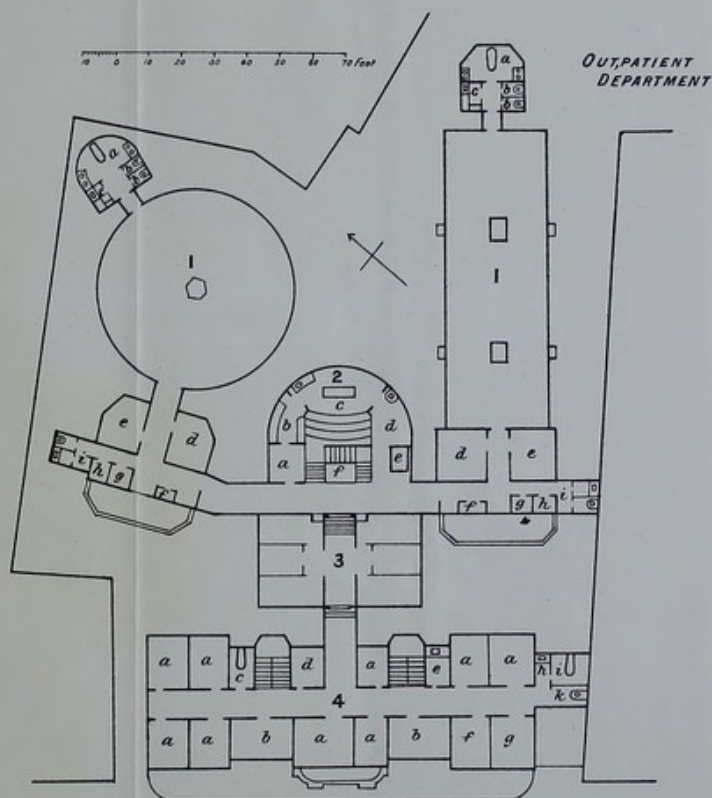
Scale 1:2500

A., Administration Block; B., Operation House; C., Isolation Ward; D., Boiler House; E., Pathological Department; F., Kitchen, Laundry, &c.; G., Bath House; H.H., Pavilions; K.K., Subway; L.L.L.L., Covered Passages.



PLAN VII.

Great Northern and Central Hospital, Holloway Road,
London N. First Floor Plan.



DETAILS OF PLAN OF GREAT NORTHERN AND CENTRAL HOSPITAL.

1. 1. WARDS FOR 20 BEDS WITH CENTRAL STOVES (ORLONG OR CIRCULAR).

- | | | |
|----------------------------|----------------------------------|-----------------------------|
| a. Bath Room and Lavatory. | d. Duty Room. | g. Linen Room. |
| b. Ward Closets. | e. Separation Ward with One Bed. | h. Patients' Clothes. |
| c. Sink. | f. Pantry. | i. Service Closet and Sink. |

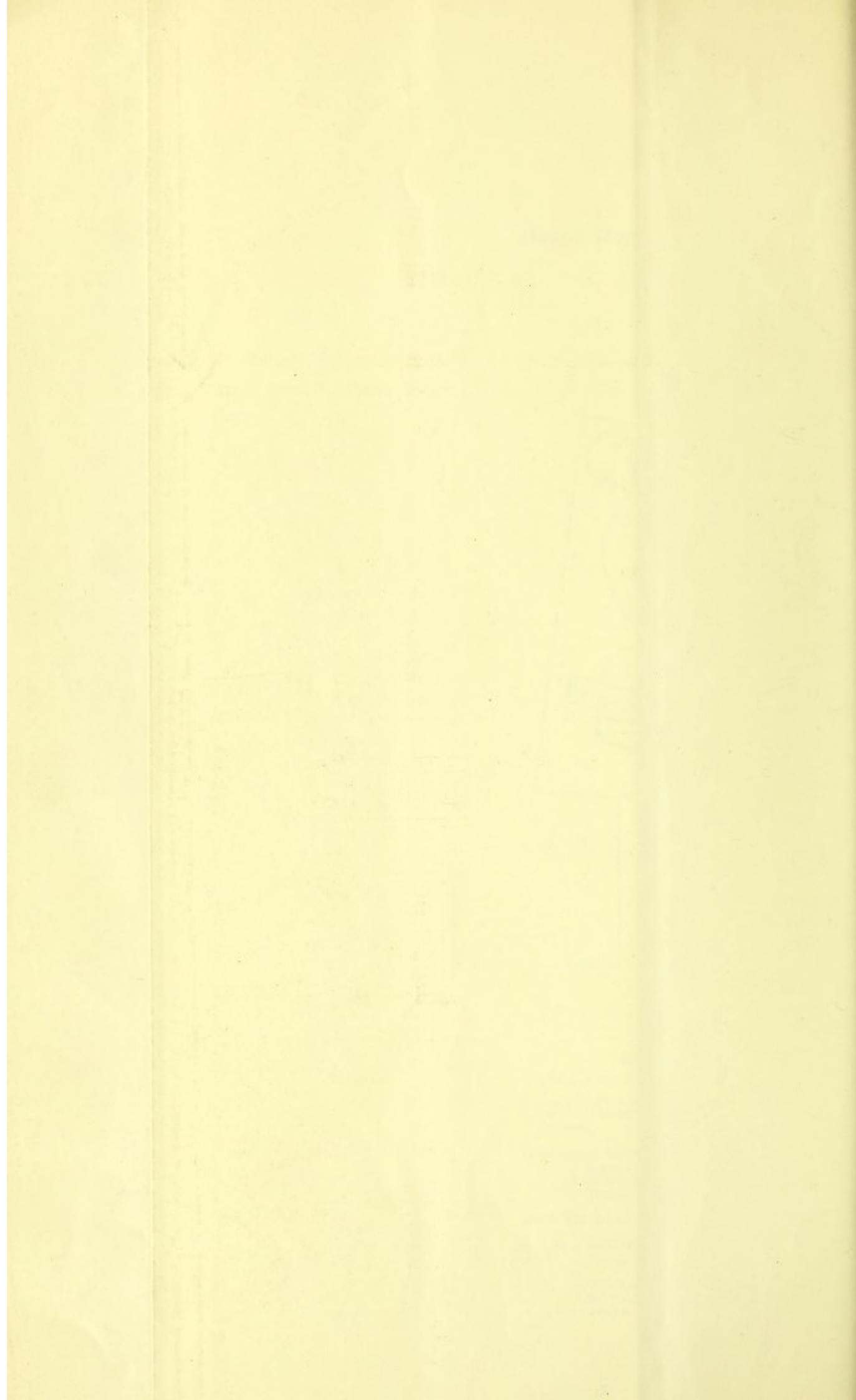
2. OPERATING ROOM.

