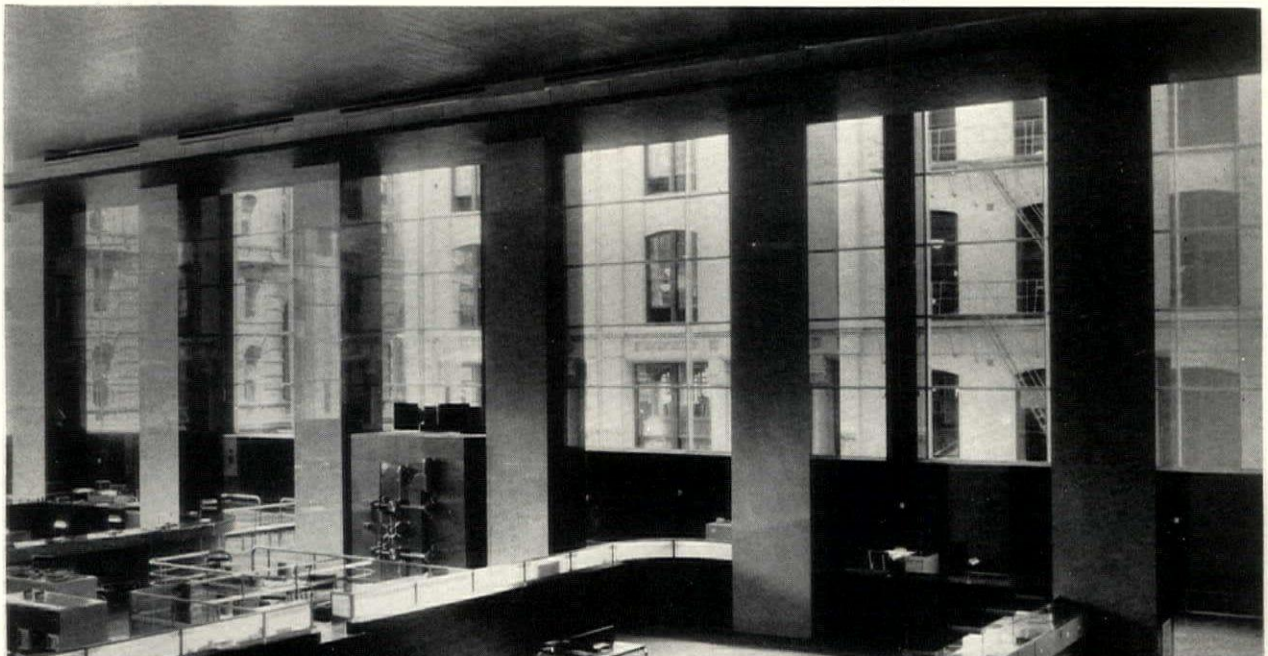
NEXT MONTH'S FORUM

AT TWELFTH and Market Streets, in the heart of Philadelphia's shopping center, stands a new bank and office building, owned by the Philadelphia Saving Fund Society, the oldest institution of its kind in America, and designed by Howe & Lescaze, architects, who are among the foremost American exponents of non-traditional architecture. Considering the conservatism of the owning institution, the old traditions of its location, the building is a paradox. It stands beside an ancient Quaker meeting house, and in its thirty-five stories of steel, concrete, glass and stainless metal includes the best contemporary example of clear-headed planning, skillful engineering and economic design that has come to our attention in many months. It is one of the few buildings in the world to be completely air conditioned. Architecturally it is controversial, yet we believe that architects cannot fail to appreciate the influence upon future structures which the building will undoubtedly have. We believe the Philadelphia Saving Fund Society Building to be significant enough to warrant a complete presentation in the pages of THE ARCHITECTURAL FORUM, and the December issue will contain the exclusive story of its design, engineering and equipment. Reproduced below is a view of one of the many excellent photographs which, with a descriptive text, will explain, at least in part, a remarkable architectural and building accomplishment.

In the same issue will be a series of plates and a short text descriptive of the Louisiana State Capitol at Baton Rouge, the latest architectural accomplishment of Weiss, Dreyfous & Seiferth, and, by a stimulating series of drawings, photographs and notes, Frederick J. Kiesler will present a most unusual project for a community theater.

Courtesy of Westinghouse

The gentleman in the mask typifies a new structural technique. Quietly, economically and safely he is joining steel to steel with an electric arc. In the December issue IRVING H. BOWMAN contributes an article on the welding of structural steel. He analyzes the work of the gentleman in the mask and explains important points in the structural design, specification and supervision of welded structures



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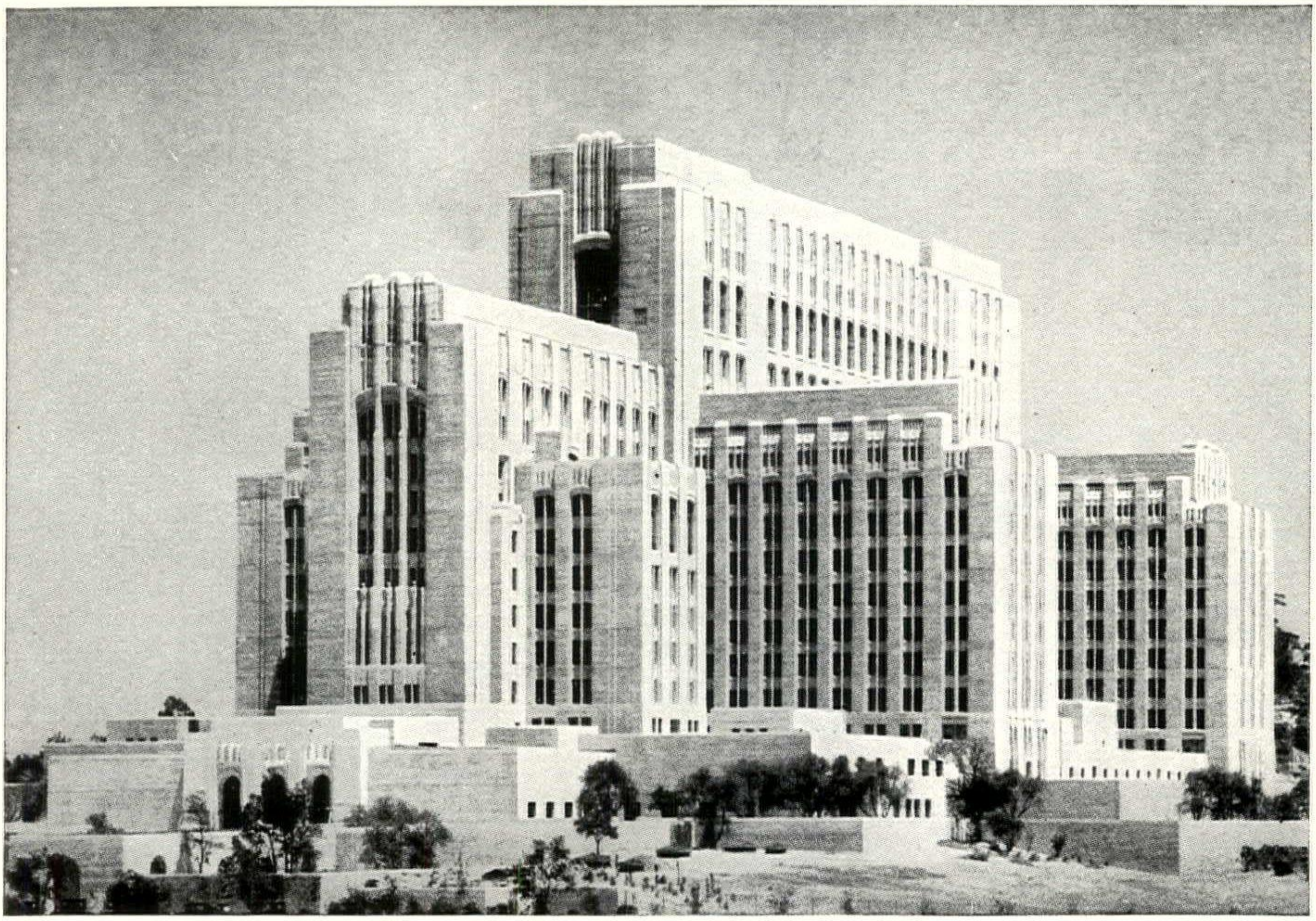
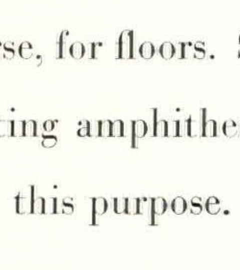


Los Angeles County General Hospital
Architect: Allied Architects, Los Angeles

Sound-absorbing, resilient, sanitary and colorful, linoleum has proved a most practical floor-covering for hospitals. 82,000 square yards of Sloane-Blabon Linoleum are used in the new Los Angeles County General Hospital. The bulk of this linoleum is used, of course, for floors. Some of it, however, is employed to cover the seats of the operating amphitheatres—the first time, we believe, that linoleum has been used for this purpose.

SLOANE-BLABON LINOLEUM



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THE ARCHITECTURAL
FORUM

VOL. LVII. NO. 5

CONTENTS

NOVEMBER, 1932

ARCHITECTURAL DESIGN

ENGINEERING AND BUSINESS

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THE ARCHITECTURAL
FORUM
VOLUME LVII NUMBER FIVE
NOVEMBER 1932

CURRENT HOSPITAL TRENDS

BY
S. S. GOLDWATER, M.D.
HOSPITAL CONSULTANT

ARCHITECTS who in these times are called upon to undertake the planning of hospitals soon discover that the problem before them includes elements of social economics with which their technical training has little to do. The perfect hospital, it soon appears, calls for the expenditure of capital sums that are beyond the resources of the average community and for individual costs of maintenance which exceed the available means of nine-tenths of the population. But the American people, despite all that may be said about the inadequacy of industrial and political leaders in recent years, is essentially a practical people and just as soon as an American building committee and its architect perceive that an ideally planned hospital is unattainable, they settle down to an analysis of the problem which aims at compromise along practical lines.

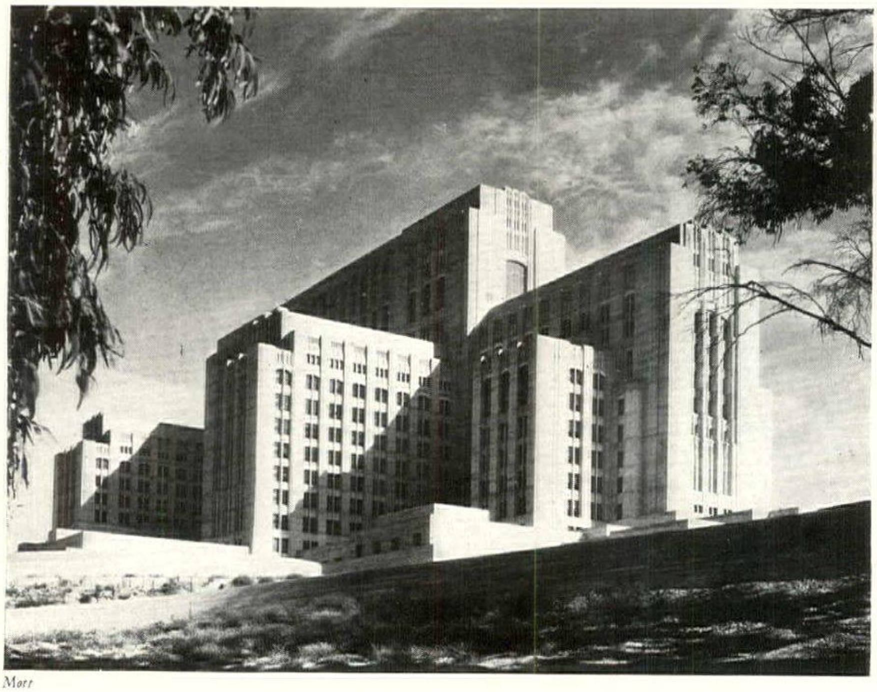
Emerging from the critical discussion of the past decade, the general tendency of which was to condemn the use of large open hospital wards, we find a new type of community hospital in which patients of moderate means and others of no means at all are offered shelter not in individual rooms assuring the maximum in privacy and comfort but in rooms containing two to four beds each — small wards in which the individual beds are separated either by light non-structural cubicle partitions or by adjustable curtains supported by overhead trolleys. The shift from large wards to small wards can perhaps be set down as the most characteristic change in American hospital planning that has occurred during the past twenty years.

Whether or not the end of this drift toward privacy has been reached may be questioned, for while the advantages of the small ward over the large ward are vigorously presented by its numerous advocates, hospital perfectionists, who see no reason for depriving the poor of any comfort which is within the reach of people of large means, continue to stress the inconsideration of compelling an acutely sick patient to share a room with others and thus to be exposed to sights, sounds and odors that are obnoxious; and to these social idealists as well as to a considerable section of the general public a separate room for every patient continues to be a tantalizing if unattainable ideal. So much for one noticeable general trend which the hospital architect must follow understandingly if he hopes to satisfy his clients.

In any general classification of hospitals there come into view immediately such distinct types as the general hospital and the special hospital, as well as the less clearly differentiated voluntary and municipal hospital. Among "special" hospitals the first position, judged by the number of beds, must be accorded to hospitals for nervous and mental patients; the tuberculosis sanitarium and various other special types trail behind. If we regard the hospital as the unit, the general hospital greatly outnumbers any special type.

The increase in bed capacity of hospitals for mental and nervous diseases during the past five years is almost startling, the number having increased from 373,000 in 1927 to 451,000 in 1931, although the number of hospitals in this group increased only from 563 to 587. In this field we have to deal for the most part with large State asylums. Tuberculosis sanitariums have lately shown little growth; in 1927 the number of available beds in this group was 63,000 and in 1931, 65,000.

The country has heard so much of medical specialization during the past decade that without knowledge of the facts one would be disposed to assume that there had occurred a vast increase in



Mott

The pictures on this and the opposite page illustrate types of hospitals for which there will be an increasing demand as public responsibility for community hospital service is more widely recognized. At the left is a view of the Los Angeles County General Hospital, Los Angeles, Cal., for which Bergstrom, Hunt, Davis, Hunt & Richards were the architects. It is not entirely finished as yet and upon its completion will be completely illustrated in THE ARCHITECTURAL FORUM. On the opposite page is the Herman Kiefer Hospital, Detroit, Mich., for which Albert Kahn, Inc. was the architect

the number of special hospitals devoted to particular branches of medicine. What has actually happened, however, has been a growing recognition of the medical specialists by general hospitals, resulting in the allocation of definite sections of general hospital buildings to individual specialties, with much specialized departmental planning. Notwithstanding a notable increase in the total volume of maternity work done in hospitals, the number of independent maternity hospitals in the country fell from 178 in 1927 to 145 in 1931; a number of maternity hospitals combined with general hospitals, but in the general hospital maternity work steadily grows in relative importance.

Industrial hospitals have increased in the past five years from a total of 108 to a total of 142, without a corresponding increase in bed capacity. Investigators who have stressed the importance of special institutions for convalescents will probably be disappointed to find that the number of convalescent hospitals listed by the American Medical Association in 1927 was 139, and in 1931 only 133. According to the last hospital census, 86 isolation hospitals for communicable diseases offered accommodations to 7,600 patients, 60 children's hospitals were equipped for 5,400 patients, 64 eye, ear, nose and throat hospitals had 2,700 beds, and 68 orthopedic hospitals 6,500 beds.

In point of bed capacity, the only single group of hospitals that can compete with general hospitals is the nervous and mental group (4,309 general hospitals, 384,000 beds; 597 nervous and mental, 451,000 beds), but as the mental hospitals are comparatively few in number, of large individual size, of relatively uniform plan, and often the product of permanent State architectural offices, one infers that the professional interest of architects practising privately in the hospital field centers upon the general hospital, which is divisible into two major groups of municipal hospitals and voluntary hospitals.

Broadly speaking, the municipal or public hospital in the United States is a hospital set up by the tax-levying authority for the accommodation of patients unable to pay for their medical or hospital care, while the voluntary hospital is a creation of a voluntary civic association offering care to rich and poor alike. These definitions must, however, be qualified, for there are some voluntary hospitals which are rigidly charitable and from which the rich are entirely excluded and others to which the penniless patient is afforded no access; while, on the other hand, there are some tax-supported State and municipal institutions from which private or paying patients are not altogether excluded.

Thirty years ago most public general hospitals, chiefly in consequence of the limited appropriations available for their construction and equipment, were comparatively poor examples of hospital planning, but the progressive and relatively liberal example of private institutions has carried over into the adjoining public field and some of the most perfectly appointed hospital buildings which the country has produced during the past five years are owned by State, county and municipal governments that have consciously aimed at high standards. Improvement in public hospital standards has occurred at just the right time, for one result of the prolonged business depression has been the stressing of the principle of public responsibility for community hospital service, and from the wider acceptance

Thomas Ellison

of this principle a sharp increase in the number and size of municipal hospitals will follow.

The university medical center, freed from the limitation of the usual "cost per bed," is, or ought to be, so far as its clinical accommodations and scientific equipment are concerned, the very best type of general hospital, since the medical student requires contact with all types of clinical service and the service must be conducted with all the accessories that modern science affords. It is a mistake, however, for the small community hospital to pattern its plant on the lavish lines of the university hospital. The creation of a Small Hospital Section within the framework of the American Hospital Association is significant: a majority of the superintendents who attend the annual conventions of the association are the representatives of small hospitals who, finding the big meetings dominated by the executives of large institutions who thought and talked in spectacular and, so far as the interests of small hospitals are concerned, in irrelevant terms, quietly withdrew into a circle where it was possible to discuss the modest realities of small hospital practise. Of all the hospitals of every description in the United States, more than 70 per cent are hospitals of less than 100 beds.

Every recent national and regional survey of hospitals and medical service has stressed the inadequacy of such service in rural centers, and side by side with the further development of existing urban institutions, we shall undoubtedly see in the future a large increase in the number of small rural hospitals modestly equipped for surgical emergencies, for maternity service, and for routine medical and surgical work, hospitals containing both small wards and individual rooms, an operating room, a modest laboratory, an x-ray room, and modern physio-therapeutic equipment which the individual country practitioner cannot afford. The rural community hospital aims to provide all the essentials of a modest hospital service at the smallest possible cost, except perhaps in the few cases in which a one-time country lad who has become a leader in finance chooses to bestow upon his home village an ornate hospital built regardless of expense.

The failure of the public to utilize a large proportion of the hospital beds which are now available, especially beds in the upper price range, is notorious. This does not necessarily mean that there are more hospital beds than are needed, for on closer examination it appears that the sickness rate and the rate of hospital utilization are two entirely different things. There are many internal diseases in which resort to the hospital is optional, and there are conditions susceptible to relief by surgical means for which hospital treatment is sought only when the patient has money to spare. The postponement of operations which in prosperous times would be undertaken without hesitation is responsible for many empty private rooms today. So far as urgent cases are concerned, the effect of financial depression is to shift the demand of patients who are still able to pay something for hospital care from higher priced to lower priced rooms and to force many self-respecting patients, however reluctantly, into the free ward class.

Thoughtful community surveys undertaken in advance of hospital building are desirable and (up to a certain point) useful, but the most intelligent survey can determine only probable utilization and cannot foretell to a nicety the character and extent of the actual demand for hospital accommodations in general or for hospital service of a particular grade. The fluctuating demand for various types of service has demonstrated the superior value of hospital layouts which are flexible in the sense that they lend themselves to the easy adaptation of ward and room spaces to changing classifications. Some private rooms, for example, are of such size and arrangement that they can be converted into semi-private rooms, while others cannot; the location of a room or small ward may or may not favor its reclassification; fenestration, too, may facilitate or obstruct the rearrangement of floor areas. In these matters the architect will do well to seek the judgment of the experienced hospital consultant or superintendent.

The vigorous campaign which is being carried on at this time for a reduction in the number of student nurses will influence one phase of hospital planning during the coming decade, for a number of schools of nursing are certain to be abandoned and spaces formerly devoted to school purposes will have to be adapted to other uses. New hospital enterprises hereafter will more frequently be undertaken without any attempt to incorporate a school of nursing in the general plan. As graduate nurses and ward maids come to replace student nurses, changes will take place in the type of residential accommodations required for part of the nursing force.

In the field of medical practise the hospital of the future will occupy a somewhat different position from that which it holds today, for physicians will increasingly make their professional headquarters at the hospital and the inclusion in the hospital plan of consulting offices for the staff may become the rule instead of the exception.

The advocates of air conditioning in hospital wards, who are pushing their wares with enthusiasm, seem to think that they are presenting something new. As a matter of fact, the control of temperature and humidity in hospital wards by mechanical means was a popular idea forty years ago but actual installations, less flexible and less cunningly devised than those available today, gave such unsatisfactory results that many protests arose and in the hospital literature of the first decade of the present century one may read the accounts of a widespread back-to-natural-ventilation movement which finally triumphed.

In the current discussion of the subject of air conditioning there is often a failure to distinguish between the idea of control and the idea of uniformity. Control, which aims at seasonal and diurnal modifications of air conditions, based on accepted physiological laws is one thing; mere constancy of what is arbitrarily chosen as a comfortable atmospheric condition is quite another. If the determination of atmospheric conditions in wards and operating rooms is left entirely to enthusiastic engineers, it is safe to predict that too little attention will be paid to clinical needs. Once more will occur a reaction based on physiological findings.

From a practical standpoint it is unwise to spend money on an elaborate air conditioning system unless the need for it has been demonstrated and its purposeful, intelligent, and continued use is assured. Again and again I have visited hospitals in which costly installations were idle, as a rule because the hospital personnel was indifferent or hostile. I do not doubt that air conditioning has a definite place in hospital planning, but I should like to see progress made along lines of known physiological laws and not in imitation of the refrigeration practise of the moving picture theater.

The organization of the International Hospital Association has stimulated a lively interchange of opinion between American and foreign hospital administrators and architects. Foreign critics think that we in this country are too careless about site, environment, sun exposure, natural ventilation and air spacing in wards. We, on the other hand, frequently find foreign hospitals awkward in arrangement and distinctly inferior in nursing equipment. The buildings of a great new Italian hospital, whose completion is described in official literature as a national achievement, are almost empty shells which contrast sharply with the recent American use of highly specialized built-in equipment.

But let us not forget that there are ways in which we can profit by the study of European practise. Deliberation in the formulation of a program or the development of plans is one lesson that we certainly can learn from our European friends; a hospital cannot be properly planned with the speed of a loft building and orders to finish complicated hospital plans in a few weeks or months will be resisted by conscientious architects who understand the nature of the work.

The number of periodicals which are devoted to hospital activities is now considerable and much can be learned from their perusal. Unfortunately, the American journals which belong to this group, while lavish in their presentation of hospital plans, elevations, and interiors, invariably present this material without critical editorial comment. A poor plan may have more allure to the uninformed than a meritorious one and the description of a plan by its enthusiastic maker may not convey the precise message which the student of hospital architecture needs. It would be a fine thing if somehow the American Hospital Association could acquire a sufficient endowment fund to enable it to develop, in connection with its excellent library in Chicago (where a large collection of hospital plans has been assembled), an institute of hospital planning officered by a competent staff of experts whose critical judgment would be available to all in need of it.

PLANNING THE GENERAL HOSPITAL

BY

H. ELDRIDGE HANNAFORD

OF THE FIRM OF

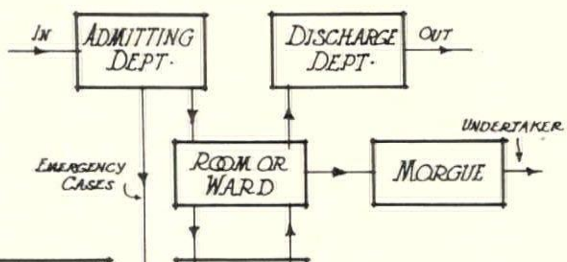
SAMUEL HANNAFORD & SONS, ARCHITECTS

NO HOSPITAL can be better than the program behind it. The importance of this truth cannot be overstressed. In this article the term "planning" should be construed in its broadest sense, and, before discussing the actual planning of the buildings and their component departments, let us consider the average hospital project in its formative state.

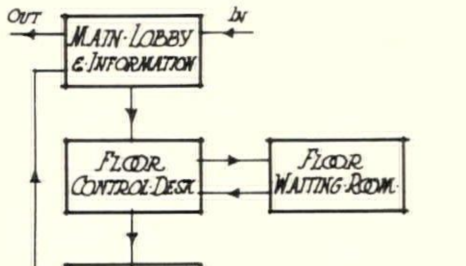
Usually a group of individuals, motivated only by the highest ideals of rendering a real service, meet and decide "to build a hospital." Without much further analysis of the problem, a site is secured and the whole project is launched in a hurricane of well-meant enthusiasm and misdirected energy. To follow this course of procedure foredooms the project to failure. Any hospital project should be approached as a difficult problem requiring solution. First of all a clear analysis should be made; the real needs, based on the broad requirements of the general community, must be determined, and a definite conception had of the exact results to be attained.

Some of the questions to be answered in formulating a hospital program are: (1) Is there a real need for any further hospital facilities in the community? (2) Just what type of service shall the hospital undertake in order to supplement or fit in with the general public health program? (3) Shall the project be set up on the basis of charity cases, part-pay cases, or strictly private room full-pay cases? (4) Where is the best location for the proposed hospital with relation to the type of service to be rendered, areas to be served, and to other hospitals? (5) What general type of building seems best suited to the hospital's special field of work? Shall it be the cottage plan, separate pavilion plan, multi-story block plan, or multi-story block plan with semi-detached wings? (6) What of future expansion and how can it be provided for? (7) Shall the building be arranged for future conversion to other hospital uses in the event this seems desirable, or is it to be set up solely as a special-purpose unit?

These questions, and many like them, must be carefully studied and weighed against each other and against the problem as a whole before a sound decision can be reached and a logical, effective program formulated. The assistance of the hospital consultant and of the architect having special and successful hospital experience must be enlisted. In selecting such specialized assistance it should be remembered, as a basic principle, that cheaply acquired and carelessly selected professional service is always highly expensive in the end, and that the best service available is barely good enough to do a real job of this sort.



·FIG. 1·
·PATIENT·TRAVEL·



·FIG. 2·
·VISITING·PUBLIC·TRAVEL·

Whittington

The Los Angeles County General Hospital, for which Bergstrom, Hunt, Davis, Hunt & Richards were the architects. Advantage has been taken of location to assure proper orientation, quiet, accessibility, outlook and facilities for expansion

General Determinations. Let us assume that we are about to begin work on a general hospital project.

NUMBER OF BEDS: The first item of determination is the number of hospital beds necessary adequately to meet the demands of the community served. The following is a good table to use for preliminary calculation for urban communities:

Medical and surgical beds	0.5 per 1,000 population
Contagious disease beds	0.5 per 1,000 population
Children's beds	0.5 per 1,000 population
Maternity beds	0.5 per 1,000 population

These proportions will be modified by several factors, such as (1) the prevalence of sickness; (2) the attitude of the medical profession toward hospitalizing their patients; (3) community social conditions; (4) rate of growth of the population. A careful survey should be made of such modifying factors and the hospital requirements finally determined from the facts developed by the survey.

In rural communities, where hospitals are not so extensively used as in cities, the above proportions can be reduced by about 40 to 50 per cent to form the basis of the program.

LOCATION. A hospital site, once chosen, is perhaps the most permanent part of the entire hospital development. The importance of a wise choice cannot therefore be overemphasized.

The following considerations should govern the selection of a site:

1. *Quiet* — Avoid locations on heavily traveled thoroughfares, street car and railroad lines, places of amusement, playgrounds, factories, etc.
2. *Clean Air* — Avoid all places where smoke, dust, or dirt originates or locations to which such impurities may be carried by the prevailing winds.
3. *Absence of Insects* — Avoid locations near swamps, ponds, streams or industries where insects are known to breed.
4. *Accessibility* — Select a location which may be quickly and easily reached by motor, trolley or bus.
5. *Suitable Outlook* — Select a site where the patients can have the benefit of seeing broad, well-kept lawns, woodlands, or distant hills.
6. *Orientation* — Select a site which will permit the hospital buildings to be so arranged as to secure sunlight in every patient's room during some portion of each day.
7. *Permanency* — Choose a site in a location where the probability of change in physical and social character is remote.
8. *Facilities for Expansion* — The site should be of such size as to permit of at least 100 per cent expansion of the original institution without crowding.
9. *Cost* — This item, while important, should never be the controlling factor except in the case of two or more sites which fulfill all the other requirements for suitability for hospital purposes. Even a donated site — if unsuited for hospital use — may prove quite expensive in the end.

Classes of Beds: No set rules can be given as to the ratios of various classes of beds to one another. Institutions vary from those having all beds in large open wards to those arranged entirely for single bed rooms. The type of service to be given (charity, part-pay, full-pay, etc.) will determine the number of ward beds, semi-private and private beds to be provided.

Perhaps a fair average assumption would be 25 per cent ward beds (more than two beds in the same room); 25 per cent semi-private (two beds to a room); and 50 per cent private beds (one bed in a room). These percentages however must be considered only as a starting point and should be used with the utmost discretion.

Other questions relative to further classifying of beds must be considered, viz., How many beds of the various classes will be needed for surgical cases; for medical cases; for maternity cases? How many for men; for women; for children? Is there a racial problem to be faced, and if so, how many beds shall be assigned for the use of Negroes or Asiatics? Each project must answer these questions in accordance with its needs.

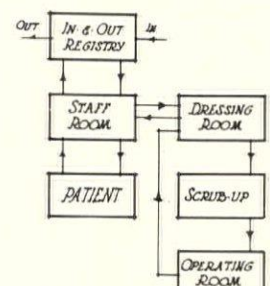
Traffic: A careful study of traffic, both to and from the hospital and also within the buildings, should be made.

Provisions must be made adequately to handle (1) the admitting of patients who arrive in ambulances, in private motors and on foot; (2) the arrival and departure of the visiting public; (3) the furnishing of motor parking facilities for doctors, conveniently located; (4) provisions for separate access to and from the buildings by the hospital personnel; (5) separate provisions for handling traffic in connection with supplies and services; (6) an unobtrusive means of removing deceased patients from the hospital, and (7) where the institution maintains an out-patient department, separate provisions to handle the arrival and departure of these patients during clinic hours.

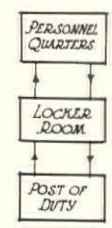
All traffic must be cared for in such a manner as to avoid conflict, crossing or back-tracking with resultant confusion.

Within the buildings other traffic problems must be successfully overcome. (1) Facilities for handling of patients should be so arranged as to allow the case to proceed from the admitting section directly to the wards (or rooms) or (if an emergency case) immediately to the operating or x-ray sections; all without coming in contact with other classes of internal traffic. (2) The same facilities for handling patients will (if properly arranged) serve for the removal of those who have died. (3) The movement of visitors through the institution must be so arranged that they are under constant supervision and are kept separated from the handling of patients and other internal traffic, insofar as possible. Visitors are usually in unfamiliar surroundings and will therefore tend to wander about unless properly controlled. (4) Provisions for handling the medical and surgical staffs and the hospital personnel must be so laid out as to permit these people to come and go to and from their duties as directly, easily and privately as possible without contacting the visiting public. (5) Handling of supplies, serving of meals, disposal of waste and like matters must be provided for in such a way that they will be handled from their point of origin to their ultimate destination promptly and without conflicting with any of the other traffic (patients, public and hospital personnel) within the building.

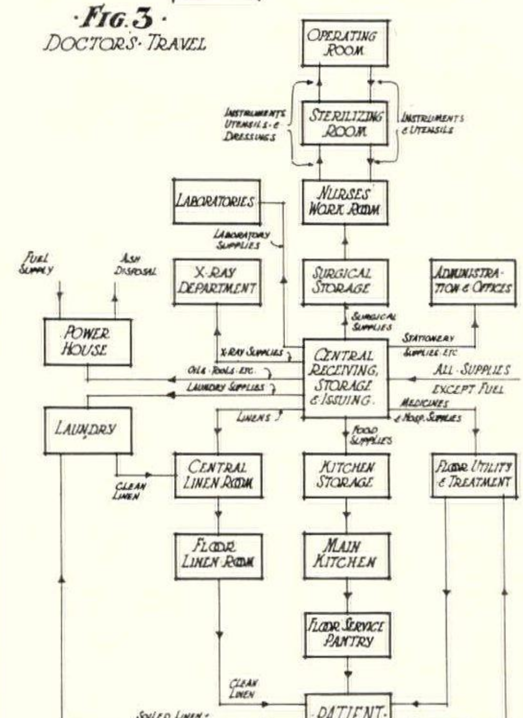
These problems require the exercise of infinite care in laying out drives; determining points of entry; arrangement of tunnel or porch connections between units, and corridors and elevators within units; as well as the proper traffic relations of the various component departments in the buildings to each other and to the scheme as a whole. Not



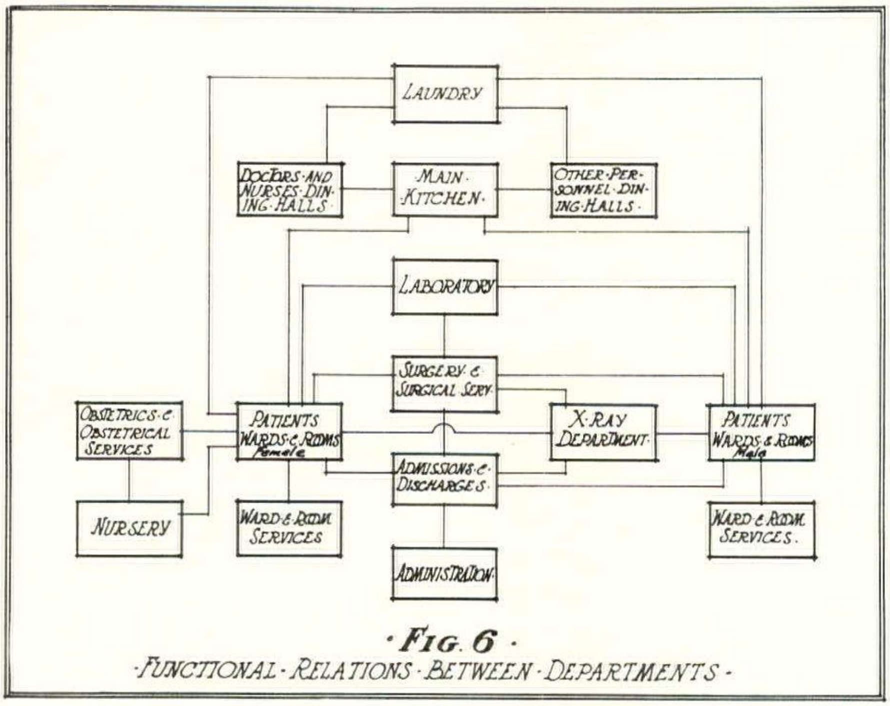
·Fig. 3·
Doctor's · Travel



·Fig. 4·
Personnel · Travel ·



·Fig. 5·
Supplies · Travel ·



·FIG. 6·
·FUNCTIONAL·RELATIONS·BETWEEN·DEPARTMENTS·

A graphic indication of the interrelation of hospital facilities most efficiently to serve the patient. It is worthy of a close analysis in that it implies the necessary circulation between departments and their relative importance in the hospital plan

only must departmental traffic relation be studied in terms of area but their superimposed relation must be considered, and, in group planning, the relation of one building to another must be studied.

All of this sounds highly complex but a clear understanding of the results to be accomplished will materially simplify the problem. The accompanying diagrams are designed to show some of the traffic movements. (See Figures 1, 2, 3, 4 and 5.)

Department Relations and Departments. Every department of a hospital exists primarily to serve the patient. This obvious fact is often overlooked by the enthusiast in each special line, who, in the ambitious development of his department toward perfection will introduce quite a few gadgets, which in no way contribute to the patient's welfare and usually cost money.

In Figure 6 the general functional relations of various hospital departments are indicated. Such departments as the power and heating, garage, maintenance and repair, etc., are not plotted, as they serve the entire development without special relation to any subdivision.

PATIENTS' QUARTERS: Since the patient is of primary importance, a satisfactory plan of the various

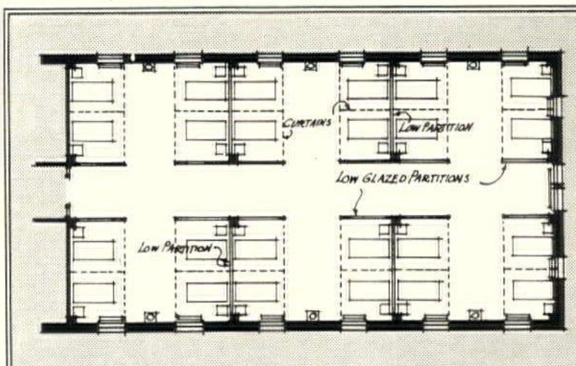
Weber

Two types of wards. The one at the left is in the Cincinnati Orphan Asylum Convalescent Home, Samuel Hannaford & Sons, architects. At the right is a semiprivate ward in the Springfield Hospital, Springfield, Mass., Stevens & Lee, architects wards and rooms should be developed first. The general area and shape of the hospital buildings are, as a rule, determined by the typical patients' floor containing the various nursing units made up of wards, semiprivate and private rooms. In laying out these patient floors the following points may prove helpful: (1) Each nursing unit should not exceed 20 to 24 beds. This applies whether the beds are ward beds, semiprivate or private. A unit of this size can be adequately supervised by one person. Larger units are too much for one person, and smaller units do not sufficiently occupy one person's time, hence both are uneconomical. (2) Each nursing unit should be controlled by a supervisor whose station is central to the area supervised and so located as to permit of visual control of the nursing unit and its services. (3) Service dependencies must be provided for each nursing unit and should be central to the area served. In no case should services be so placed as to make it necessary for a nurse or patient to walk more than 90 ft. (60 or 75 ft. is preferable) from the farthest bed to the service in question.

In some cases a service kitchen, treatment room and a solarium or day room are provided with each nursing unit, but on a floor containing a group of nursing units, these services are usually arranged to serve and be central to the group. The various services should be only of such size as to permit an efficient, workable arrangement of the necessary fixtures and equipment which go into each service or utility.

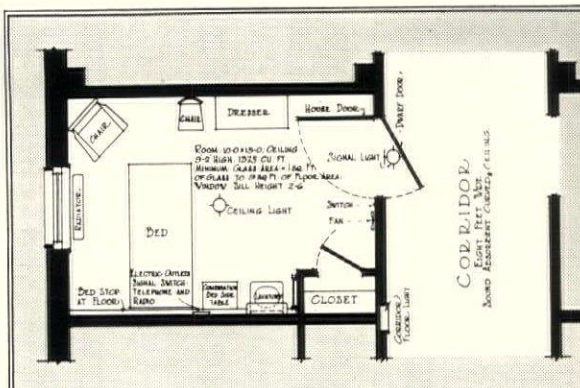
Administration Section: In this section the business of the hospital is carried on. Here also the public has its first contact with the hospital and forms a definite impression of the institution therefrom. It is therefore highly important that this section be so planned and finished as to radiate hospitality, friendliness and welcome as well as give the impression of businesslike efficiency. The entrance lobby and waiting rooms should be spacious and tastefully furnished, the information desk, elevators and other points of contact with the visiting public should be conveniently located in connection with the entrance lobby and waiting rooms so that they may be easily found by those entering for the first time (Figure 11).

Admitting Unit: This section handles the admission of the patient to the institution. Principally ambulance cases will be handled here. (The entering patient who is well enough to walk to the hospital is admitted through the administration section.) Here the patient is removed from the ambulance; placed on a stretcher or in a wheel chair, moved to an elevator and transported to ward, room, or operating section, as the case demands. In some cases an emergency operating room in direct connection with the admitting section seems desirable, so that the ambulance case can be cleaned up,

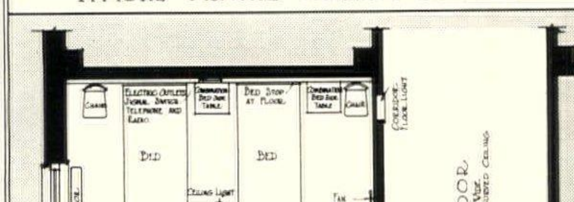


·FIG. 7·
·WARD·

An efficient layout of the patients' wards or rooms is of primary importance in developing an efficient hospital plant. Figure 7 illustrates a ward of 24 beds subdivided with low partitions, which in this case would also constitute an efficient nursing unit. The services would be placed at the end of the ward corridor and the entire unit easily supervised by one person. The two plans below illustrate typical layouts of private and semiprivate bedrooms to provide a standard of adequate comfort and service

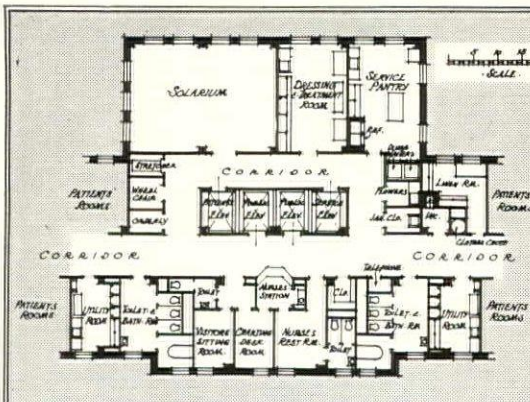


·TYPICAL·PRIVATE·PATIENT'S·BEDROOM·

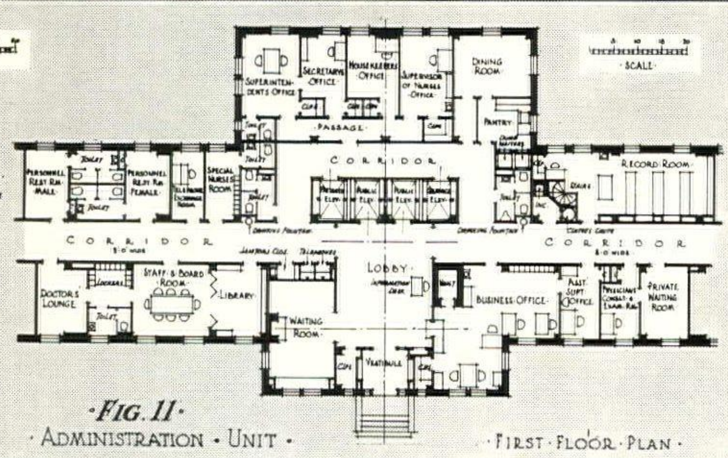


·TYPICAL·SEMIPRIVATE·PATIENTS'·BEDROOM·

Figure 8. A typical semiprivate patient's bedroom
Figure 9. A typical private patient's bedroom



·FIG. 10·
·SERVICE·SECTION·PATIENTS' FLOOR·



·FIG. 11·
·ADMINISTRATION · UNIT · · FIRST · FLOOR · PLAN ·

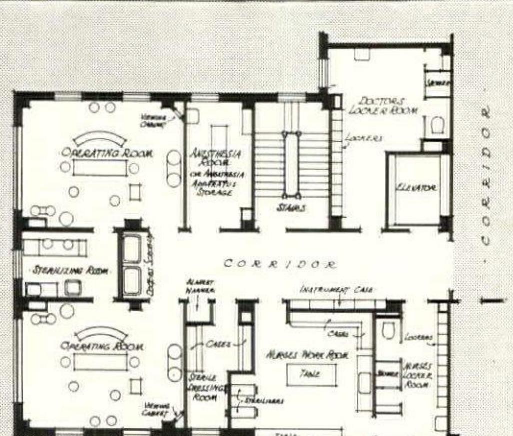
prepared, and operated upon, or otherwise treated, in the quickest and most convenient manner. This is not universal practise and the general arrangement of the admitting section should be worked out to suit local conditions.

SURGICAL SECTION: This section includes all operating rooms and necessary service and work adjuncts in connection therewith. Let us briefly outline what goes on in the surgical section to make the problem apparent.

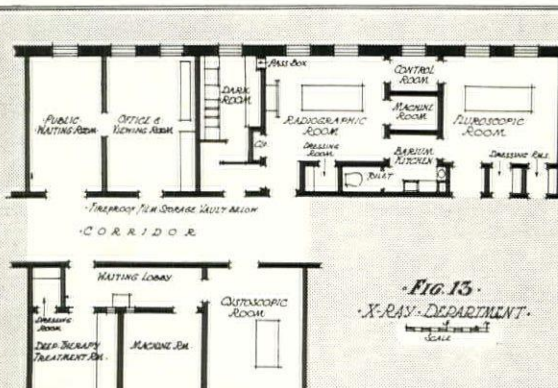
THE PATIENT: The patient is brought to the surgical section immediately prior to the scheduled operating time and is either put in an anæsthesia room or moved directly into the operating room to receive the anæsthetic. A marked difference of opinion exists among hospital authorities as to the need of anæsthesia rooms. Some maintain that the anæsthetic should be given in the operating room in any case, and therefore the separate anæsthesia room merely uses up space which can be better occupied. Others are equally insistent that the administration of the anæsthetic in the operating room tends to upset the patient's nerves and therefore the separate room for anæsthesia is essential. Both positions have points in their favor. Local technique and practise should govern.