- | | |
|--------------------|----------------------|
| a. Surgeons' Room. | d. Waiting Room. |
| b. Ante-Room. | e. Lift for Patients |
| c. Theatre. | f. Staircase |
- } Connecting all the Floors.

3. SIX BED ROOMS, WITH SERVICE LIFTS NEXT THE CORRIDOR.

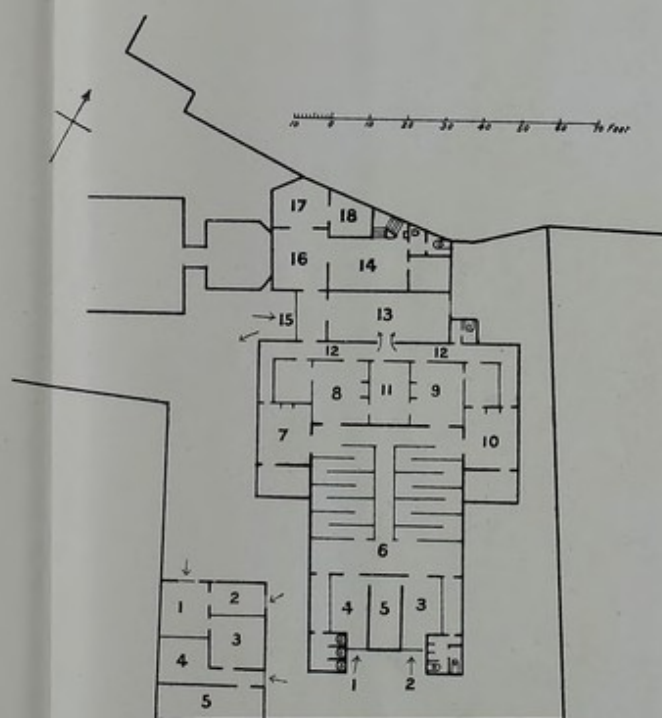
4. PAYING PATIENTS' AND LADY SUPERINTENDENT'S ROOMS.

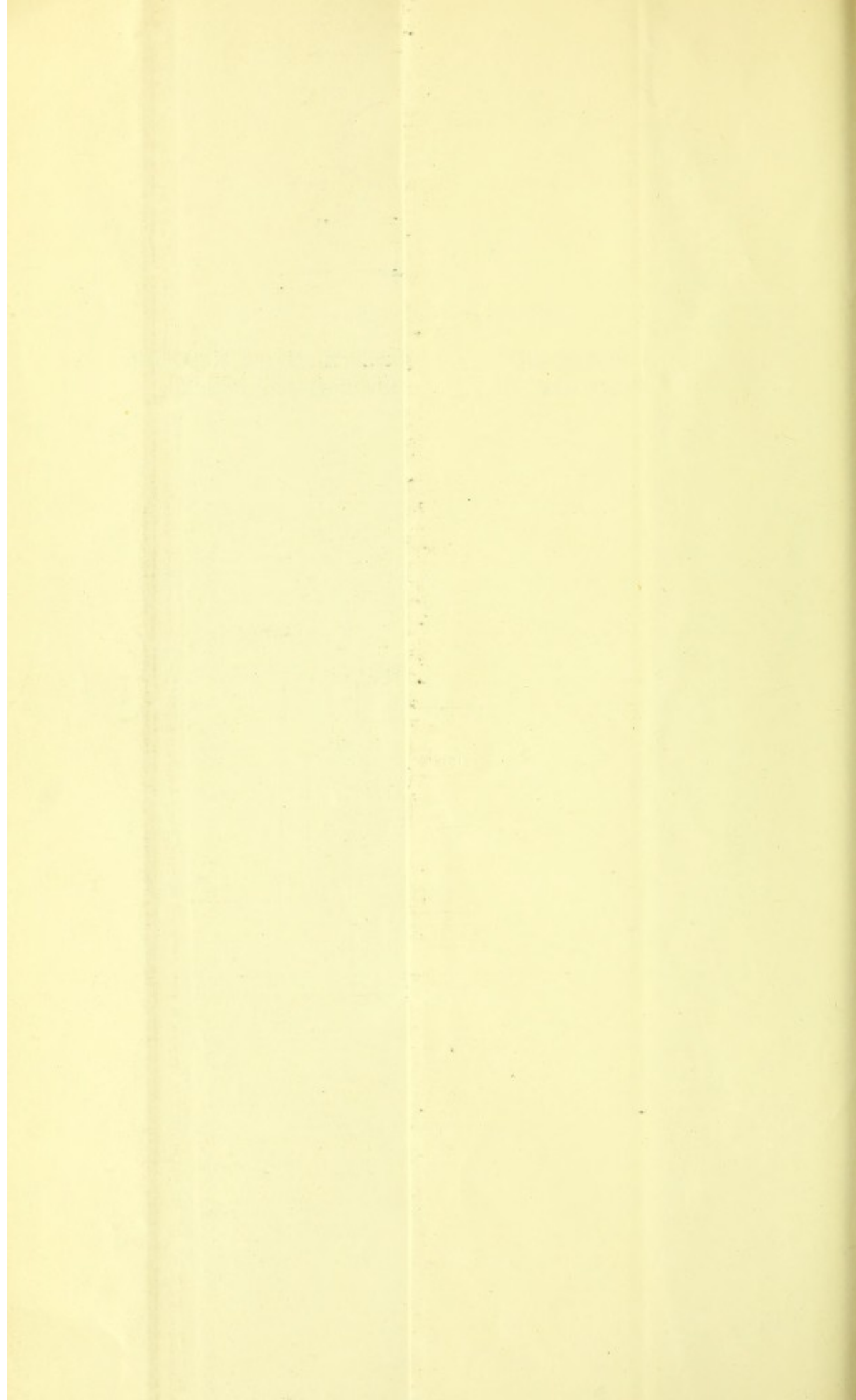
- | | |
|---|--|
| a. Paying Patients' Rooms with One Bed. | f. Lady Superintendent's Sitting Room. |
| b. " " " " Two Beds. | g. " " " " Bed Room. |
| c. Bath Room. | h. Sink. |
| d. Nurses' Room. | i. Bath Room. |
| e. Pantry. | k. Closet. |



PLAN VIII.