After the operation the patient, covered in hot blankets to ward off a post-operative chill, is returned to his room for recovery. Formerly it was common practise to provide special "recovery rooms" to which the patient could be taken after the operation and then later removed to his own room. As this involves extra handling of the case, with possible bad results, it is considered best to return the patient at once to his own bed, excepting in the case of ward patients who should be isolated until they have recovered from the anæsthetic and will no longer disturb the other ward patients.

THE DOCTOR: The doctor or surgeon who is to take part in the operation goes first to the dressing room where he removes his clothes, takes a shower, puts on a suit of clean pajamas and covers his hair with a sterile towel. He then proceeds to the scrub-up room where he vigorously soaps and scrubs his hands and arms; then, with hands and arms wrapped in a sterile towel, he enters the operating room, dons



· FIG. 12 ·
· SURGICAL · SECTION · OF · A · SMALL · HOSPITAL ·
· SCALE ·



·FIG. 13·
·X-RAY·DEPARTMENT·
SCALE

his sterile gown and mask (handed him by one of the nurses), plunges his hands and arms in chemical disinfectant; draws on the sterile rubber gloves and is ready for the operation. Having completed the operation, the surgeon returns to the scrub-up room, where he divests himself of gloves, gown and mask, and, if he has no further operation to perform, returns to the dressing room and dresses.

THE NURSING PERSONNEL: It is the duty of the surgical supervisor and the operating room teams to make ready for every operation; to see that every need — normal as well as emergency — is provided for during the operation; and to clean up the surgical section at the end of each day's work and make ready for the next day's schedule.

Gowns, masks, gloves, etc., must be sterilized and so kept, ready for immediate use. Instruments and utensils must be sterilized, put in perfect condition and properly stored so as to be available instantly when needed. Sterile dressings, sponges, bandages, pads and the like must be prepared and kept in sterile storage until required. This work is done in the sterilizing rooms and the nurses' work rooms in the surgical section.

In addition to this the nurses actually serving in connection with the operative work must change their clothes, scrub-up, and don gowns, masks, etc., with the same meticulous care as the surgeons. The illustration (Figure 12) of a typical surgical section illustrates how the procedure, as above outlined, is planned for and facilitated. The various dimensions of the surgical units should be considered as a minimum.

OBSTETRICS: In this department the arrangement is usually quite similar to the surgical unit except that certain special dependencies should be included. These consist mainly of: (1) labor rooms, in close proximity to the delivery rooms; (2) waiting room where the "expectant father" can spend his time pending the child's delivery; (3) rest room for the use of the obstetrician during the final labor period immediately before his presence will be required in

A heliotherapy room in a children's convalescent hospital, Samuel Hannaford & Sons, architects

Above is a utility room in a children's convalescent hospital, below, an operating room and a typical utility room in the Christian R. Holmes Hospital, Cincinnati, Ohio, Samuel Hannaford & Sons, architects

the delivery room; (4) the nursery and its service dependencies which care for the new-born infant. In connection with the nursery should be the infant's bath and utility rooms; and a constant-temperature or incubator room should be provided to care for the premature or under-developed baby. There should also be an isolation section provided for septic births and for infected babies.

X-Ray: This department functions both for diagnosis and treatment. The diagnostic work consisting of the examining of the patient under the fluoroscope and the taking of x-ray photographs. The treatment consisting of exposing affected portions of the patient (skin eruptions, ulcers, tumors, cancer, etc.) to the action of the rays themselves. As a rule this department is put in proximity to the surgical section, but, due to the extensive use of x-ray in general diagnosis, a location elsewhere (e.g. as a part of the admitting section) is sometimes preferred.

The sizes of x-ray units, shown in Figure 13, should be considered minimum. The walls of the fluoroscopic, radiographic and deep therapy rooms should be covered with lead; the doors to these rooms should be lead-cored; and, in cases where patients' rooms are located above or below, the ceilings and floors should be lead-covered as well as the walls. Provide ample storage space to permit of the careful storage of films (of a non-inflammable type) in fireproof containers kept in a fireproof room; with adequate ventilation arranged so as to allow film gases to escape harmlessly in the event of a conflagration.

Laboratory: This department is a part of the general diagnostic work of the hospital (urinalysis, blood count, microscopic examinations, etc.) and also functions as a treatment medium in the preparation of special cultures, serums and the like.

The usual location is in conjunction with the surgical section; but, as in the case of x-ray, this should be determined to conform to the needs of the special problem in hand. No rules as to size or arrangement of this department can be laid down as these may range from one small room to an entire floor or wing, depending upon the amount and type of work to be done.

Culinary Department: This department is responsible for the preparation and serving of all food throughout the hospital, not only to patients but to the hospital personnel as well. It is vitally important, before attempting to locate this department or determine its interior arrangement, that the general scheme of food service be predetermined.*

Nurses' Home and Personnel Quarters: The housing of personnel in connection with a hospital is properly a problem of its own which can well be discussed in detail in a separate article.

In connection with any hospital development, however small it may be at the start, it is advisable to give consideration to a nurses' home (either present or future) and quarters for male and female help which may become necessary as the institution grows. These units should be provided for as a part of the original general plan and should be so located as to be readily accessible to the hospital proper and yet be sufficiently private to permit the resident personnel to enjoy its off-duty hours without being constantly reminded of hospital routine. Enough ground area should be set aside in connection with these residential buildings to provide for tennis courts or other outdoor areas for recreation.

A certain amount of supervision and control of the resident personnel is essential and the buildings should be so located and arranged as to permit of this supervision being easily effected. As a general rule only single rooms should be provided and these should be of ample size to accommodate properly the furniture arrangement but not of such size as to encourage groups to congregate in the bedrooms. A room size 7 ft. 6 in. x 13 ft. or 14 ft. is, as a rule, sufficient, the larger dimension being assumed to be taken at right angles to the outside wall and inside corridor. The congregating of the resident personnel in social groups when off duty should be encouraged and cheerful lounging and recreation rooms of adequate size should be provided on the first floor. Proper quarters for floor supervisors should be made and these, as a rule, consist of a small living room and a bedroom and bath in connection therewith. It is sometimes advisable to provide on each sleeping floor a small kitchenette and a room where personal laundering can be done.

For the typical bedroom the furniture should be simple, consisting of a single bed, two straight chairs, a chest of drawers and a desk. There should also be in connection with each bedroom a hanging closet of adequate size to permit the storage of personal clothing and spare uniforms, but this closet need not be sufficiently large to accommodate a trunk, as these articles are better taken care of in trunk rooms located in other parts of the building.

Conclusion: In this article it has been the writer's endeavor merely to cover a few basic factors in the problem of planning a general hospital but each hospital project is unique. Special factors and combinations of circumstances must be given individual consideration and the whole problem must be thoroughly analyzed, and all points understood and properly evaluated as to their importance in the general scheme before any adequate solution can be reached.

Perhaps the most helpful advice which can be given is — know your problem thoroughly, in all its phases, before attempting its solution.

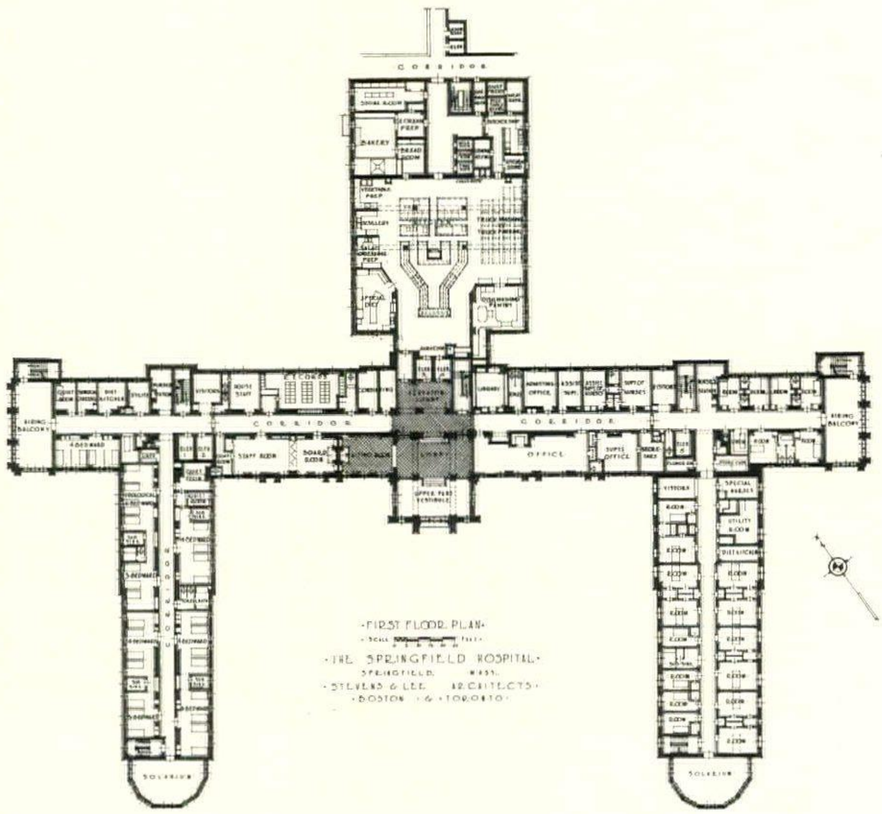
*This department is discussed in detail in a separate article in this issue.

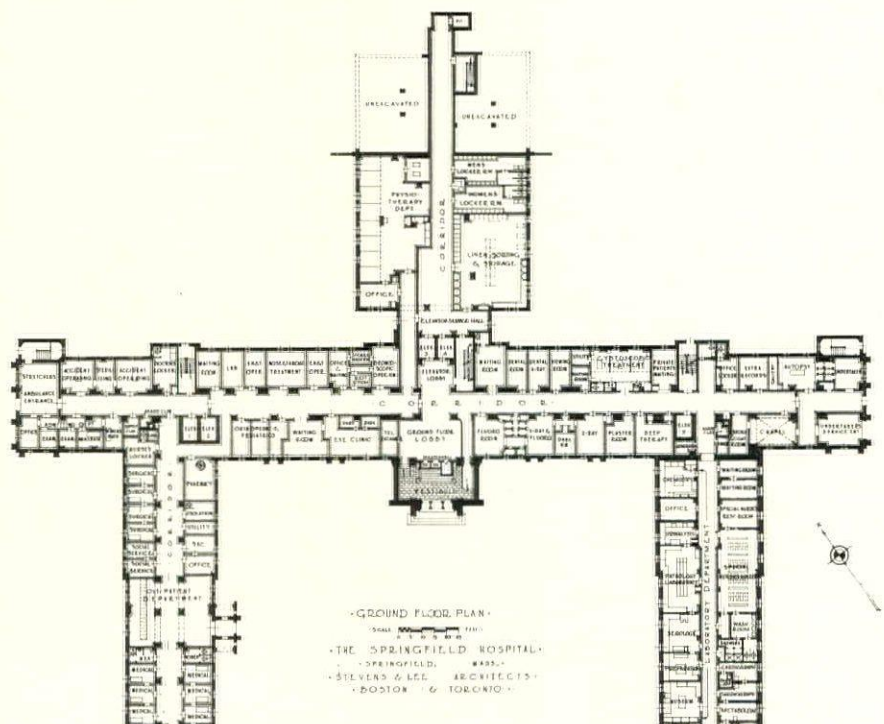
Weber

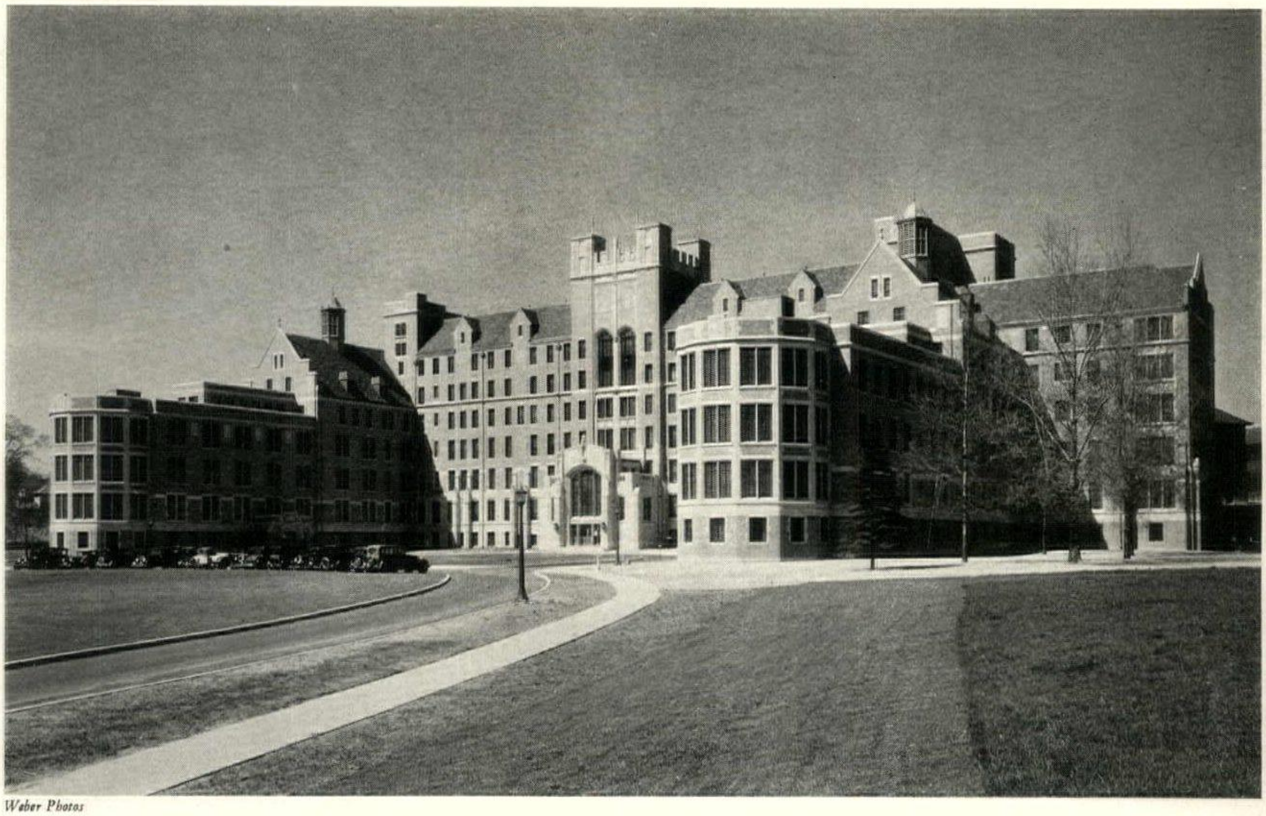
SPRINGFIELD HOSPITAL

SPRINGFIELD, MASSACHUSETTS

STEVENS & LEE, Architects, CHARLES F. NEERGAARD, Consultant


FIRST FLOOR PLAN
THE SPRINGFIELD HOSPITAL
SPRINGFIELD MASS.
STEVENS & LEE ARCHITECTS
BOSTON & TORONTO


GROUND FLOOR PLAN
THE SPRINGFIELD HOSPITAL
SPRINGFIELD MASS.
STEVENS & LEE ARCHITECTS
BOSTON & TORONTO



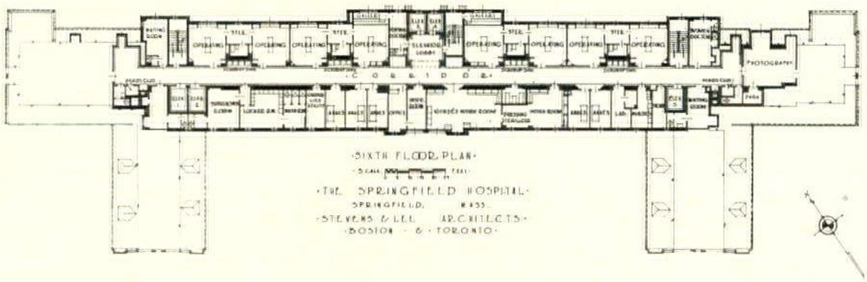
Weber Photos

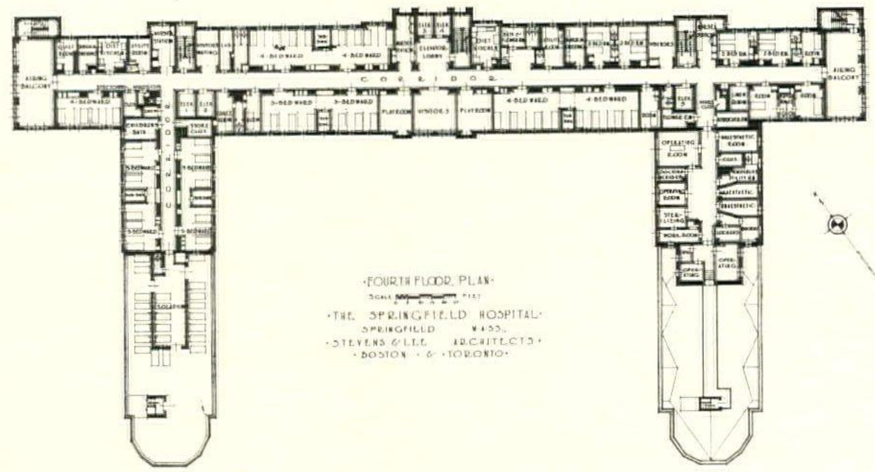
AS IS the case with many hospitals, the Springfield Hospital as it now stands is the result of extensive additions and alterations to the original plant. In 1930 this hospital had a rating as a 172 bed institution. Now it is rated as a 323 bed hospital embracing every important field of physical and medical treatment except maternity. It is of fireproof construction throughout, the exterior being faced with red brick and cast stone trim. The pitched roofs are of gray-green tile. Particularly important in this institution is the out-patient department, located in the west wing of the ground floor and reached by a separate entrance. The plan is shown on the opposite page. Especially noteworthy are the operating facilities and those for many types of special treatment

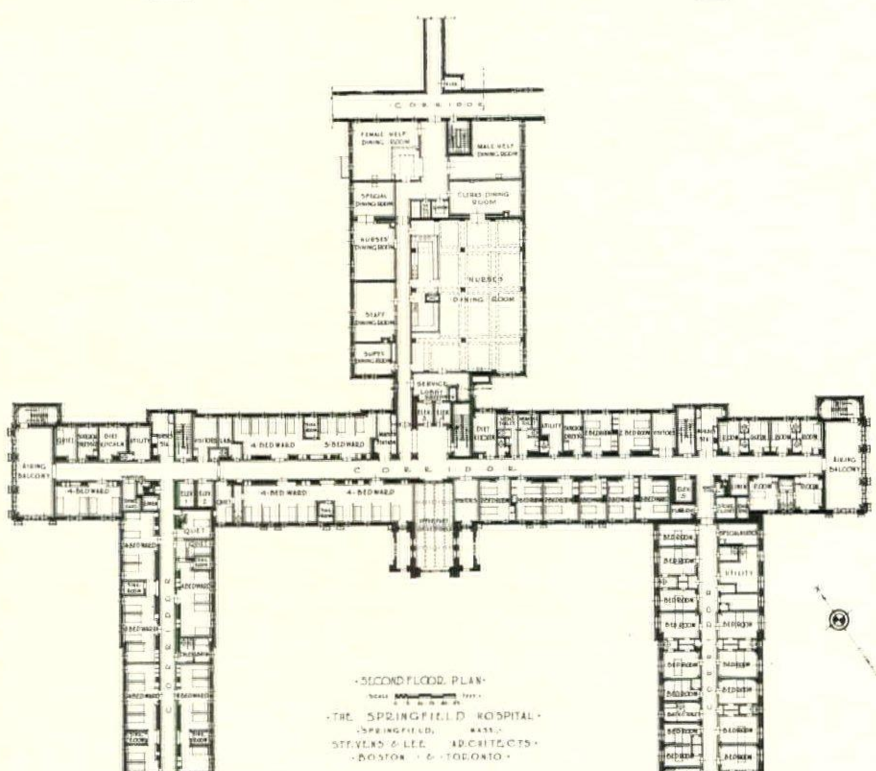
SPRINGFIELD HOSPITAL

SPRINGFIELD, MASSACHUSETTS

STEVENS & LEE, ARCHITECTS, CHARLES F. NEERGAARD, CONSULTANT


SIXTH FLOOR PLAN
THE SPRINGFIELD HOSPITAL
SPRINGFIELD MASS.
STEVENS & LEE ARCHITECTS
BOSTON & TORONTO


FOURTH FLOOR PLAN
THE SPRINGFIELD HOSPITAL
SPRINGFIELD MASS.
STEVENS & LEE ARCHITECTS
BOSTON & TORONTO


SECOND FLOOR PLAN
THE SPRINGFIELD HOSPITAL
SPRINGFIELD MASS.
STEVENS & LEE ARCHITECTS
BOSTON & TORONTO

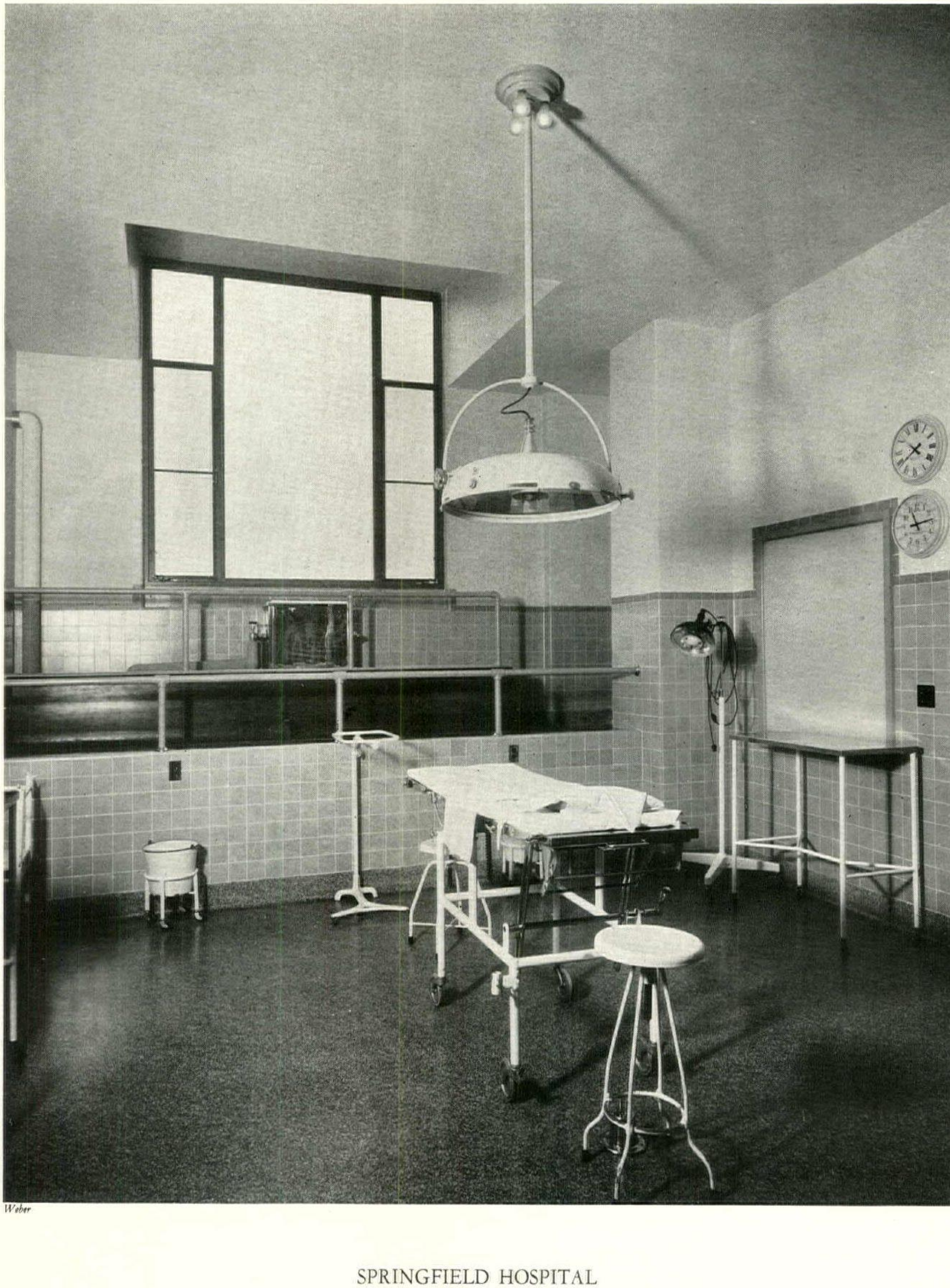
Weber Photos

THE illustrations on this page show the treatment of typical interior public spaces. Above is a view of the board and staff room. At the right is the hostesses' alcove in the entrance lobby. The doctors' in-and-out register behind the desk is duplicated in the board and staff room and at the various entrances. As a doctor enters or leaves the hospital he throws a switch operating a lamp in the register annunciator. The in-and-out indication is duplicated in the annunciators throughout the building