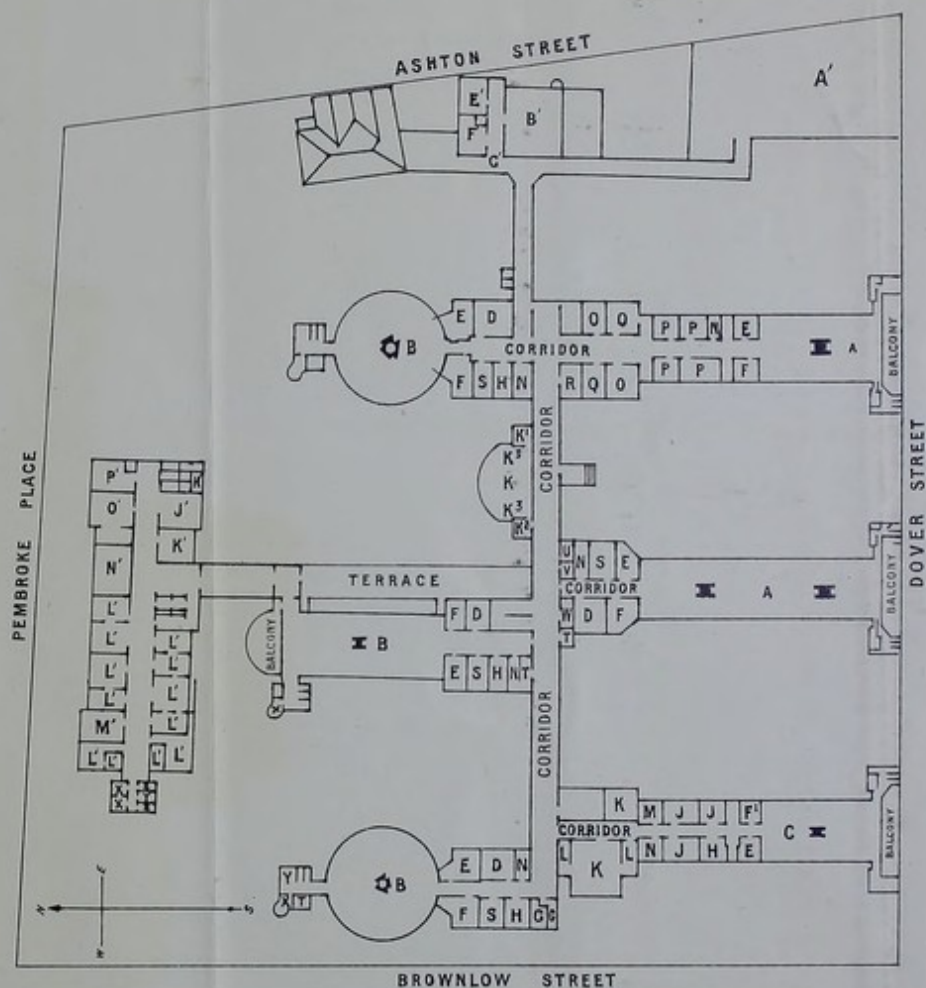
Out-patient and Pathological Departments, Great Northern
and Central Hospital, Holloway Road, North London.





PLAN IX.

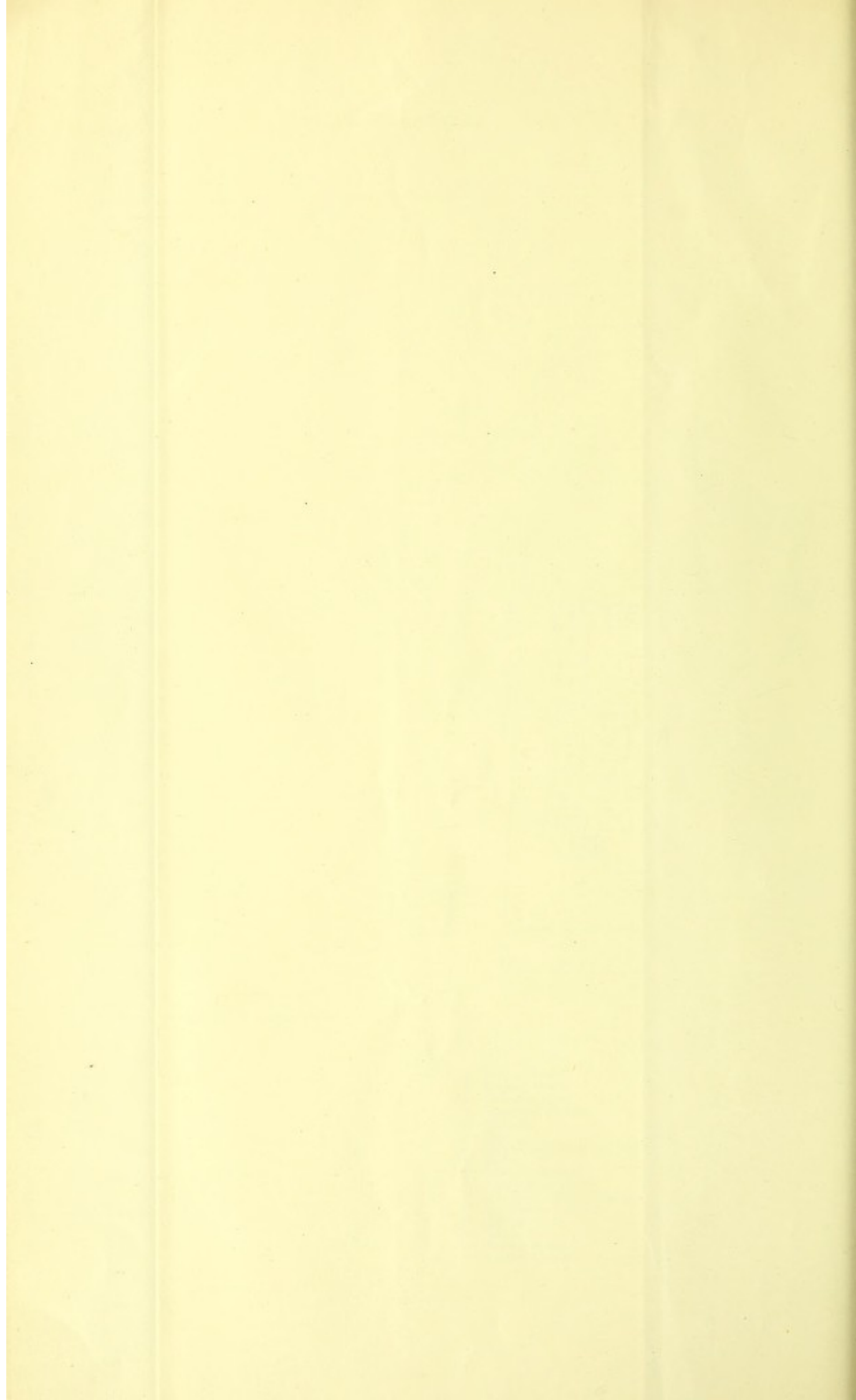
New Liverpool Royal Infirmary.