SPRINGFIELD HOSPITAL

SPRINGFIELD, MASSACHUSETTS

STEVENS & LEE, ARCHITECTS, CHARLES F. NEERGAARD, CONSULTANT



Weber

SPRINGFIELD HOSPITAL

SPRINGFIELD, MASSACHUSETTS

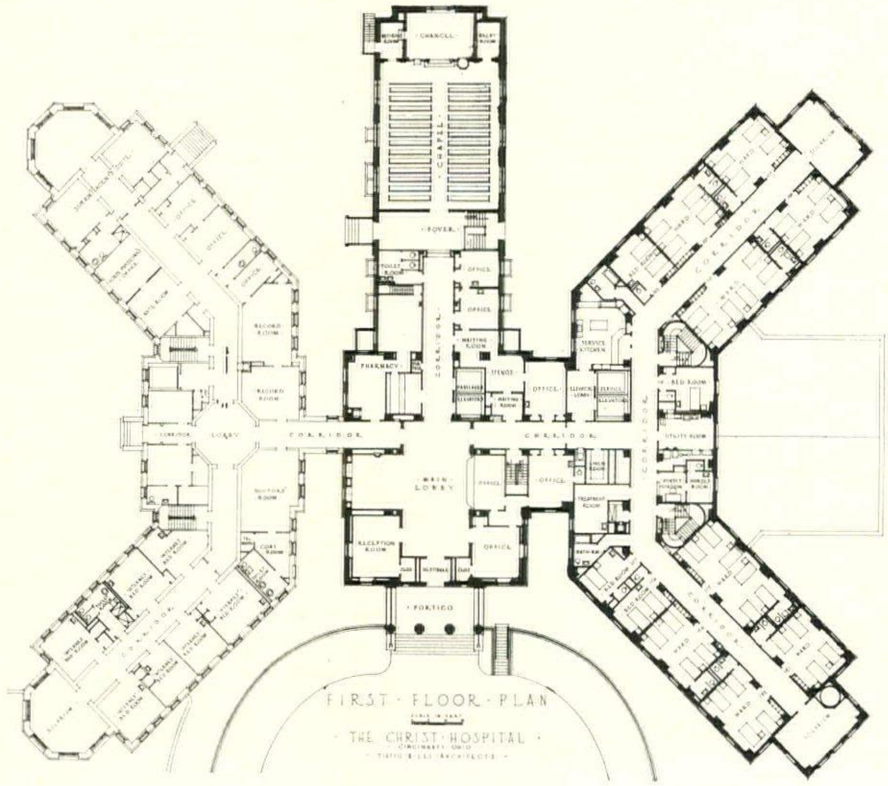
STEVENS & LEE, ARCHITECTS, CHARLES F. NEERGAARD, CONSULTANT

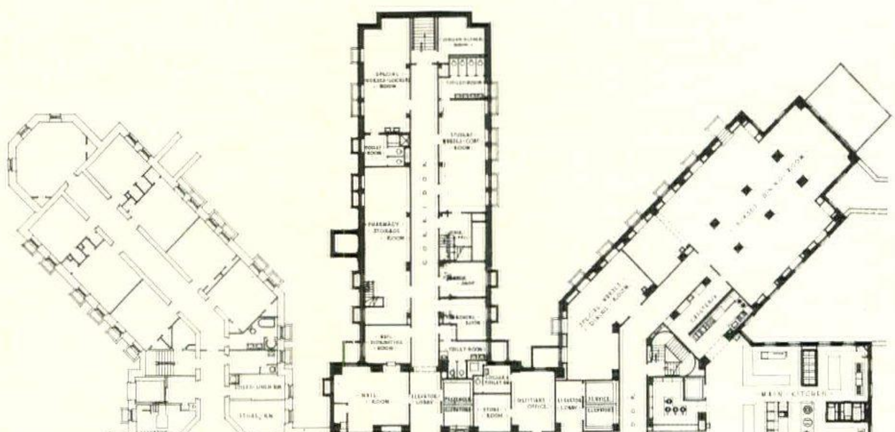
THIS institution has facilities for 400 patients. The building contains seven nursing floors, each with from 30 to 60 patient beds, and as shown here includes only part of what ultimately will be a symmetrical structure with even greater facilities, indicated in part by the plans on page 406. The surgical department situated on the eighth floor provides complete facilities for all forms of general operative work, and in addition has separate rooms for specialties, such as deep therapy, cystoscopy and radiography. The hospital is served by a staff of 47 surgeons and an average of 62 operations is performed each week

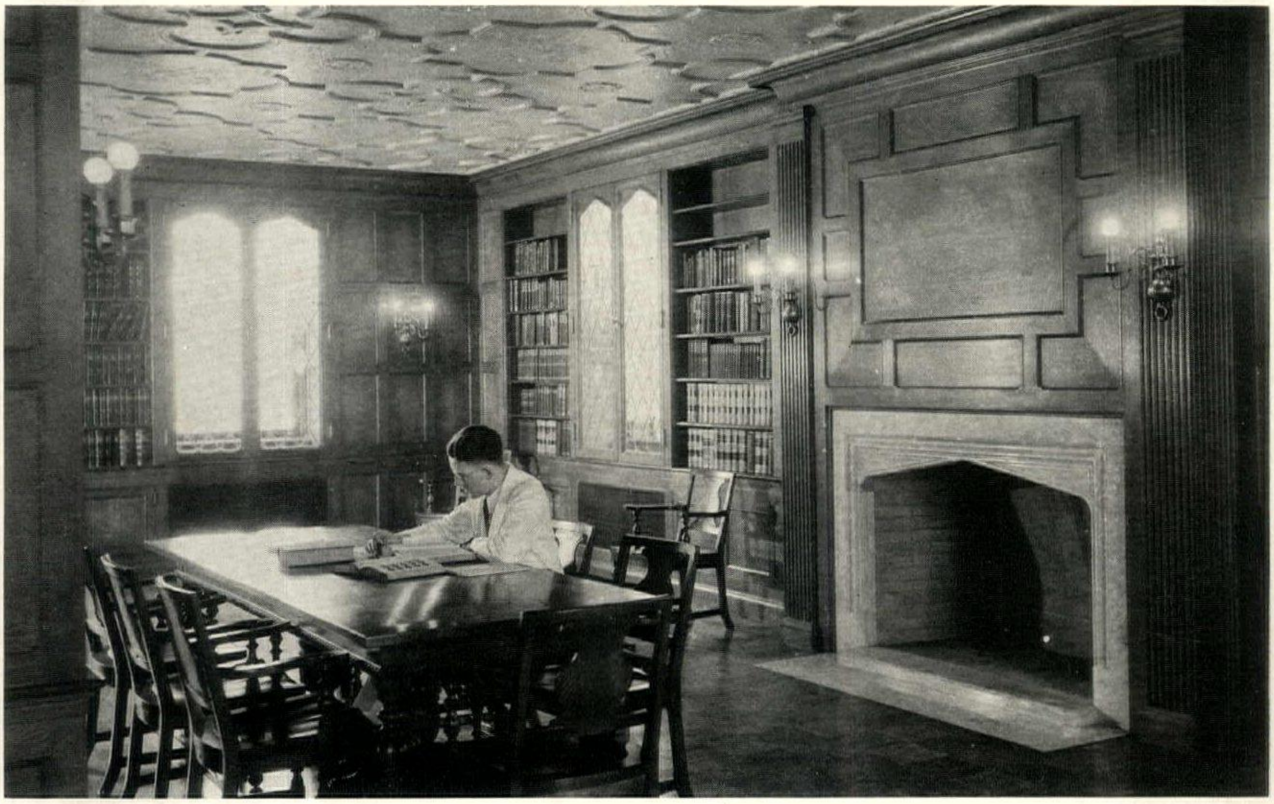
CHRIST HOSPITAL

CINCINNATI, OHIO

TIETIG & LEE, ARCHITECTS


FIRST · FLOOR · PLAN
THE · CHRIST · HOSPITAL
CINCINNATI · OHIO


BASEMENT · FLOOR · PLAN
THE · CHRIST · HOSPITAL
CINCINNATI · OHIO
MAIN · KITCHEN



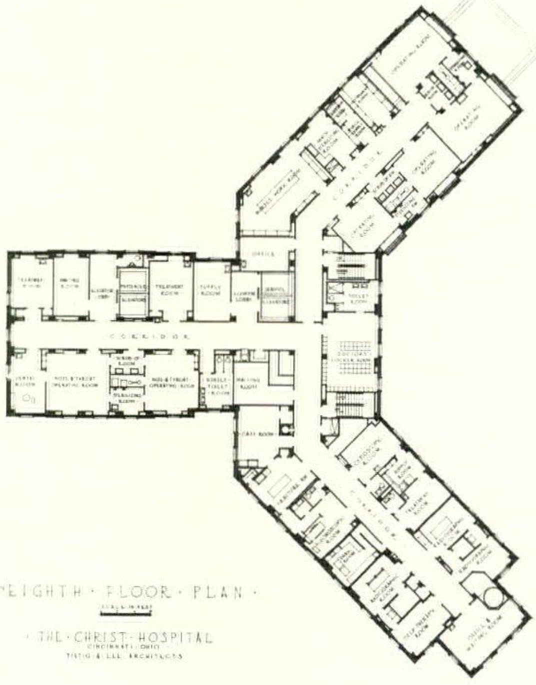
William Schuster

ABOVE is an illustration of the library. At the right is a view of a typical operating room. The major operating rooms occupy the end of one wing and measure 14 x 20 ft.

CHRIST HOSPITAL

CINCINNATI, OHIO

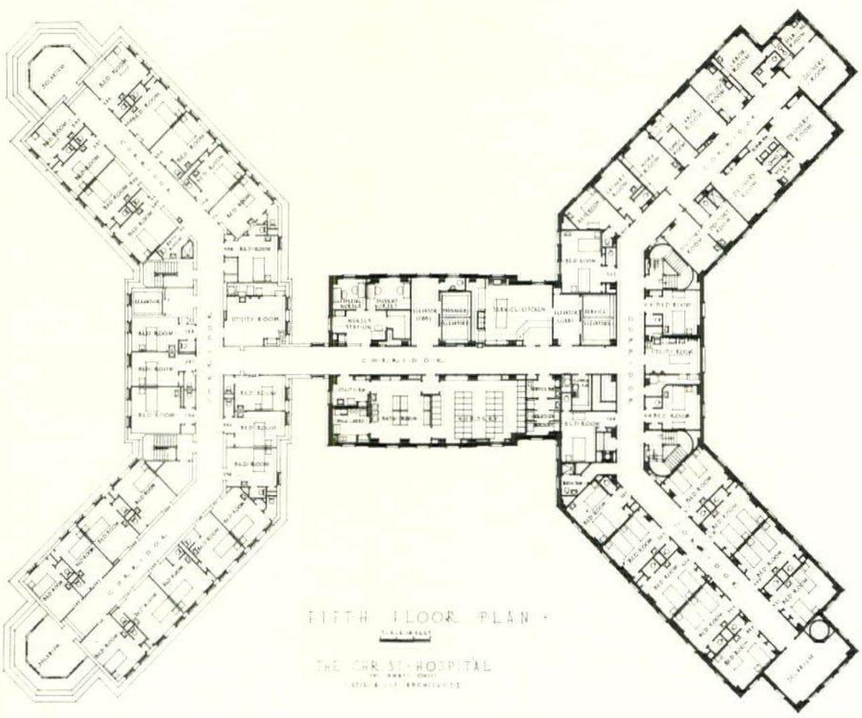
TIETIG & LEE, ARCHITECTS



· EIGHTH · FLOOR · PLAN ·

SCALE IN FEET

· THE · CHRIST · HOSPITAL
CINCINNATI · OHIO
TIETIG & LEE · ARCHITECTS



FIFTH · FLOOR · PLAN ·

SCALE IN FEET

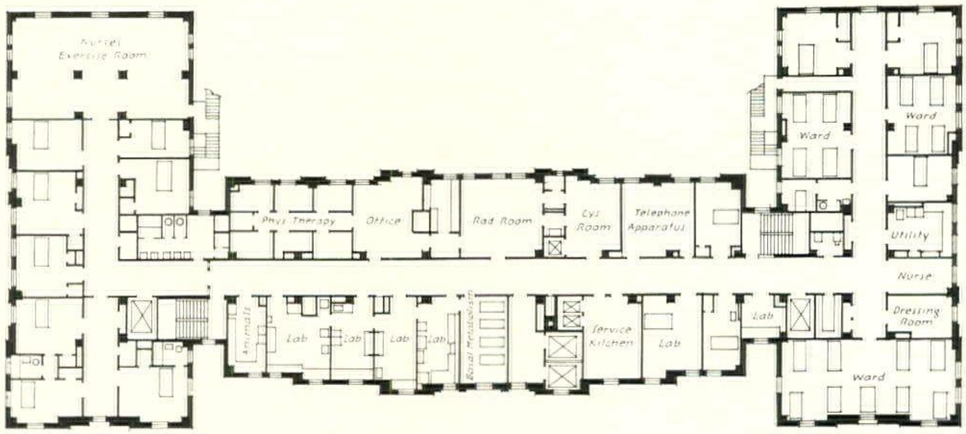
THE · CHRIST · HOSPITAL
CINCINNATI · OHIO
TIETIG & LEE · ARCHITECTS

Fuermann & Sons

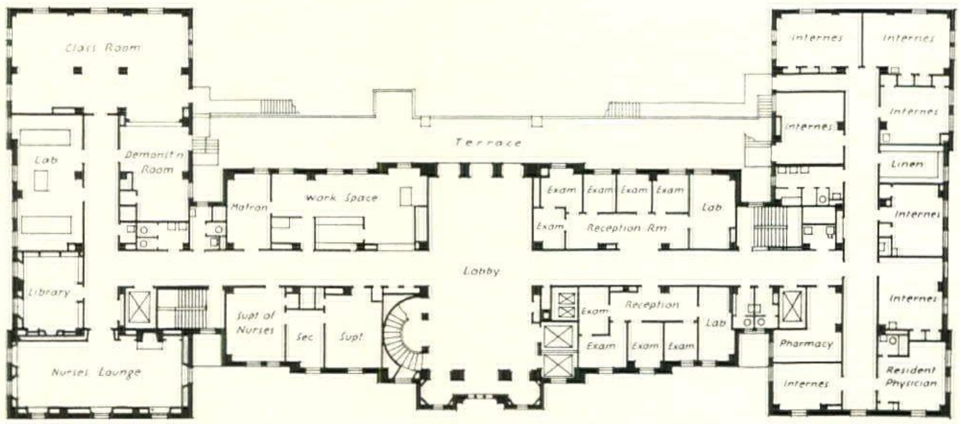
PASSAVANT HOSPITAL

CHICAGO, ILLINOIS

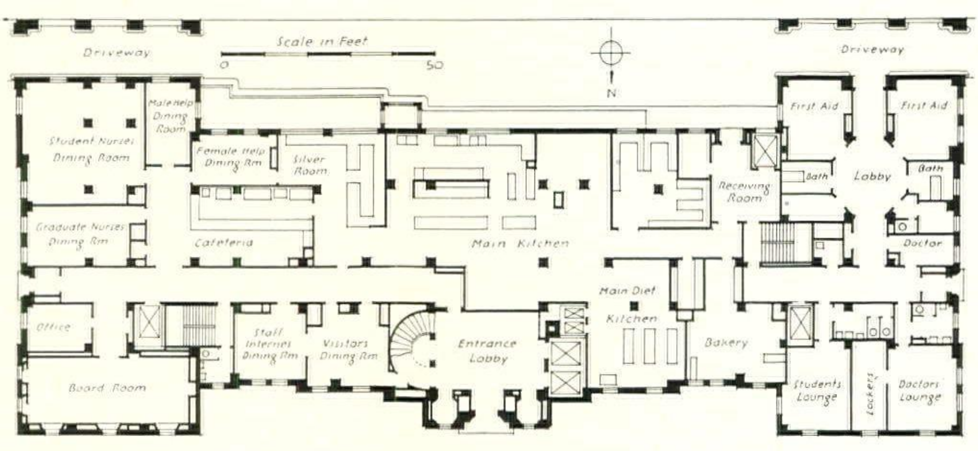
HOLABIRD & ROOT, ARCHITECTS



SECOND FLOOR PLAN



FIRST FLOOR PLAN



GROUND FLOOR PLAN

PASSAVANT HOSPITAL

CHICAGO, ILLINOIS

HOLABIRD & ROOT, ARCHITECTS

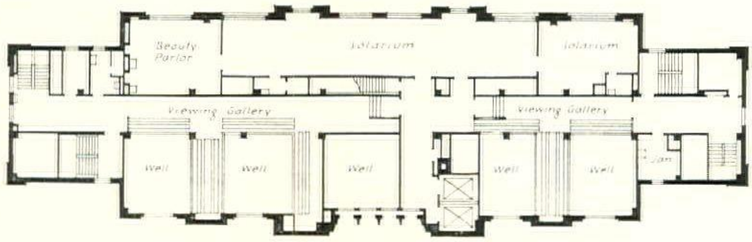
Fuermann & Sons Photos

THE two illustrations on this page are typical of the general interior treatment of the Passavant Hospital. Above is the library. The simple design and comfortable furnishings are common to the other public spaces throughout the building. The small picture at the right is a view of a Class A private room. The harmony achieved by attractive, simply designed furniture against a plain background is common to every patient's room, including the wards