- a. Medical Wards.
- b. Surgical Wards.
- c. Thornton Ward.
- d. Separation Wards.
- e. Scullery.
- f. Sister.
- g. Sisters' Bath Room and W.C.
- h. Doctor.
- i. Operation Rooms.
- k. Operating Theatres.
- l. Ante-Room, Chloroforming.
- m. Ante-Room, Lavatory.
- n. Instruments.
- o. Splints.
- p. Waiting Room.
- q. Patients' Clothes.

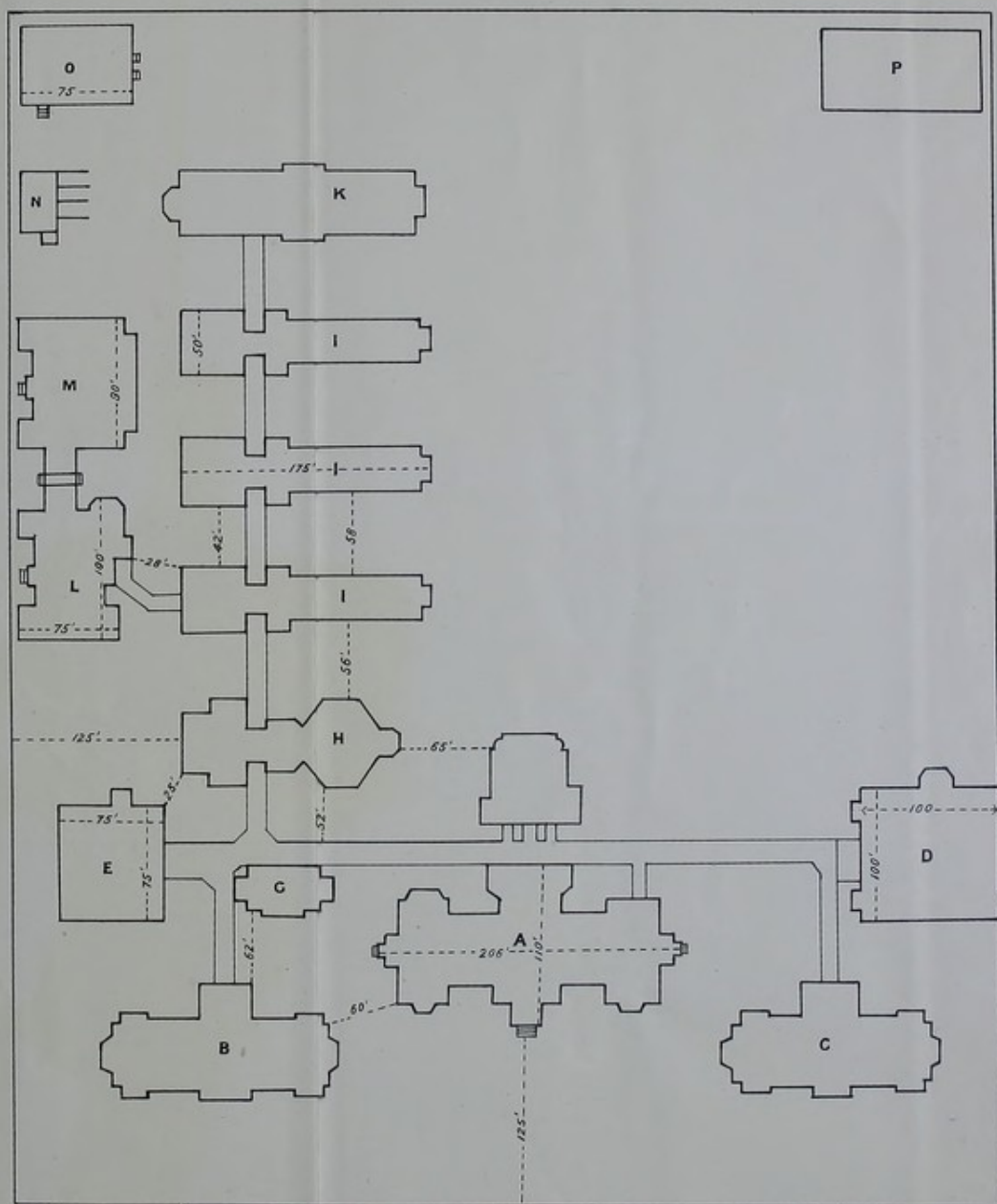
- r. Sick Nurse.
- s. Pay Wards.
- t. Bath Room for Sick Nurses.
- u. Vapour Bath for Pay Patients.
- v. Dining and Convalescent Room.
- w. Housemaids' Closet.
- x. Movable Baths.
- y. Service Lift.
- z. Passenger Lift.
- aa. Bath Rooms.
- ab. Lavatories.
- ac. W.C's.
- ad. Nurses Home.
- ae. Laundry.
- af. Engineers' W.C.
- ag. Women's W.C.

- ah. Receiving Room.
- ai. Delivery Room.
- aj. Women's Entrance to Laundry.
- ak. Linen Room.
- al. Needlewoman.
- am. Lady Superintendent's Dining Room.
- an. Medical Officers' Sitting and Bed Rooms.
- ao. Spare Room.
- ap. Medical Officers' Common Room.
- aq. Medical Officers' Dining Room.
- ar. Serving Room.
- as. Covered Drying Ground.



PLAN X.

Plan of the Johns Hopkins Hospital.



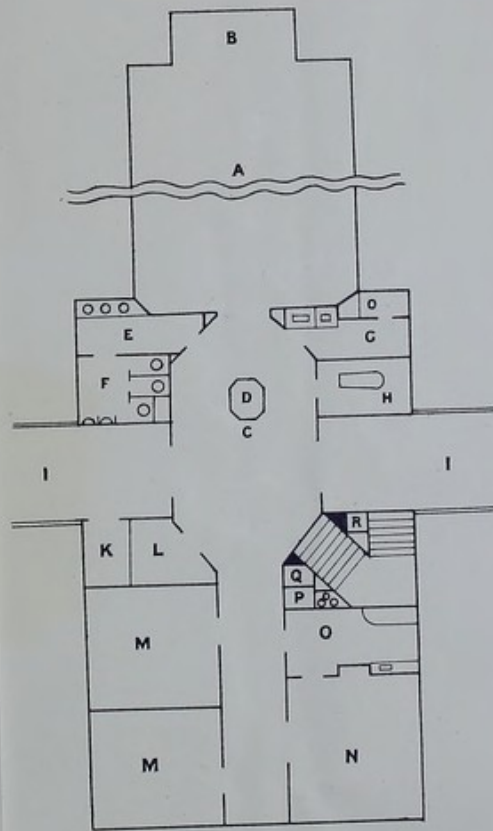
Scale, 100 Feet to an Inch.

A., Administration Block; B., C., Male and Female Paying Wards; D., Nurses' Home; E., Kitchen; F., Apothecary; G., Bath House; H., Octagonal Ward; I., I., I., Ordinary Wards; K., Isolation Ward; L., Amphitheatre; M., Dispensary; N., Stables; O., Pathological Department; P., Laundry.