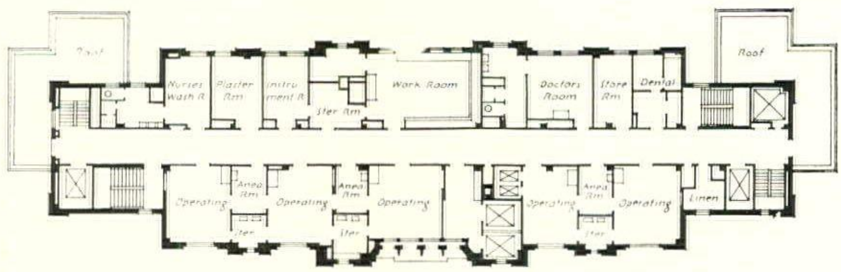
PASSAVANT HOSPITAL

CHICAGO, ILLINOIS

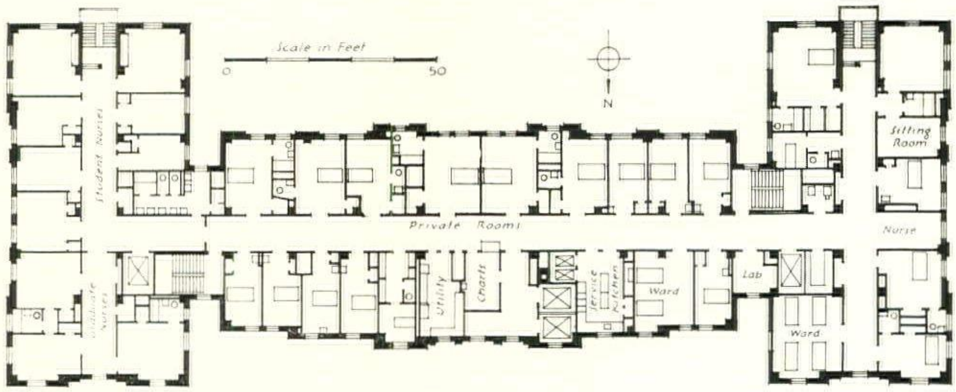
HOLABIRD & ROOT, ARCHITECTS



ELEVENTH FLOOR PLAN



TENTH FLOOR PLAN



FIFTH AND SIXTH FLOOR PLAN

PASSAVANT HOSPITAL

CHICAGO, ILLINOIS

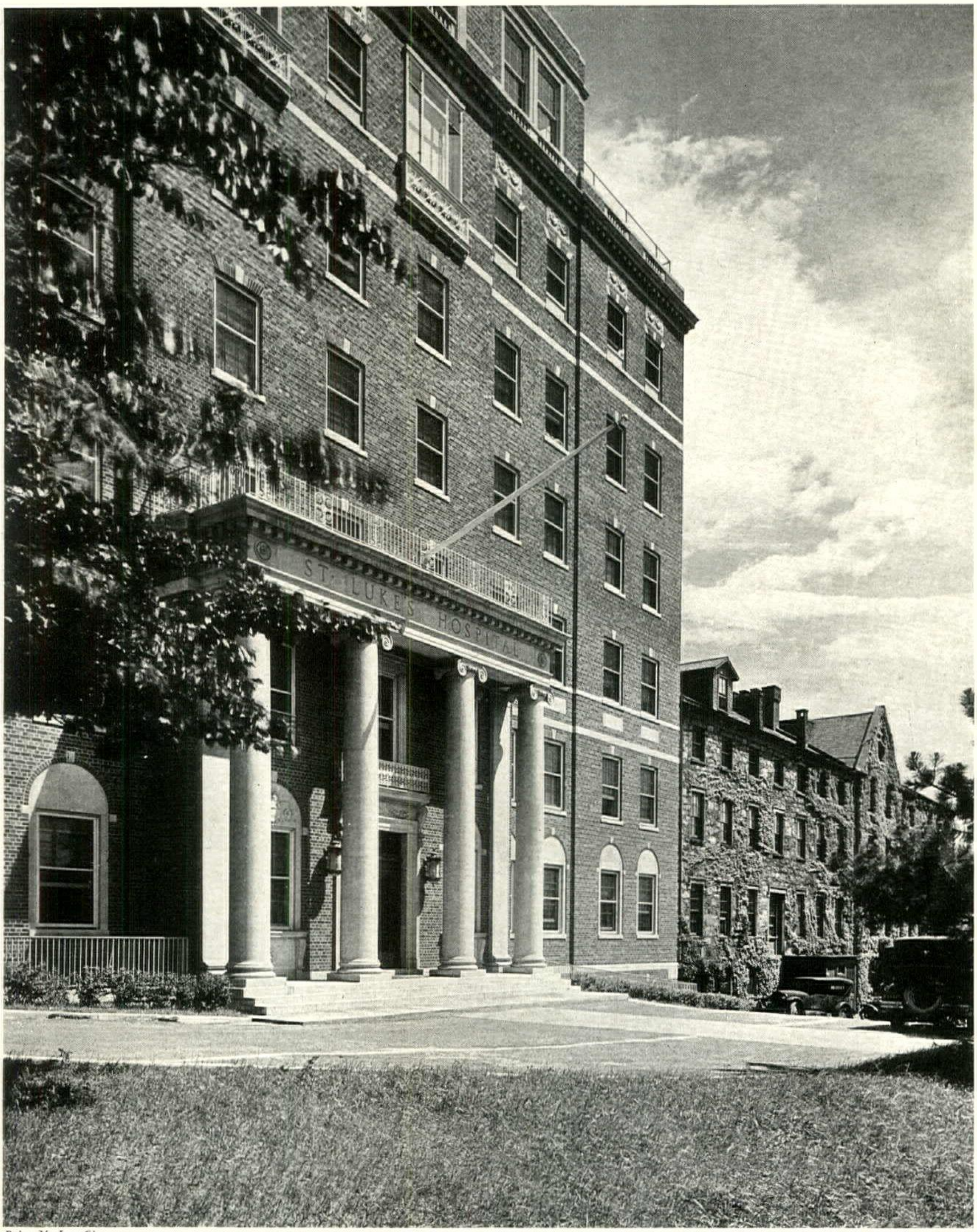
HOLABIRD & ROOT, ARCHITECTS

Fuermann & Sons

PASSAVANT HOSPITAL

CHICAGO, ILLINOIS

HOLABIRD & ROOT, ARCHITECTS



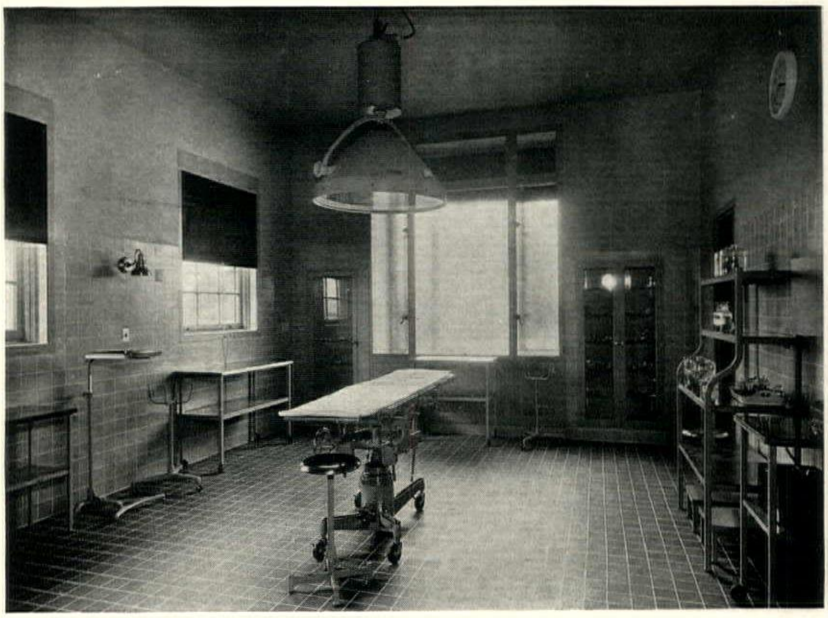
Robert MacLean Glasgow

ST. LUKE'S HOSPITAL

NEWBURGH, N. Y.

CROW, LEWIS & WICK, ARCHITECTS

Robert MacLean Glasgow Photos

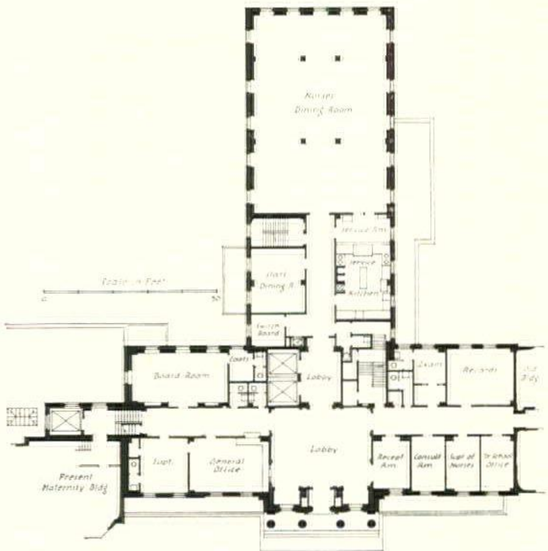


THE present plant is the result of an addition to and some alteration of existing buildings. The new portion, the entrance of which is illustrated on the opposite page, was built between two existing buildings, as indicated in the plans on page 416. The picture at the top of this page is of the lobby looking toward the entrance. At the right is one of the major operating rooms on the sixth floor

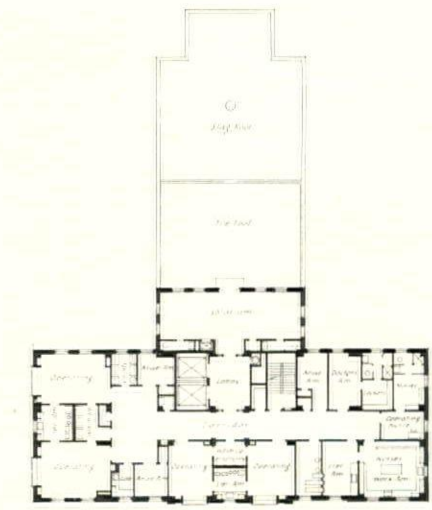
ST. LUKE'S HOSPITAL

NEWBURGH, N. Y.

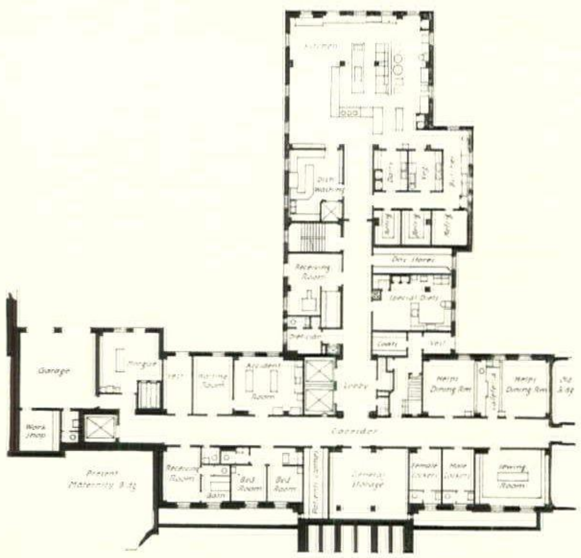
CROW, LEWIS & WICK, ARCHITECTS



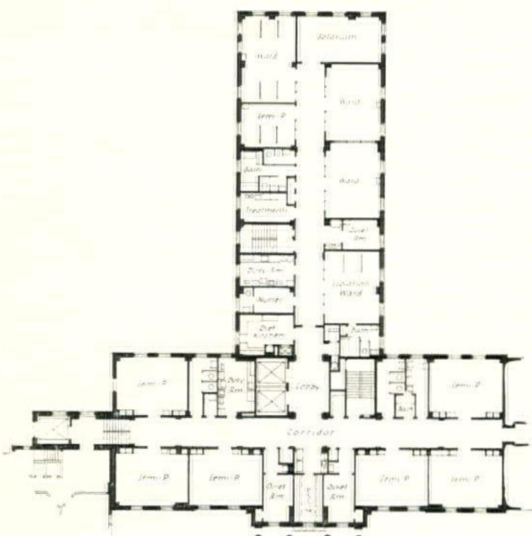
FIRST FLOOR PLAN



SIXTH FLOOR PLAN



GROUND FLOOR PLAN



SECOND FLOOR PLAN

ST. LUKE'S HOSPITAL

NEWBURGH, N. Y.

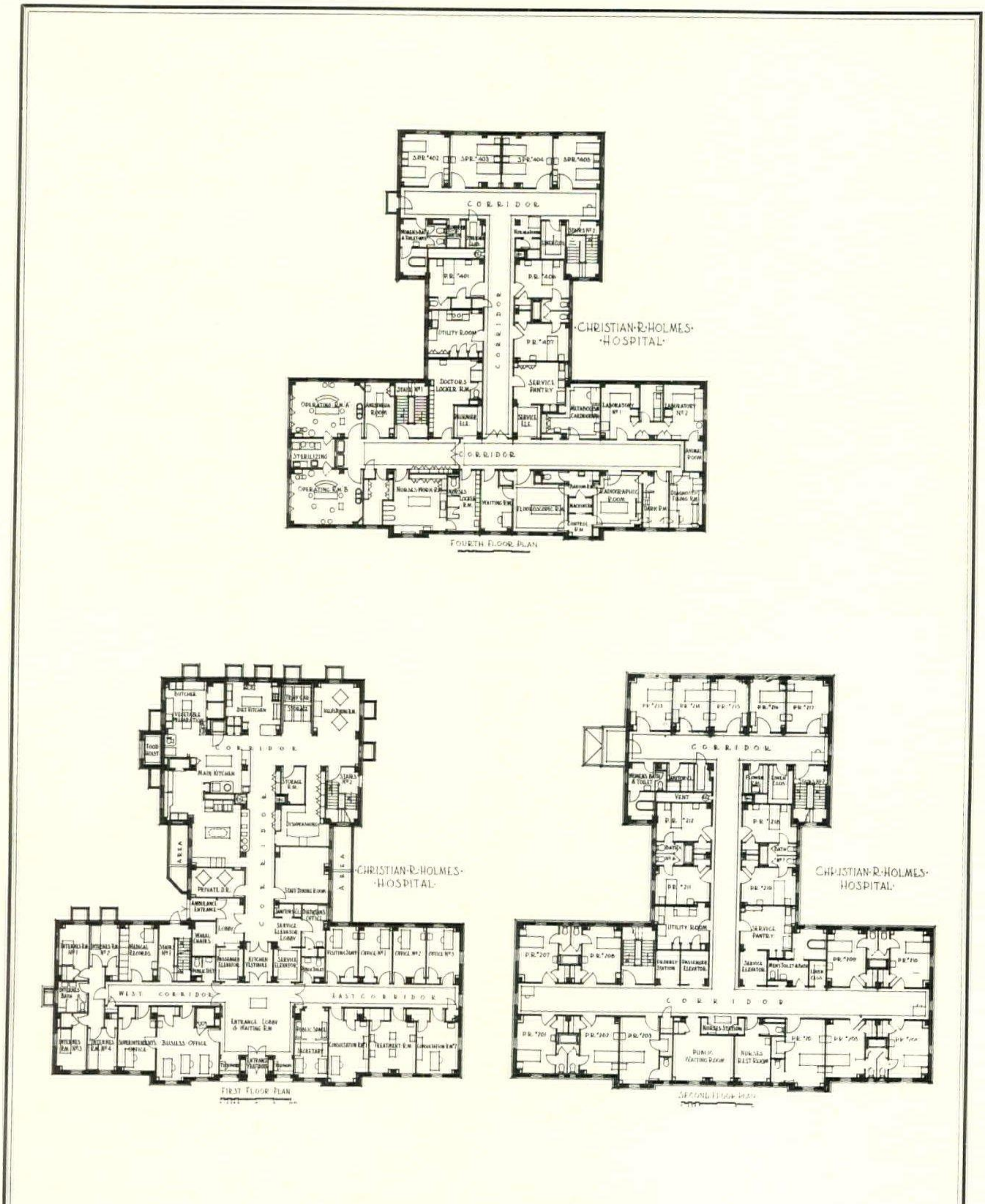
CROW, LEWIS & WICK, ARCHITECTS

ABOVE is a general view of the building looking toward the main entrance. At the right is an illustration of the entrance lobby and reading room looking toward the elevators. Notice the doctors' in-and-out registry annunciator which has been incorporated as an integral part of the information desk

CHRISTIAN R. HOLMES HOSPITAL

CINCINNATI, OHIO

SAMUEL HANNAFORD & SONS, ARCHITECTS



CHRISTIAN R. HOLMES HOSPITAL

CINCINNATI, OHIO

SAMUEL HANNAFORD & SONS, ARCHITECTS

AT THE top of the page is a view of the interior of the solarium located on the roof of the building, as illustrated on page 417. At the right is a view of a typical private room. A study of the plans on the opposite page will reveal a very completely equipped small hospital plant. The building has been designed primarily as a private hospital and consequently has few facilities in its out-patient department

CHRISTIAN R. HOLMES HOSPITAL

CINCINNATI, OHIO

SAMUEL HANNAFORD & SONS, ARCHITECTS

Onishi

HARBORVIEW HOSPITAL

SEATTLE, WASHINGTON

THOMAS, GRAINGER & THOMAS, ARCHITECTS


Depue, Morgan & Co., Inc.

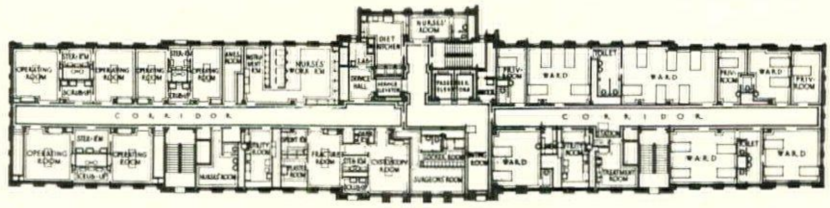
THIS building, the first unit of an elaborate hospital plant, has a capacity of 425 beds. All the floors above the first are devoted to patients' rooms and wards, with the exception of the seventh and eighth floors on the south wing where the operating rooms are located. The building has a reinforced concrete structure and is faced with a cream colored brick trimmed with terra cotta of the same tone. The rough walls are of concrete tile. The building was constructed at a cost of $1,523,394, or approximately 50.8 cents per cu. ft. The cost per patient was $3,584.46 for the hospital proper, and for the entire plant, including a nurses' home and laundry, $5,100.96. At the right is the model of the project


Walter P. Miller

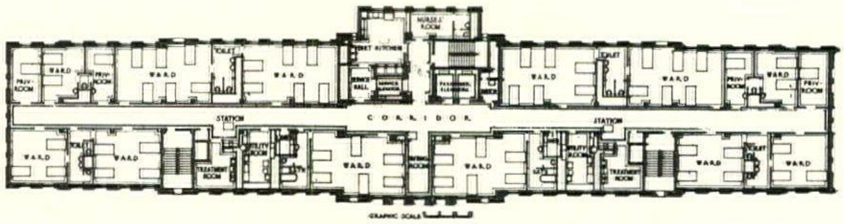
HARBORVIEW HOSPITAL

SEATTLE, WASHINGTON

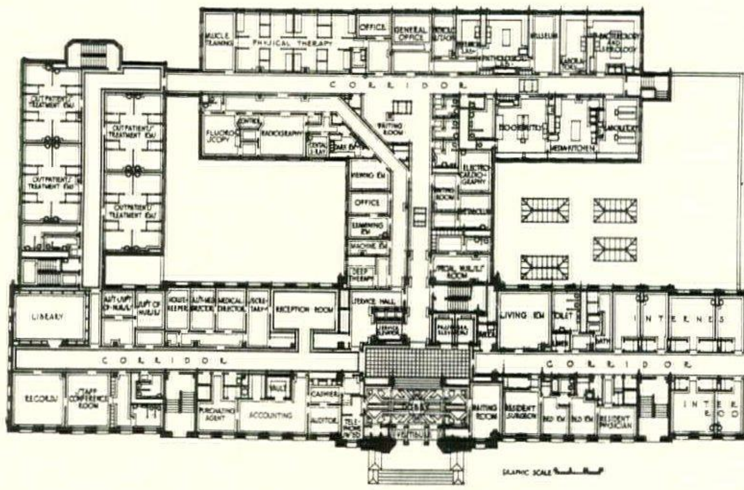
THOMAS, GRAINGER & THOMAS, ARCHITECTS



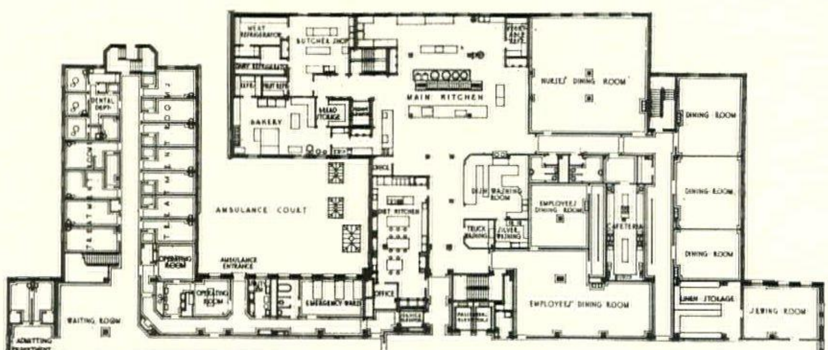
SEVENTH FLOOR PLAN



TYPICAL FLOOR PLAN



FIRST FLOOR PLAN



GROUND FLOOR PLAN

THE EDITOR'S FORUM

IN THE WILDERNESS

THE future activity in building (and with it the demands for architectural services) will be in the fields of modernizing and remodeling, of institutional work, and of housing, rather than in commercial or speculative ventures. While this has been called to the attention of the profession constantly, one is surprised at times at the apparent architectural apathy — or is it lethargy? *Vox clamantis in deserto*, and with scarcely an echo. A voice calling in the wilderness. Why?

There are probably many reasons why the opportunities, in housing especially, call forth so little response in action, however much the general interest. It is a comparatively new field for most architects, and at first blush the difficulties, the problems, the complexities of housing have seemed discouraging. There are so many complicating factors — land cost and acquisition, legal requirements, corporation formation, land coverage, taxation, promotion — that the whole field of building economics seems involved, and this is all so far removed from "design." By inclination, education, training and experience, we have come to feel that only the specific planning and designing of buildings is the architect's particular sphere. All those vexatious preliminary factors in building have heretofore been taken care of by the client. Must we change now from being artists interested in the æsthetics of architecture, to becoming experts in the economics and promotion of building as well? Can we? How?

What place should the architect have in the building industry, locally as well as nationally? Shall it be one of aggressive leadership, of expansion into a broader activity in the industry, or shall we "stick to our last" as designers primarily concerned with the appearance of buildings? What is to be gained — or lost — by either course, socially, economically, commercially or æsthetically? These questions might well constitute the central topic of discussion at the next A. I. A. Convention. It should be thrashed out in meetings of the chapters and societies before that. But now it is a vital subject of personal debate in each architect's own mind. Which course shall I attempt to pursue? What will be the probable result, to me, to the profession, to my community? The implications of your answers will have a profound effect on the future of your own work, and in the aggregate will indicate the path the profession will pursue. What are your answers? It will help others to know. With these basic questions answered, the voice may no longer be calling in the wilderness.

A PRACTICAL NEED

THE idea of prefabricated houses and other small buildings is being worked out in several ways and with various materials. The factory-built panel unit is the basis of several systems of such construction; others are to be assembled of standardized single steel members. The adequacy of the construction of the panel types can be determined by tests of a few installations. For the type employing a structural steel frame, the proportioning of members must be based on calculations. While the use of the table in present structural steel handbooks will give results guaranteeing safety, the frame thus designed would be so heavy as to be a commercial handicap. The present handbooks were published largely for use in bridge and multi-story building designing, not for residence requirements.

There are fundamental differences in the requirements for these types — for instance, the comparatively light loads in residences require slim members whose ratio of slenderness far exceeds that permitted in the handbooks. For residence work a new handbook might well take into account the enveloping materials by which the slim steel may be braced. Any stiffening of masonry is of course properly disregarded in present handbooks for large buildings.

In multi-story buildings the dead load of the floor construction exceeds the live load for which it is designed, whereas in residences this condition is usually reversed. Special attention must therefore be given to insure that the deflection due to live load does not crack the plastered ceilings beneath the shallow floors. In many cases this requirement will result in the use of a unit stress that is less than the maximum permitted in other structural work. Also in residence construction it appears more advantageous to reverse the usual practise by breaking the vertical stud system of each story by continuous horizontal courses of sills and girts at each floor level, instead of having the columns continuous.

There is therefore a practical need for a handbook for this special field of residential construction. It should make available a series of suitable and economical framing members, capable of being worked into any design, which will permit flexibility in arrangement and ease in handling and installation, with a minimum of fabrication; and should give tables and formulæ for the architects' use. Such a practical need will surely be met before long.

Kenneth K Stowell

EDITOR

PLANNING THE FLEXIBLE HOSPITAL

BY

ISADORE ROSENFIELD

WE ARE going through a period of readjustment. Though it is a case of "muddling through," it affects our endeavors. Our plans must be modified to meet the new régimes or circumstances as they emerge. The problem of providing physically for the care of the sick will always remain. When the depression is over, the questions will be: How many hospitals are and will be required? Where? What kind? How large? These must be answered in terms of present needs and the analysis of trends and probable future requirements. The importance of creating hospital buildings that are flexible enough to meet present and future requirements becomes apparent.

Present Needs. In 1931 we had 1,015,104 hospital beds. Of these, 701,683 were active beds and 313,421 were in the related group, comprising the mental and nervous convalescents, chronic, tubercular, etc.* Statistical analysis shows that to bring the country up to a standard consistent with a high civilization, we should add approximately 116,000 hospital beds to our present facilities. In addition there will be the need arising from the normal growth of population and the replacement of obsolete hospitals.

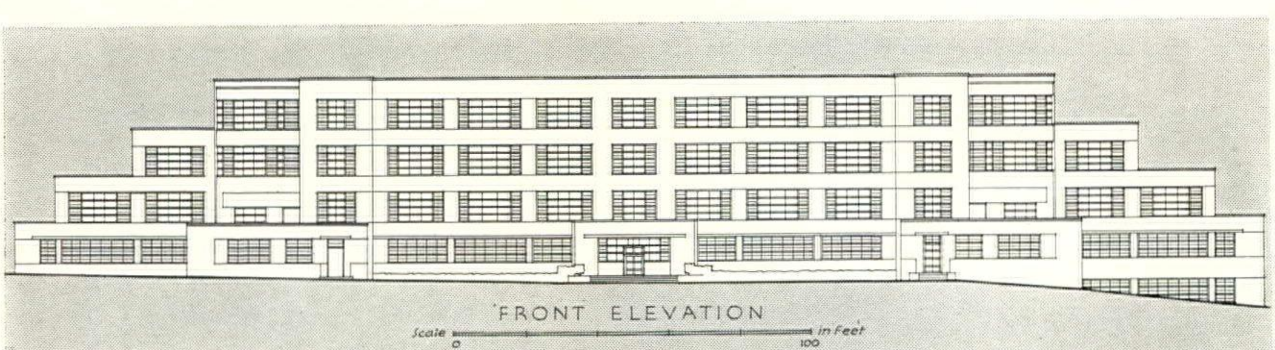
Not only do we need more hospitals, but they must be properly distributed. An analysis of the distribution of hospitals indicates that our efforts in hospital construction for the next ten years ought to be directed to the rural communities. We seem to have enough super-skyscraper hospitals in the large city centers. Let us build efficient hospitals where they are needed — in the rural centers.

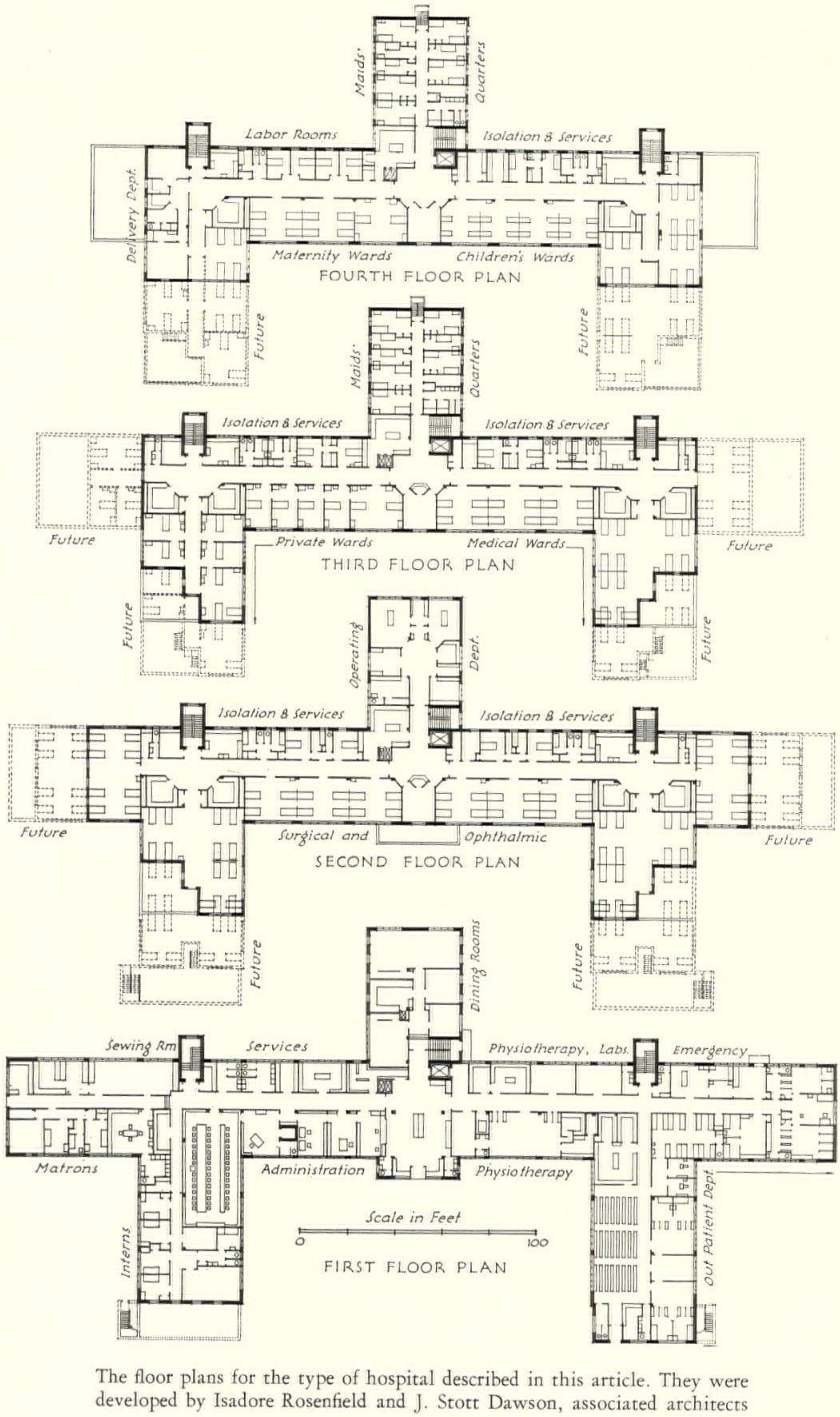
* *The Modern Hospital Year Book, 1932.*

Present Standards. We have developed a fairly satisfactory type of hospital building in this country. Its positive characteristics are: (1) Multi-story building, which means economy of construction and maintenance, for compared with the pavilion type there is a smaller basement, less roof, less piping and conduits, less loss of heat and pressure, and fewer steps for administration. (2) The services in the nursing unit are concentrated on the north side of the building and superposed by floors. (3) The patients' quarters utilize the sun exposures and cluster about the services. All these features are good and should be continued.

However there are also shortcomings which should be eliminated in the future. (1) The inner divisions or partitions usually have been made rigid, of masonry, which destroys flexibility, as a change means costly and dusty reconstruction. (2) We have overbuilt the private room facilities and have more or less forgotten the man with the slim pocketbook. The result is that private facilities are at the best about 30 per cent idle today while the ward facilities are overcrowded. What we need then is to make the hospital of the future flexible.

Medium Size Hospitals Preferred. The accompanying plans are of a hypothetical hospital in which an attempt was made to solve some of the chief problems. It is a medium size hospital, for a small hospital cannot afford all the necessary diagnostic, treatment and service facilities necessary to make it efficient. In order to attract and hold the respect of the best elements of the profession and the community, a hospital must be fully equipped with modern facilities. It is better therefore to





The floor plans for the type of hospital described in this article. They were developed by Isadore Rosenfield and J. Stott Dawson, associated architects build one medium size hospital serving a wide area than several small ones. The condition of our roads and modern facilities of transportation should justify this attitude. Approximately 72 per cent of all our hospitals have less than 100 beds, but as a class these are not our best hospitals.

As we have become converted to the district school, as compared to the one-room schoolhouse, so in hospitals we should urge the district hospital instead of the relatively uneconomic and inefficient small hospital.

The Uniform Bay. All the patients' quarters of the hospital illustrated are planned on the principle of the uniform bay for flexibility. Each bay is good for either four-ward patients or two semiprivate rooms, or two comfortable private rooms. In addition to flexibility, uniformity should lead to economy of construction.

Readjustment in the use of space is essential for flexibility. This most important point is not obvious in the reduced scale of the plan. Rigid construction is the chief obstacle to flexibility. We should be able to make adjustments in the use of space corresponding to the types of nursing required, such as ward, semiprivate, private and group nursing. The last named is a definite trend in forward-looking hospitals.

Service Partitions. It is proposed to build the services in each nursing unit in more or less the traditional manner, which means that the service partitions may be of masonry. It is recommended, however, that the new system of building solid plaster partitions be considered, using metal lath with integral self-centering steel studding. Heretofore it has been necessary to build the framework of steel studs first and apply the metal lath afterwards.

Divisions for Patients. The space intended for patients would not be subdivided until the hospital was practically completed. The plastering of exterior walls and ceilings would be done and the floors laid throughout the entire space reserved for patients, without respect to location of partitions. The floor pattern may be arranged so as to give demarcations of bays and half-bays. This method of plastering and floor laying should, incidentally, result in some initial economy. Piping for wash basins is provided in the plans in each bay at the column against a masonry back which may run to the ceiling. Fixtures, however, need not be attached except as occasion may demand.

The Unit Partition. The partitions are to be erected last of all. They are light, sanitary, strong and interchangeable units erected without channeling either the floor or the ceiling, nor are nails or screws used. The units lock one into the other and are merely wedged in place between floor and ceiling by a series of jackscrews or wedges. A cover strip fastened to the partition takes care of unevenness. When these partitions are removed they leave no disfiguring marks either on the floor or on the ceiling. As the beds are always in the same position, all electrical outlets can be provided in the floor and extended to the bed, as occasion may demand. The units of partition may be solid or have clear or obscure glass, or be fitted with doors. Thus it is proposed that the corridor partitions have glass above the chair rail which would do away with the usual gloomy appearance of the corridor. Between private and semiprivate rooms there would be intercommunicating doors, so that group nursing could be effected.

The whole hospital is planned on the basis of units of four beds which is ideal for group nursing. The new building recently completed at the Mount Sinai Hospital, in New York, is entirely planned on the unit-of-four basis. In good times such a hospital may subdivide its space into as many private rooms as necessary. When stringent times come along certain partitions can be removed and the ward facilities expanded accordingly. The work involved is clean and requires no particular skill.

Expansion. The plans show that the system of expansion is elaborately worked out. In his article on Hospital Expansion* in 1927, the author urged the method of vertical expansion. In the present case the horizontal method of expansion was decided upon. Units of bays are to be added horizontally to the initial nursing floor. It is considered that the services provided in the initial stage of this hospital would continue to be adequate for many additional beds before sub-utilities and other supplementary services would be required.

This method of expansion, it will be noted, creates a series of flat terraces at all extremities of the building not only in the initial stage but at the various stages of expansion.

The nurses' home and the maids' quarters are to be expanded vertically. By adding an extra floor to a hospital it is necessary to repeat a complete set of services and the departments throughout the hospital must be replanned accordingly. In the case of nurses and help it is practically only a question of stairs and baths.

These plans were worked out from an actual program written along traditional lines and implying a pavilion system of plan. The architects, however, set themselves to the task of designing the hospital along modern lines disregarding all old methods. Several items, like the large board room, were included as called for in the program, thus creating features here and there which may seem puzzling from the standpoint of the usual practise.

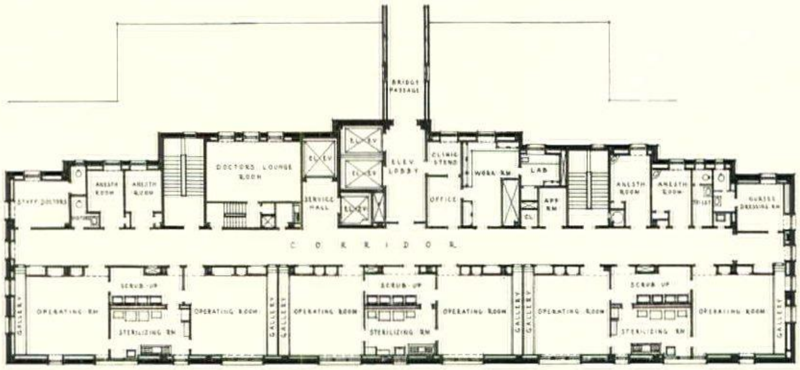
* *The Modern Hospital*, April, 1927.

Irving Underhill

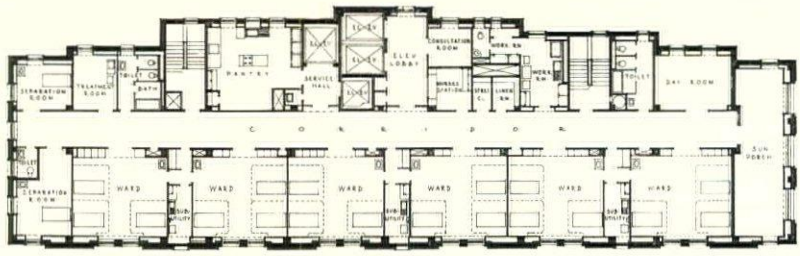
MT. SINAI HOSPITAL, NEW YORK, N. Y.

ROBERT D. KOHN AND CHARLES BUTLER, ARCHITECTS

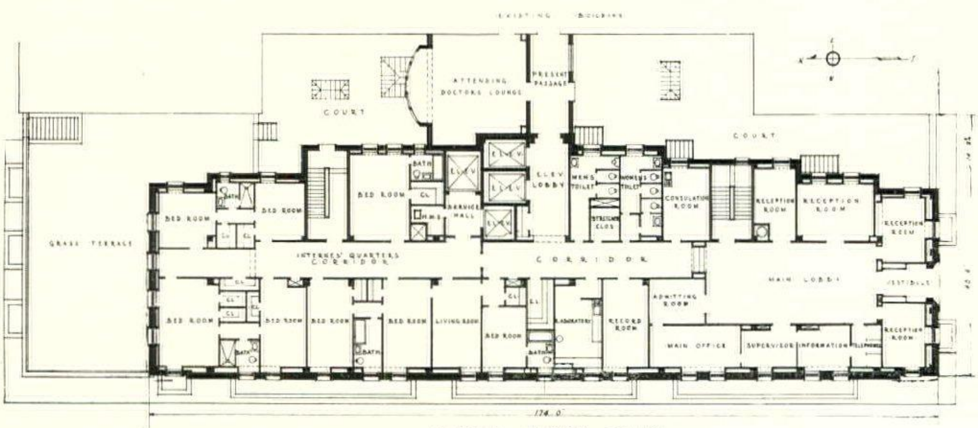
S. S. GOLDWATER, M.D., CONSULTANT



8TH & 9TH FLOORS
· OPERATING · FLOOR · PLAN



· TYPICAL · FLOOR · PLAN ·
2ND TO 7TH FLOORS · INCL ·



· FIRST · FLOOR · PLAN ·

MT. SINAI HOSPITAL, NEW YORK, N. Y.

ROBERT D. KOHN AND CHARLES BUTLER, ARCHITECTS

S. S. GOLDWATER, M.D., CONSULTANT

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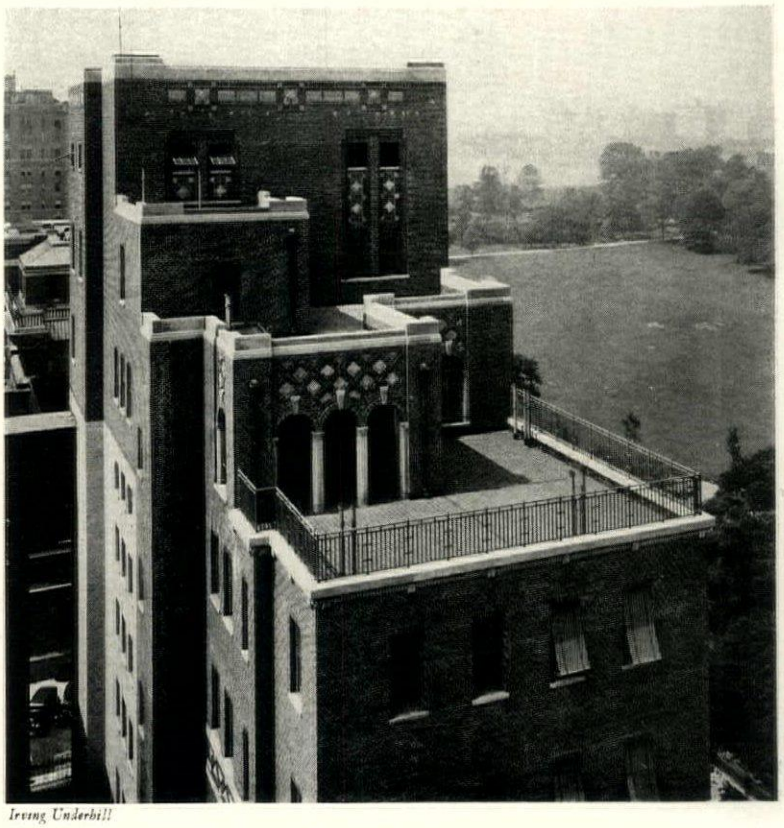
THE building illustrated here is one unit of a large metropolitan hospital plant, designed particularly to solve the problem of service to patients of moderate means. Most of the patients' floors are divided into small wards, as illustrated in detail on the following page. Since practically the entire operating service of the Mt. Sinai Hospital has been transferred to this new building, the eighth and ninth floors each contain six major operating rooms. The eleventh floor in the form of a tower is devoted to surgical preparation service. To adhere as closely as possible to the appearance of the existing hospital units the building is faced with red brick trimmed with limestone. Above on this page is a view of the building taken from Central Park, and the illustration at the right shows the terrace on the tenth floor which overlooks Fifth Avenue and Central Park



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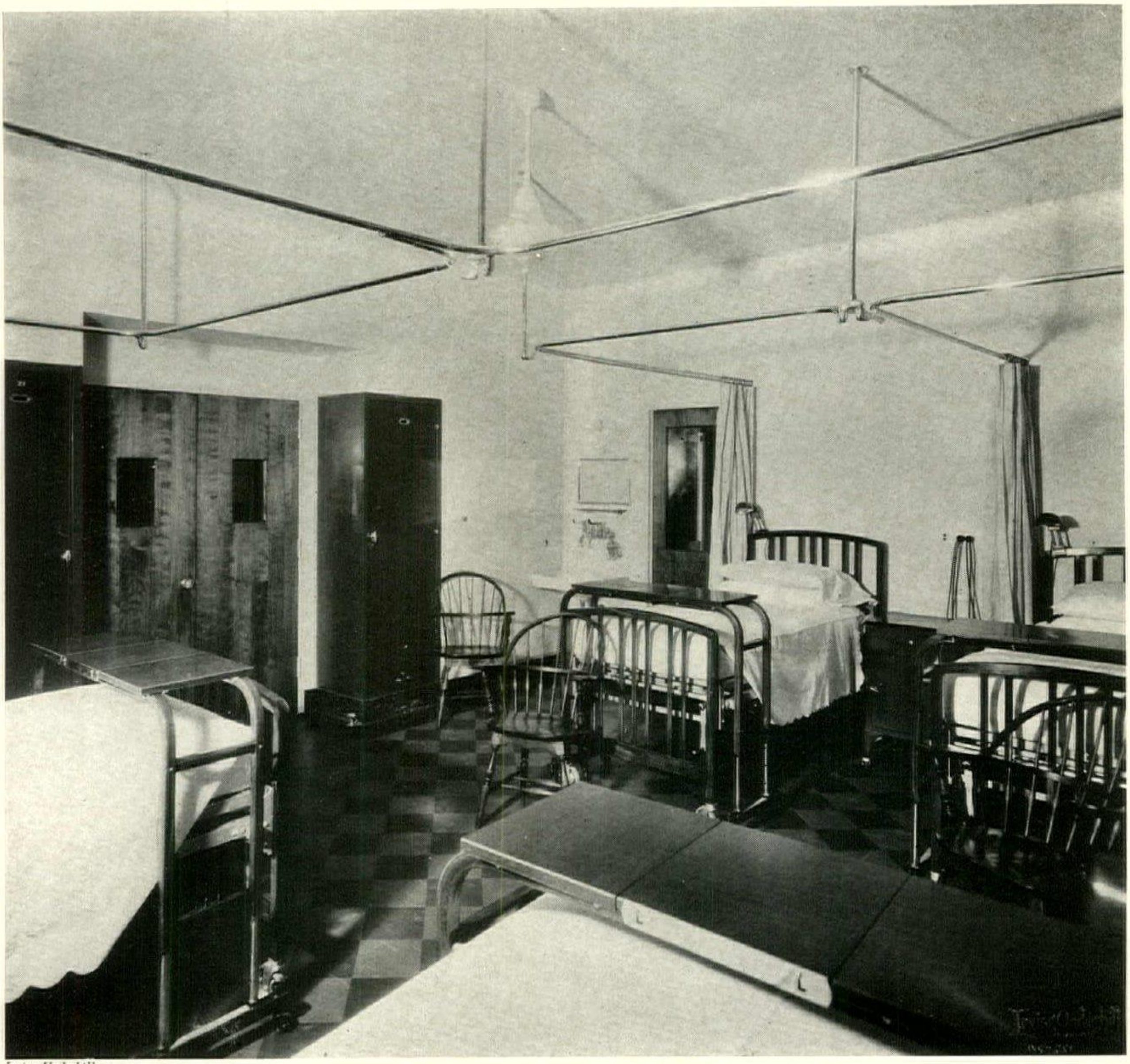

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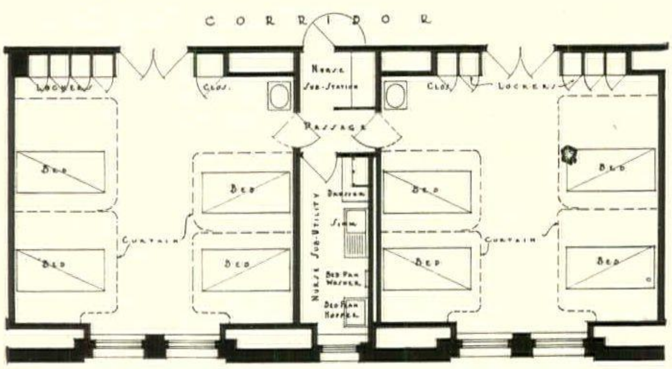


THE wards and typical floors of the building are placed in the west front while the southern exposure is devoted to the sun porch, with an adjacent day room facing east. (See plans on page 428.) The beds in the wards are placed parallel to the outside walls to give the patients as much of a view of the outdoors as possible. Both the wards and sub-utility rooms have double hung wood sashes without transoms and with ventilators in the wide bottom rail of the lower sash. Roll-up type screens have been provided and Venetian blinds have been substituted for the usual awnings

MT. SINAI HOSPITAL, NEW YORK, N. Y.