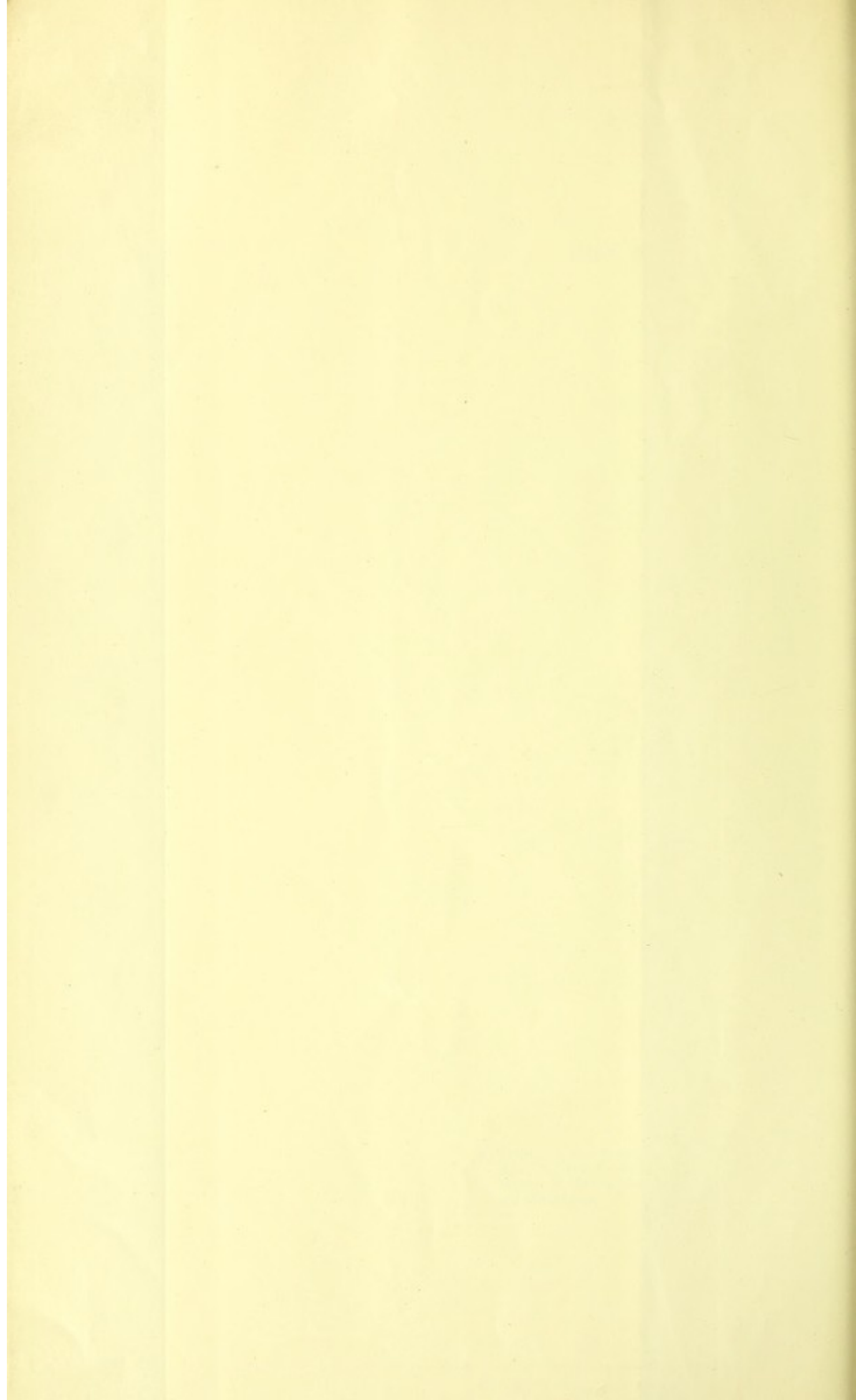


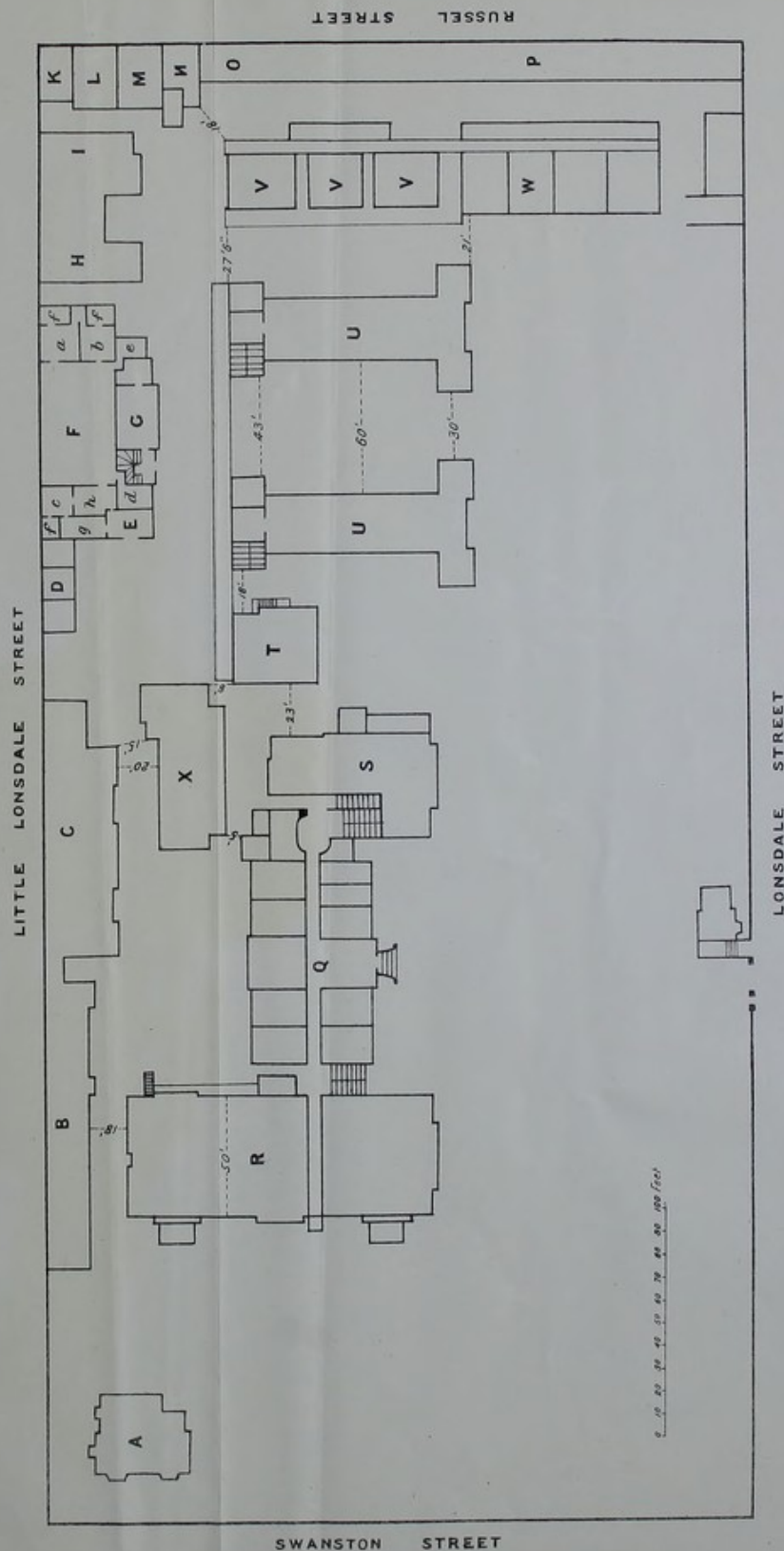
PLAN XI.

Plan of Ordinary Ward, Johns Hopkins Hospital.



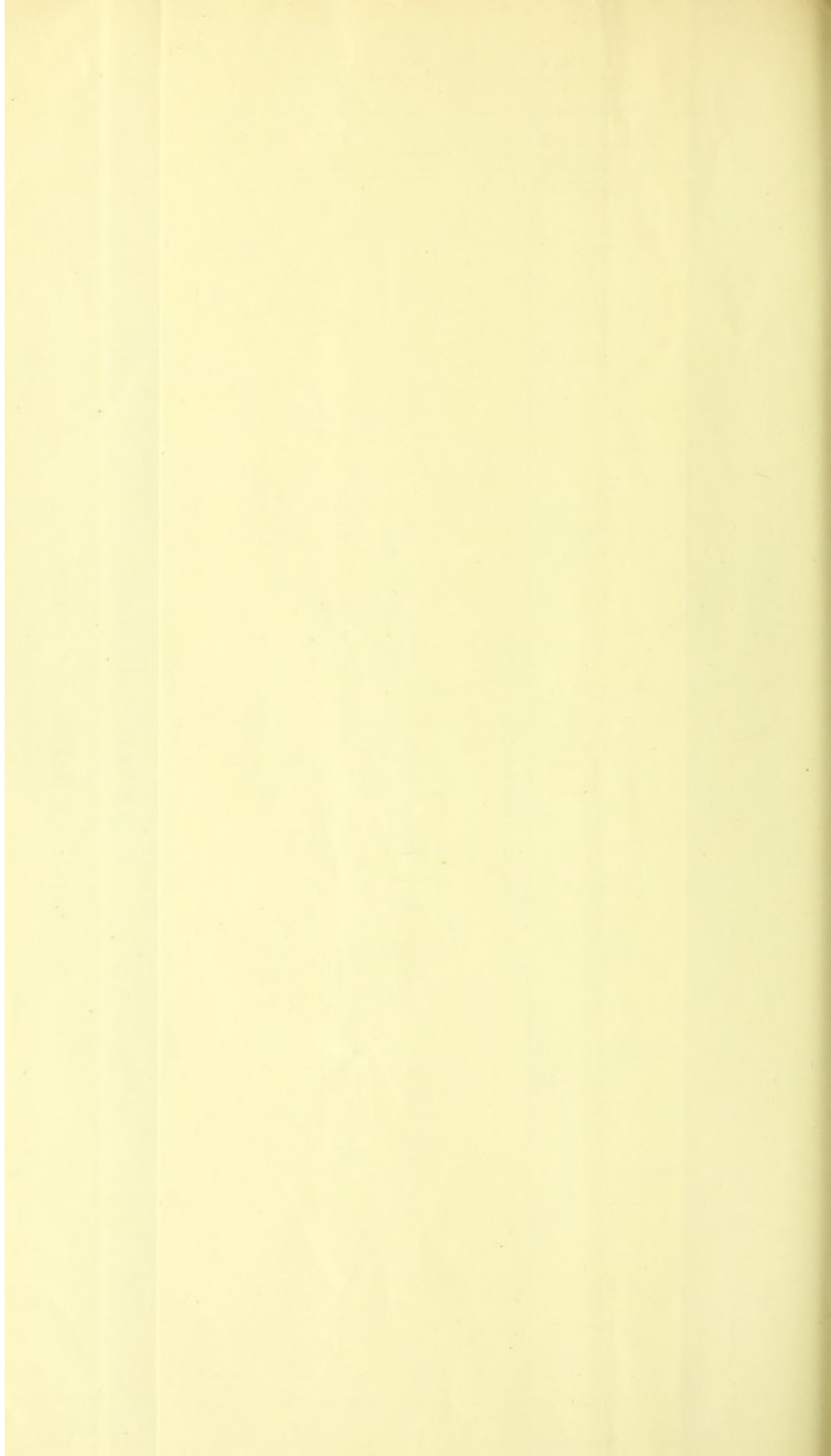
A., Ward; *B.*, Sun Room; *C.*, Hall; *D.*, Ventilating Shaft; *E.*, Lavatory; *F.*, Closets; *G.*, Nurses' Closet and Sink; *H.*, Bath Room; *I. I.*, Open Terrace over Corridor; *K.*, Patients' Clothes; *L.*, Linen Room; *M. M.*, Special Wards; *N.*, Dining Room; *O.*, Ward Kitchen; *P.*, Food Lift; *Q.*, Ventilating Shaft for Lift; *R.*, Lift for Coals and Soiled Linen.

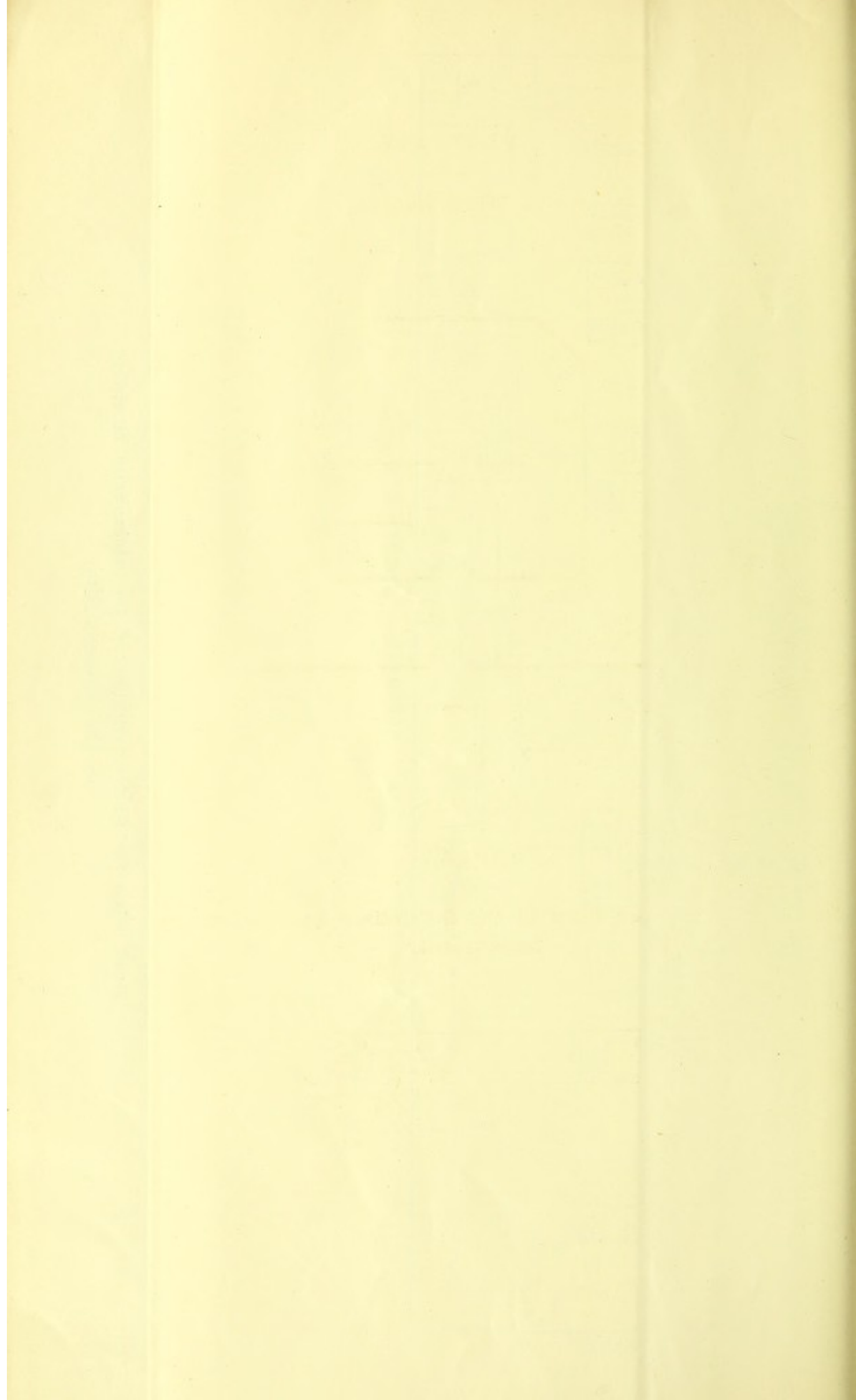




PLAN XII.

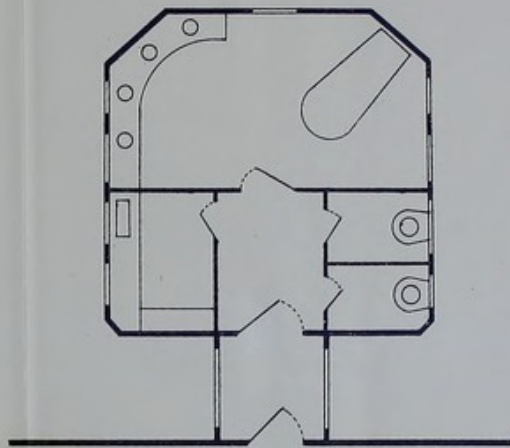
The Melbourne Hospital as it is.





PLAN XIV.

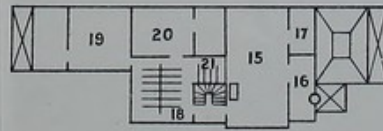
A Ward Annexe.



Scale, An Inch to a Foot.

PLAN XV.