ROBERT D. KOHN AND CHARLES BUTLER, ARCHITECTS

S. S. GOLDWATER, M.D., CONSULTANT

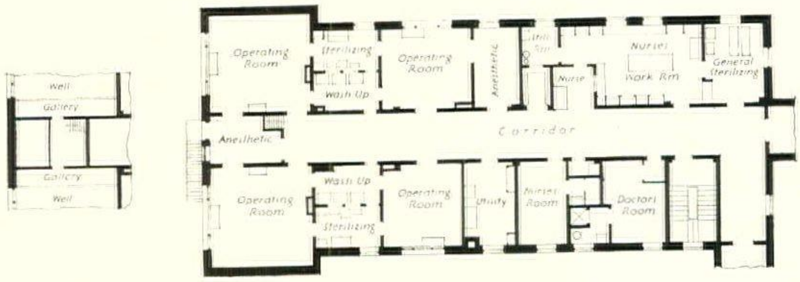
Wurts Bros. Photos

THE present structure has resulted from several extensive alterations to a rather small original hospital plant. The illustrations on this page are of the main portion of the hospital and show the completed addition to the memorial wing. The entrance to the wing is shown above; at the right is an interior view of one of the solarium floors above it. Plans on the following page show the typical layout of this building and a typical operating floor of the service wing

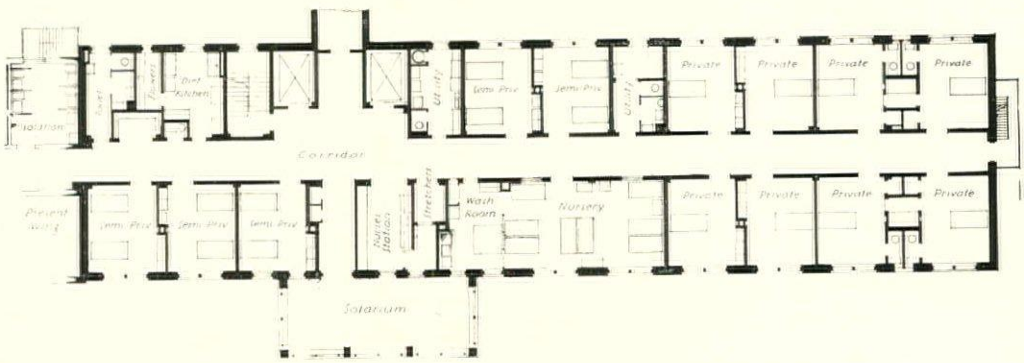
UNITED HOSPITAL, PORT CHESTER, N. Y.

HOOD, GODLEY & FOUILHOUX, ARCHITECTS

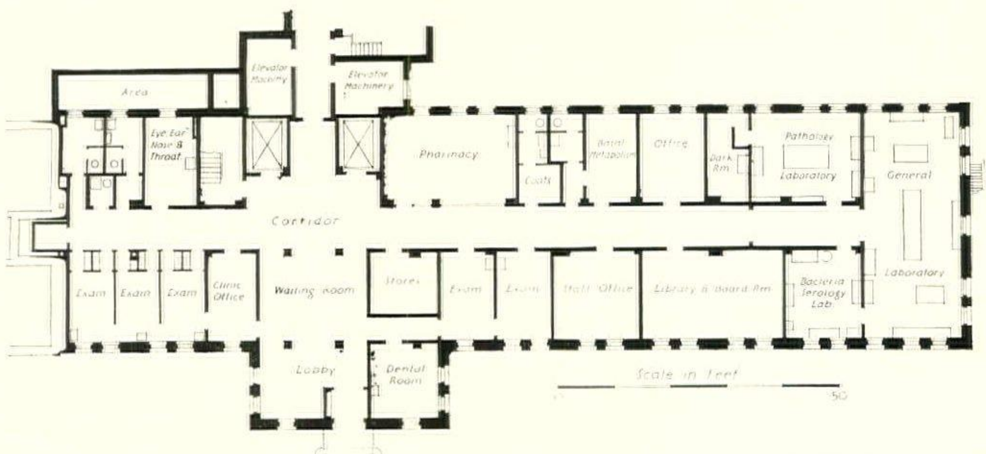
CHARLES F. NEERGAARD, CONSULTANT



THIRD FLOOR PLAN
SERVICE AND OPERATING WING



THIRD FLOOR PLAN
ADDITION TO PRESENT MEMORIAL WING



GROUND FLOOR PLAN
ADDITION TO PRESENT MEMORIAL WING

UNITED HOSPITAL, PORT CHESTER, N. Y.
HOOD, GODLEY & FOUILHOUX, ARCHITECTS
CHARLES F. NEERGAARD, CONSULTANT

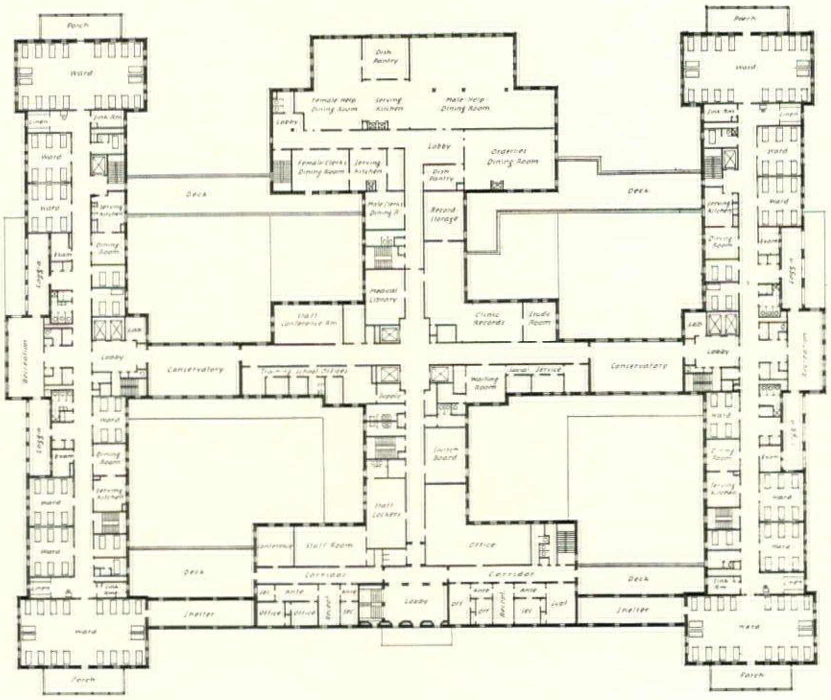
Wurts Bros.

ALTHOUGH the Kings County Hospital had its origin at the present location in 1831, the plant has been completely rebuilt and as it now exists is one of the largest municipal hospitals contracted for as a single building operation. The hospital grounds are extensive and the main facade of the building is located about 120 ft. from a traffic thoroughfare, insuring a relative freedom from street noises as well as providing an opportunity for landscape treatment. The main building has a frontage of approximately 415 ft. and a depth of approximately 320 ft., and has been studied so that the free exposure of the wards to sun and air may be insured and short lines of communication in the corridors guaranteed. The construction is of a standard steel frame with solid brick curtain walls and tile furring. The exterior is faced with a variegated, rose-colored brick trimmed with limestone above a base of pink granite. The roofs of the towers are covered with a variegated brown and buff tile. The porches are of special design with spandrels of hard lead. The illustration above shows the entrance front

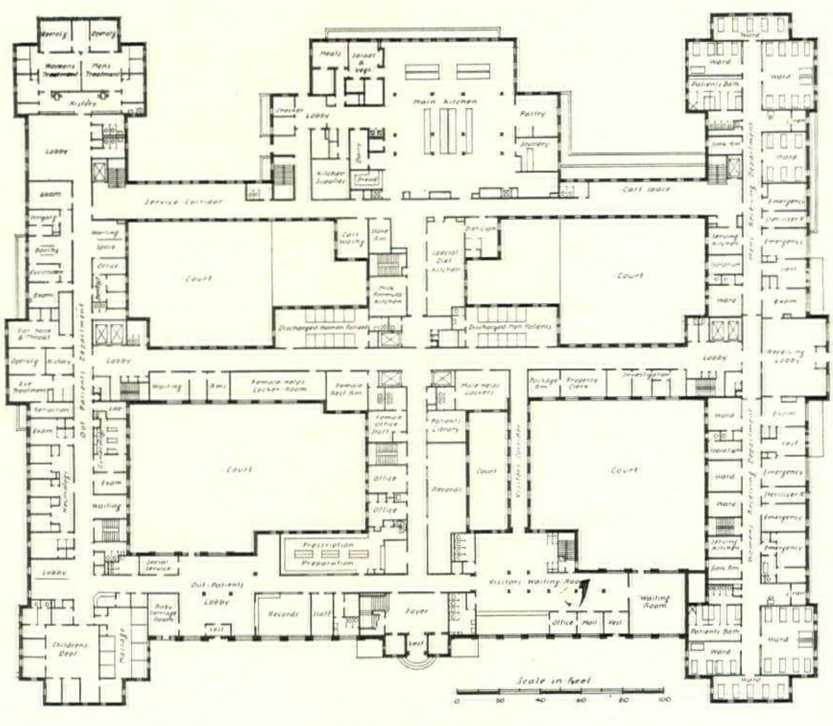
KINGS COUNTY HOSPITAL

BROOKLYN, N. Y.

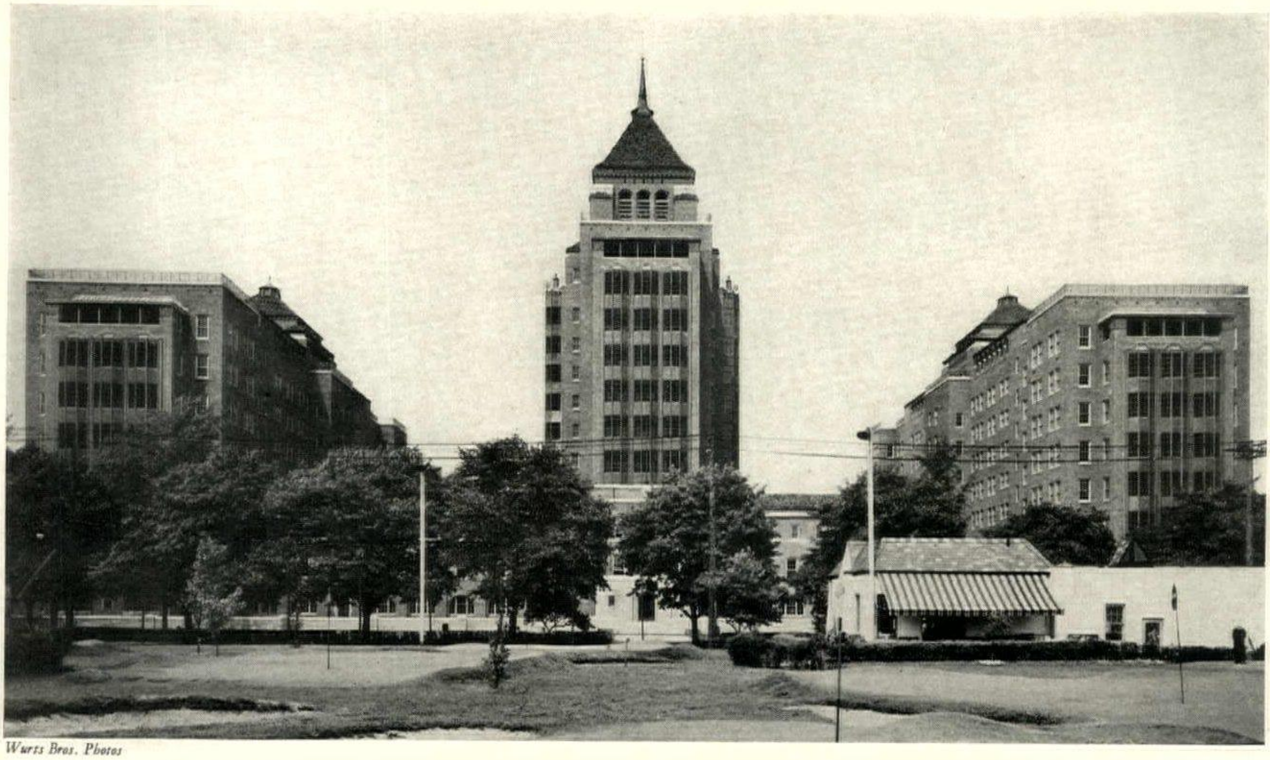
LEROY P. WARD, ARCHITECT, S. S. GOLDWATER, M.D., CONSULTANT



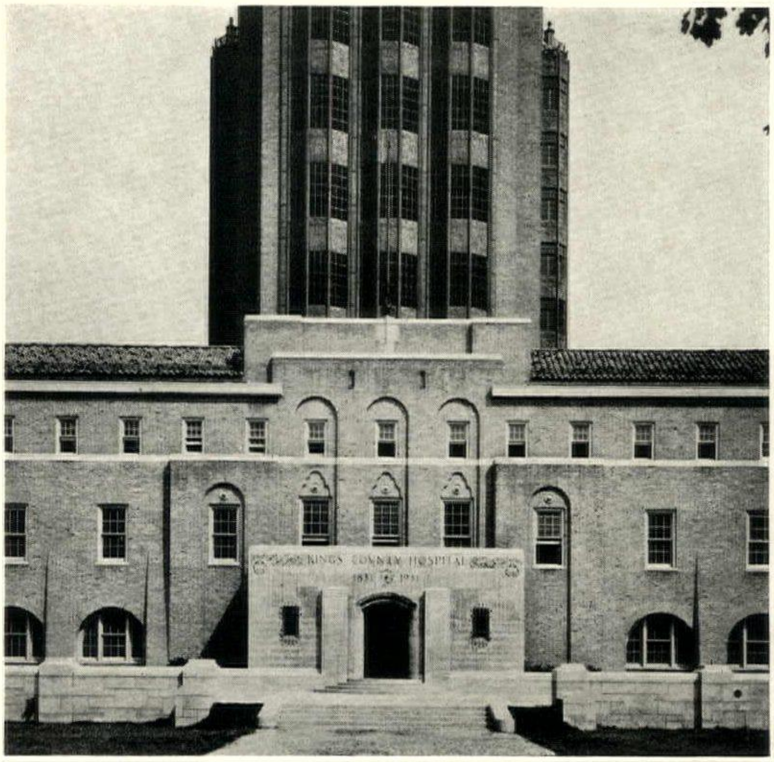
FIRST FLOOR PLAN



GROUND FLOOR PLAN



Wurts Bros. Photos

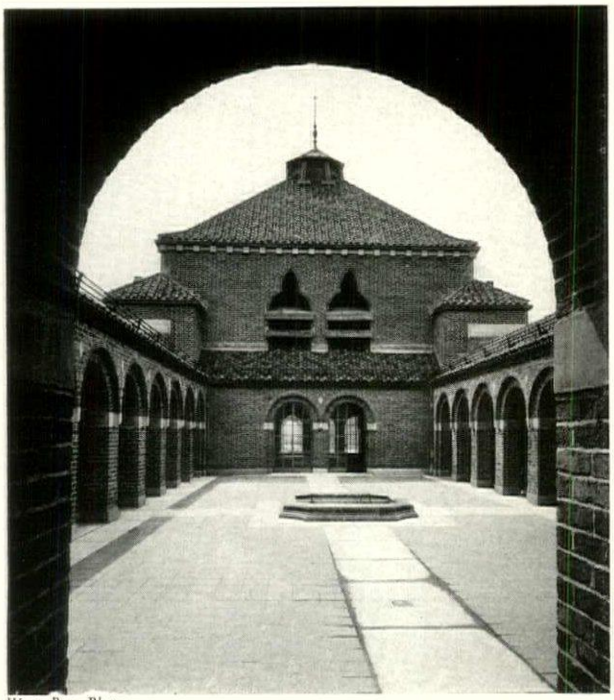


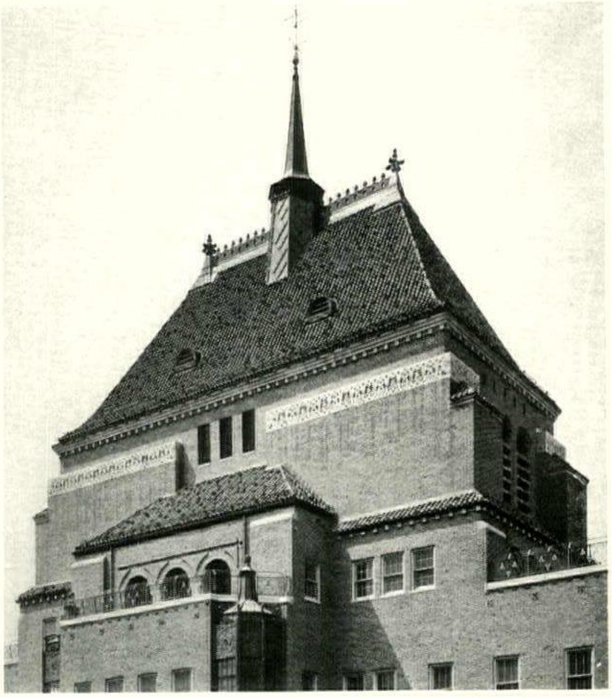
THESE two views of the building convey an excellent idea of its extent and the architectural treatment which has been characterized as "modern," in that the consideration of function has been uppermost in the development of the design. A study of the two plans on the opposite page will indicate the care with which every department of the hospital has been planned. Above the second floor the building becomes in effect three structures devoted respectively to men, women and children. Since the hospital is a municipal one, the floors have been devoted primarily to wards planned to assure proper clinical classification, the orderly handling of patients, and to provide for fluctuations in the demand for hospital accommodations

KINGS COUNTY HOSPITAL

BROOKLYN, N. Y.

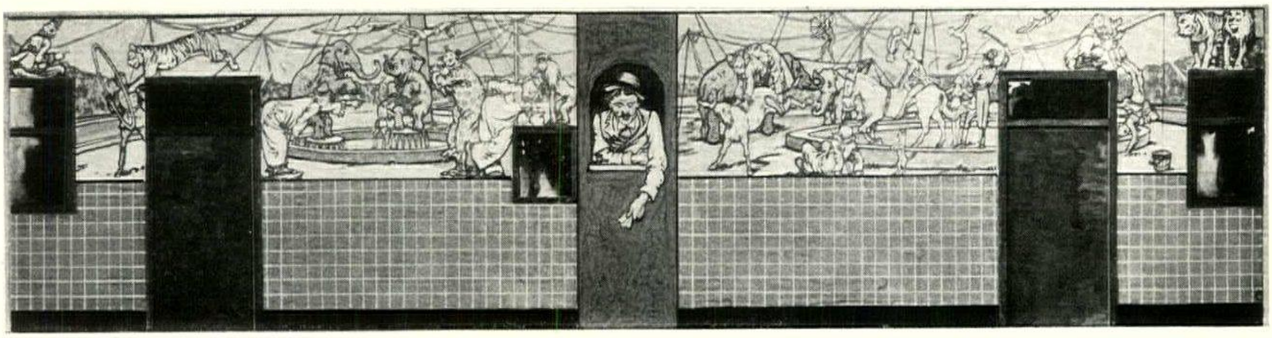
LEROY P. WARD, ARCHITECT, S. S. GOLDWATER, M.D., CONSULTANT

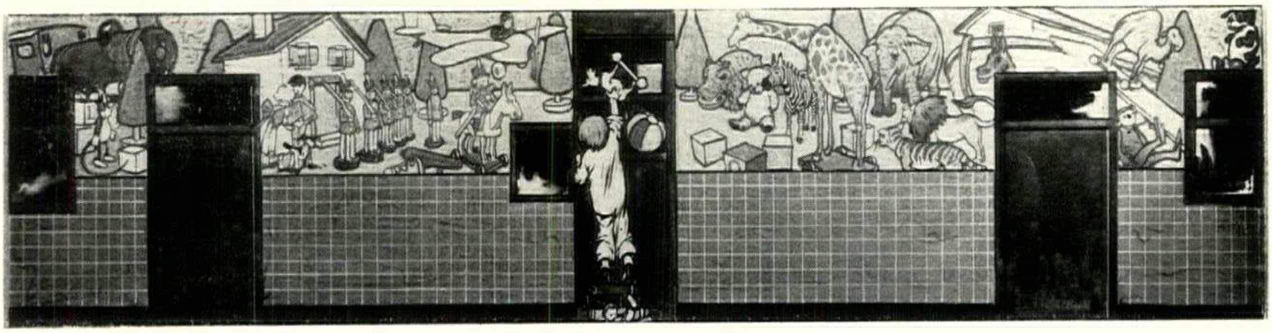




Wurts Bros. Photos

The two details at the top of the page show the care with which every part of the architectural design was evolved. At the left is a view of one of the roof courts. At the right is a detail of the central tower. Below are sketches of wall treatments in the children's department. The murals were executed by Frank Godwin

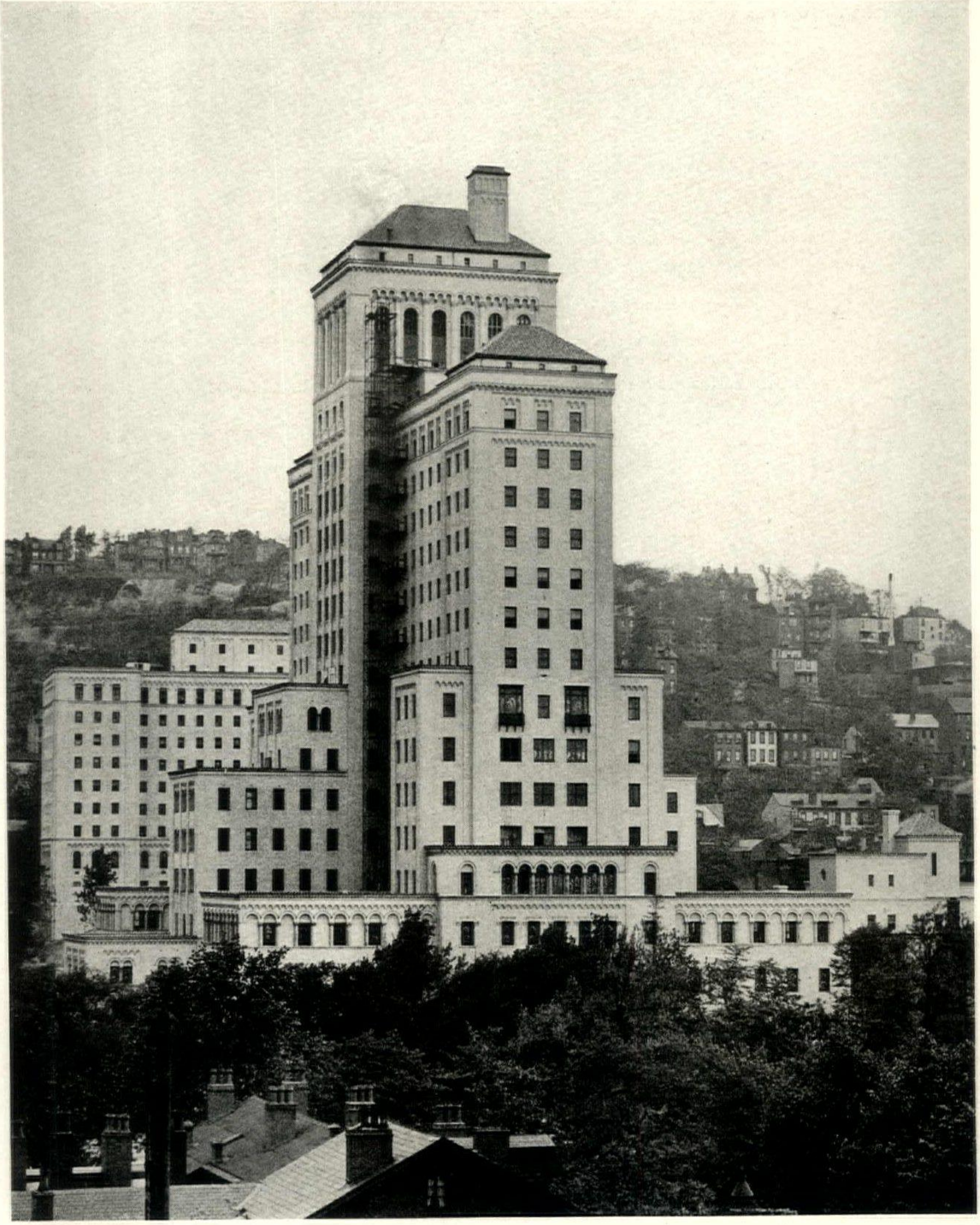




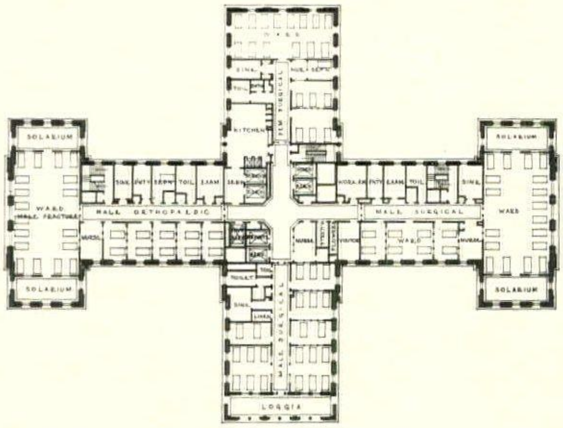
KINGS COUNTY HOSPITAL

BROOKLYN, N. Y.