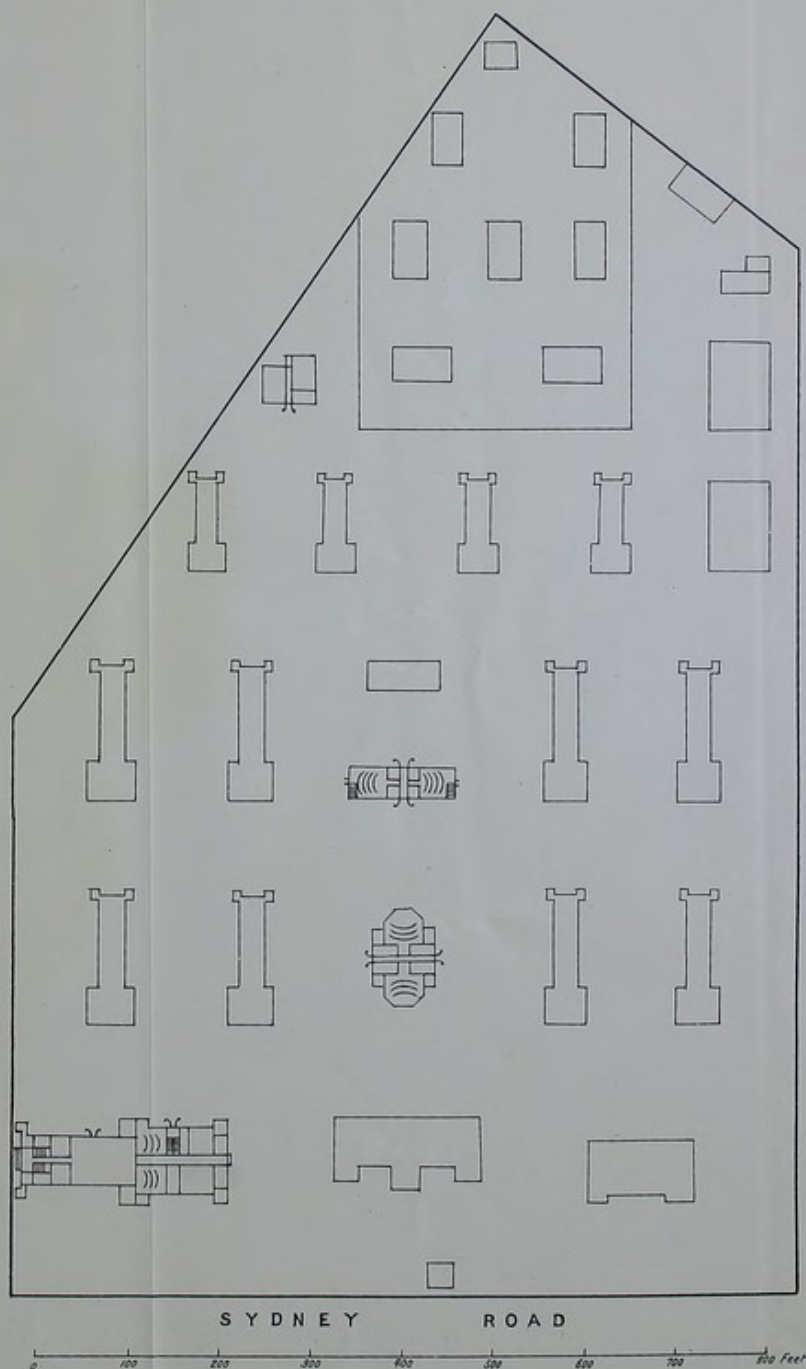
Sketch of Upper Floor in the Out-patient and Dispensary Department.

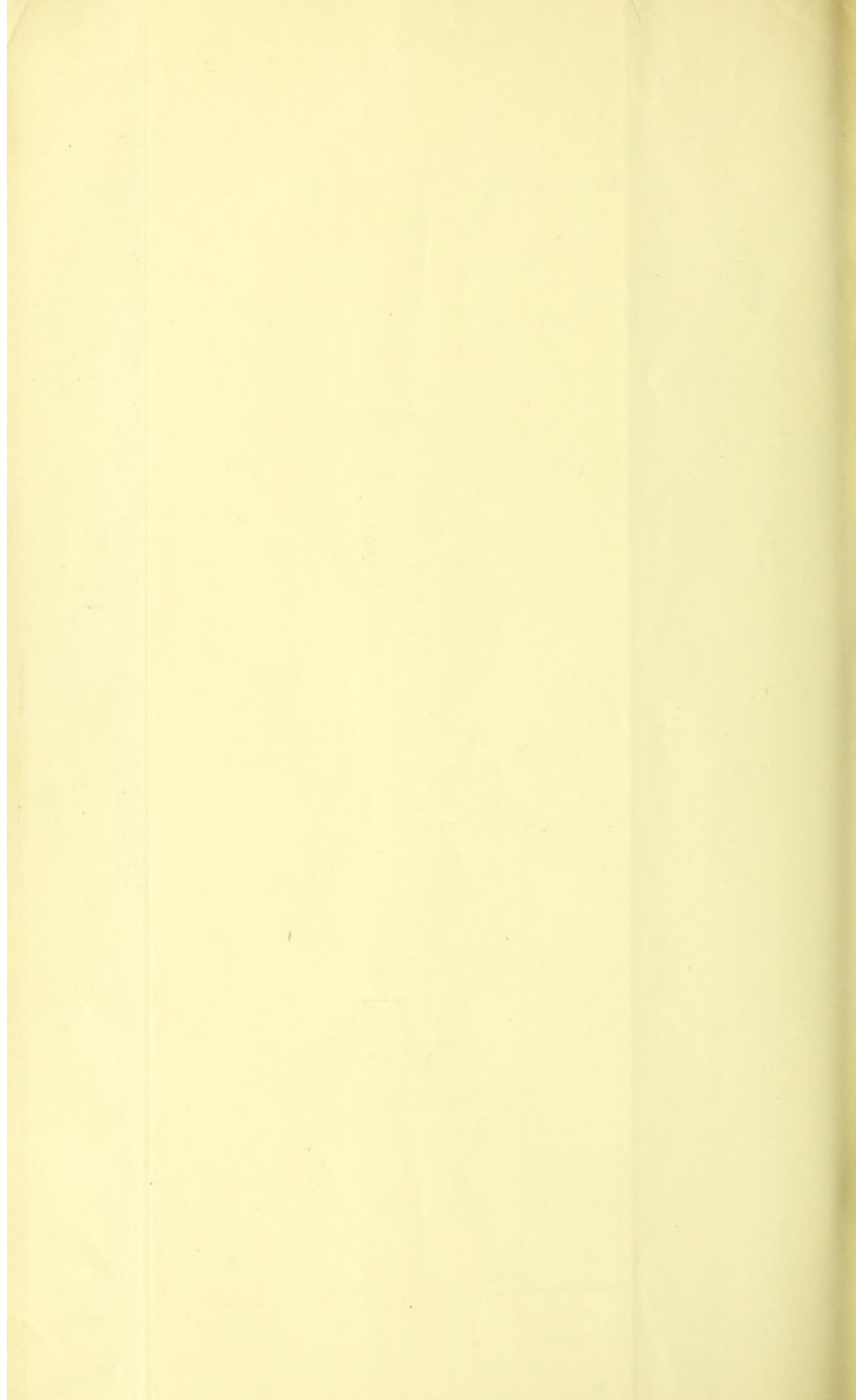




PLAN XVI.

Plan of a New Hospital on the Site of the Horse, Cattle,
and Pig Market.





PLAN XVII.

A Pavilion Ward.