LEROY P. WARD, ARCHITECT, S. S. GOLDWATER, M.D., CONSULTANT

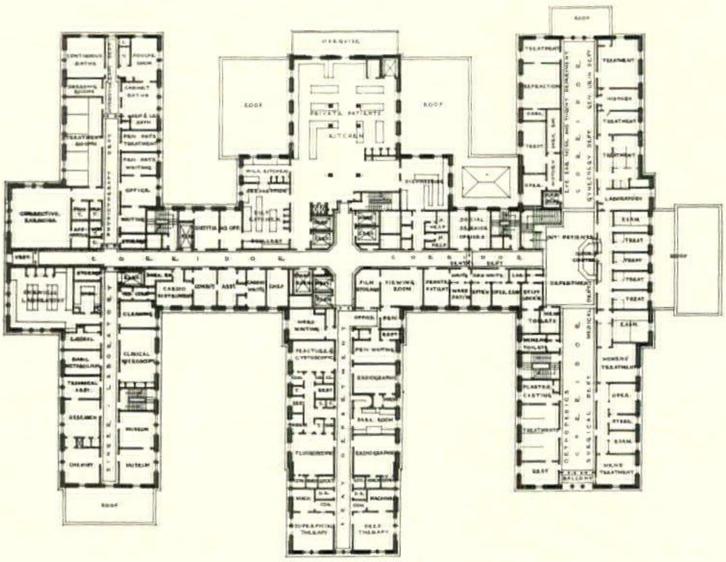


ALLEGHENY GENERAL HOSPITAL
PITTSBURGH, PENNSYLVANIA
YORK & SAWYER, ARCHITECTS

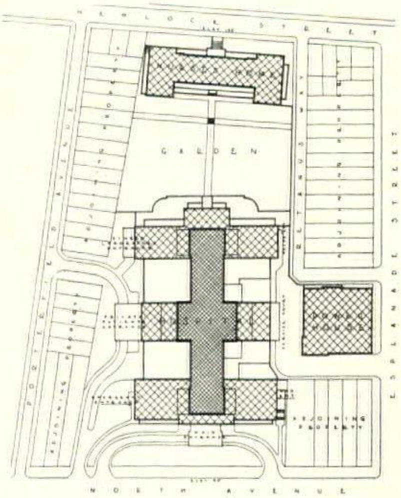


FIFTH AND SIXTH FLOORS

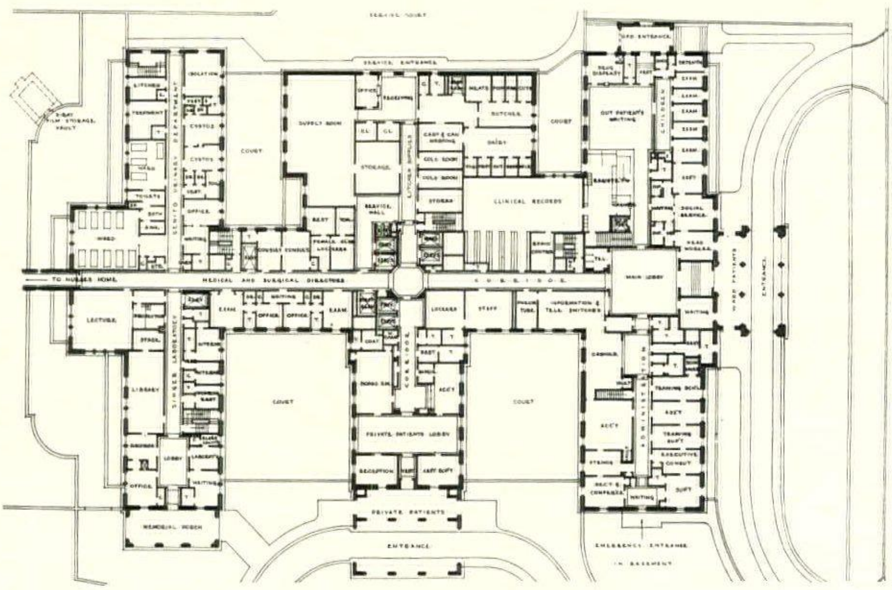
EIGHTH FLOOR



SECOND FLOOR



PLOT PLAN



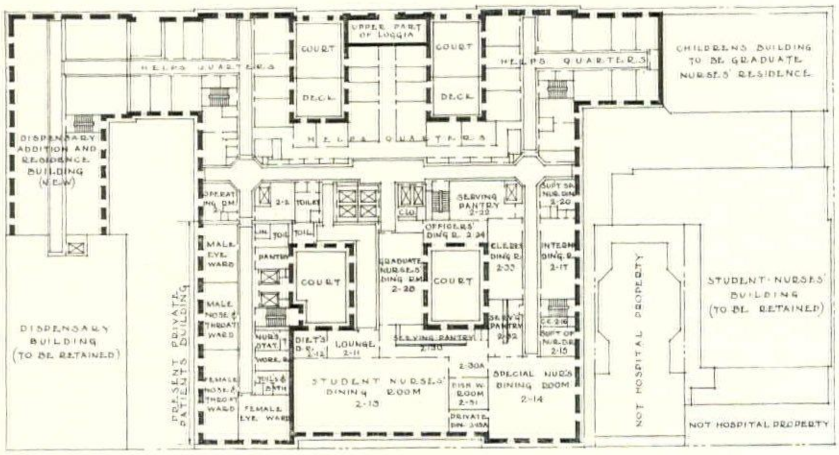
FIRST FLOOR

THE perspective on this page illustrates the new structure which will supplement the departments of a hospital plant founded in 1861. Before the present structure was finished, the hospital contained facilities for only 325 beds. The new structure has almost doubled this number and the ward and semiprivate departments will now accommodate approximately 450 beds. The children's department will have 70 beds, private patient department 102. Special semiprivate facilities have been provided for patients of moderate means. The cost of the building was approximately $6,000,000. The extent of the structure illustrated on this page and its relation to the old buildings constituting the hospital plant are illustrated by the plans on pages 440 and 442. Of the plans not included, the fifth and sixth floors are devoted to surgical wards and specialties; the seventh floor contains the semiprivate patient department; the eighth and ninth floors a private patient department. The eleventh floor contains the children's wards

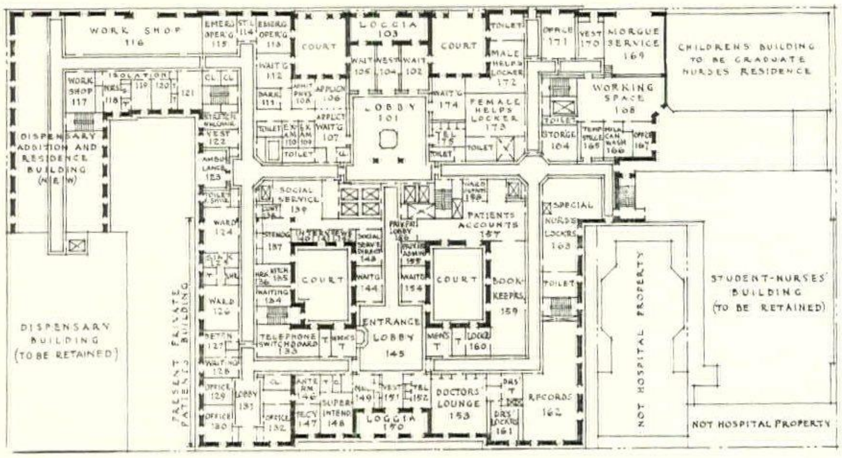
LENOX HILL HOSPITAL

NEW YORK, N. Y.

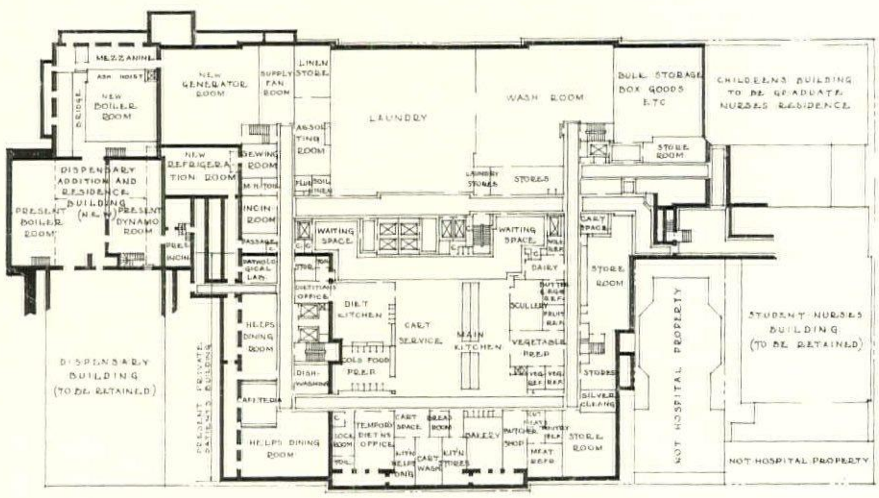
YORK & SAWYER, ARCHITECTS



SECOND FLOOR PLAN



FIRST FLOOR PLAN



BASEMENT FLOOR PLAN

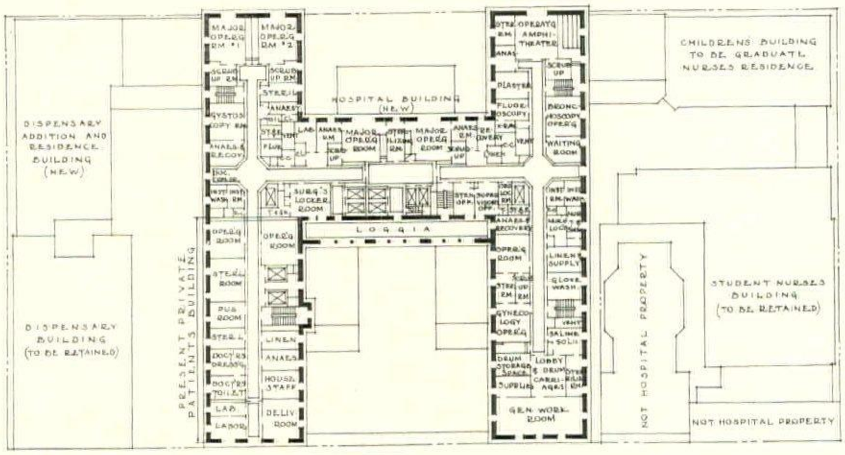
Drucker & Baltes Co.

TWO typical interior illustrations. Above is a view of the entrance lobby looking toward one of the waiting rooms and the corridor leading to the main lobby. At the right is a view in one of the men's typical wards on the fourth floor

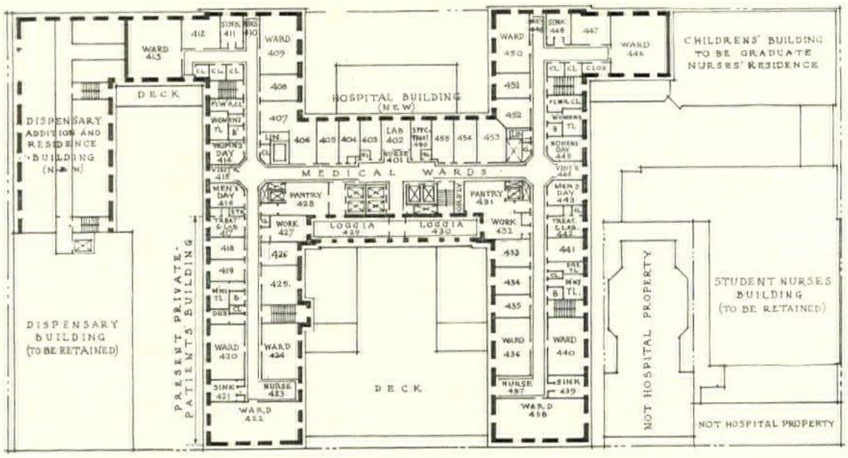
LENOX HILL HOSPITAL

NEW YORK, N. Y.

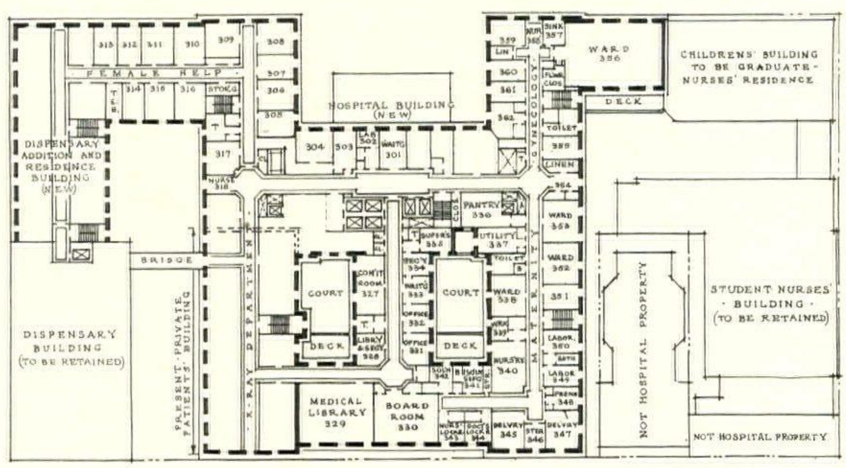
YORK & SAWYER, ARCHITECTS



TENTH FLOOR PLAN



FOURTH FLOOR PLAN



THIRD FLOOR PLAN

NOTES ON HOSPITAL CONSTRUCTION AND FINISH

THE problems in the construction, finish and equipment of the modern hospital, regardless of size, are subject to many solutions. Influences of locality, the peculiar requirements of the building program, costs and the element of time make any complete discussion of the subject impossible within the limits of a magazine article. The following paragraphs, therefore, will serve only as a guide to practises most generally accepted as satisfactory for a hospital structure. They have been compiled from the specification data of Crow, Lewis & Wick, architects. This firm's experience in hospital work has been wide, and they have adapted these recommendations as standard practises as a result of their practical efficiency in the field

CONSTRUCTION. As a hospital necessarily must have a great deal of plumbing, steam piping, and electrical conduits for lighting, signaling, telephones and other services, the system of construction should be that best adapted to the orderly and sightly installation of this piping.

While there is an advantage in having all piping exposed, to permit easy repair, the unsightly appearance of exposed piping overweighs its adoption and in practically all hospitals the piping is run concealed almost entirely in public rooms, patients' rooms and operating rooms. If piping is to be run concealed, the system best adaptable to hospital construction is a standard steel skeleton construction, with flat floor slabs 4 in. thick. This construction permits risers to be run concealed in walls and the concealing of branches either in the floor fill or between the floor beams.

It is advisable to modify the usual steel frame by the use of two-member spandrel beams, one member being framed near the outside of the wall to carry the wall load, and the other being placed about 1 in. clear of the inside of the wall. If this is done and a 4 in. brick veneer with 10 in. thick hollow terra cotta back-up tiles is used, it is possible to build 8 in. deep chases in the walls and fur the brick veneer 2 in. at the back of the chases. Eight inch deep chases will permit the installation of steam risers and plumbing lines up to 5 in. without projection beyond the inside finished surface.

If a brick veneered block exterior wall is used, the bricks should be laid up in waterproofed mortar and plastered on the back with waterproofed mortar. To insure against leakage, it is advisable forcefully to point the brick joints.

As the subdivision of hospital floors will normally vary, it is seldom possible to adopt an economical spacing of floor beams which will present an orderly appearance on the ceilings if the beams are exposed. For the sake of cleanliness and appearance, it is advisable to fur ceilings under piping and in rooms where the beam spacing is irregular.

Nearly all steam and plumbing branches and conduits may be run in a 4 in. fill above the beams. It is possible to economize, however, by locating the top of the floor slabs 2½ in. above the top of the beams. Provided there are enough properly located electrical distribution points, branch electric conduits can then be run over the tops of the beams and embedded in the floor arches when they are poured. In this case the arches must be set lower where tile or terrazzo floors occur or else the cement topping on the slabs will have to be 1½ in. thick throughout.

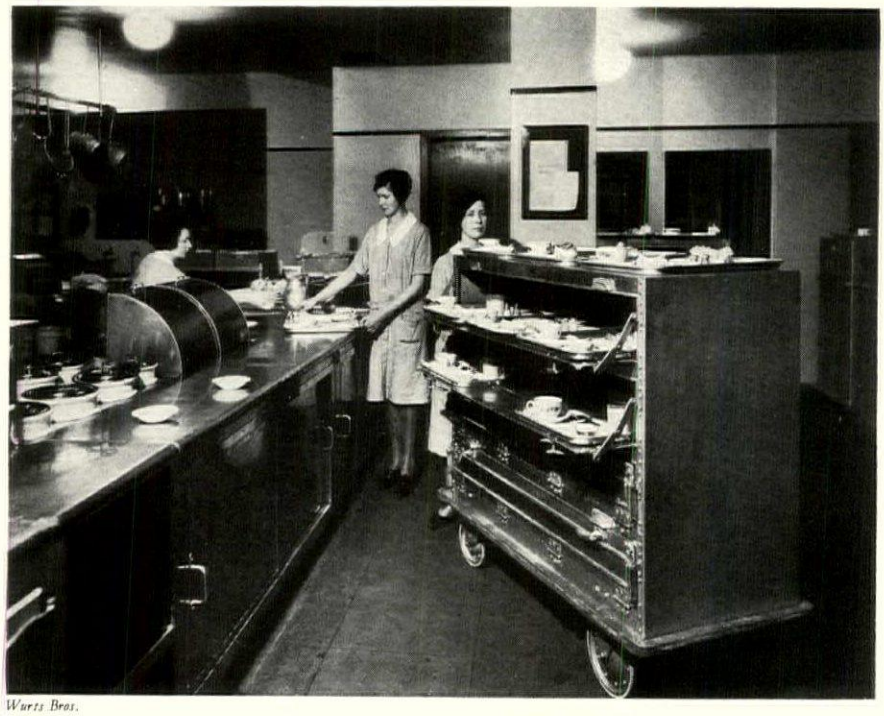
Floor Finishes. Except in special cases, cement floor finish and bases are satisfactory and economical. Where no covering is to be used, they can be most cheaply finished by painting with any one of the good cement coatings. Where traffic is not excessive or where the cement floors are not on the ground, the paint has a reasonably long life and can be cheaply renewed. If cement floors are on the ground, paint will not be satisfactory. It is advisable here to waterproof the topping mixture or to apply hardener to the surface.

Color in cement generally does not produce an even tone. If colored cement topping is scored into small tile squares, however, the irregularity of color is not objectionable.

In operating departments, treatment rooms, duty rooms, serving rooms and in bathrooms and toilets, floors and bases should preferably be of tile, but can be terrazzo at some saving in cost.

Floors in operating rooms preferably should be of non-slip tile up to 4¼ in. square. In other rooms where tile should be used the choice is wide, the cheapest tile floors being in ceramic sizes.

For rigid economy the floors of the main kitchen and its dependencies can be cement, waterproofed or hardened. Quarry tile floors and bases are more desirable, however. At some less cost 6 x 9 in. roofing tile slabs may be used.



Wurts Bros.

In all hospital service spaces materials should be chosen to withstand hard and constant usage. They should be simple, durable and easily maintained. The illustration shows a typical diet kitchen in the Neurological Hospital of the Presbyterian Medical Center, New York, for which James Gamble Rogers was the architect

To reduce noise of traffic, it is advisable to use "soft" floor covering in all parts of a hospital where patients are housed. This includes wards, bedrooms, corridors and all spaces where traffic is slight, where water is not frequently spilled, and where thorough cleaning is seldom required.

Terrazzo flooring and base are widely used for nearly all hospital rooms. It is comparatively inexpensive. Terrazzo should be laid in as small squares as possible, with brass dividing strips, due to the inherent tendency of the terrazzo to brack. It may be left untreated, but is improved in appearance by the use of special "waxes." The use of ordinary floor wax is not to be recommended for terrazzo floors. The chief objection to the use of terrazzo flooring in a hospital, apart from its brittleness, is its hardness. It reflects sound easily and its unyielding surface is fatiguing to hospital employes.

The most commonly used "soft" floorings are linoleum, rubber and some of the elaterite floorings. Considering first cost and cost of maintenance, linoleum is the best and the most used of the "soft" floorings. Grade "A" light battleship linoleum (.142 in. thick) is sufficiently heavy if laid over lining felt weighing 1½ pounds per sq. yd. The felt should be cemented down solidly to the cement floor and rolled. After the felt has dried out, the linoleum should be cemented over the entire surface, using waterproof cement 4 in. back from edges and beams and on edges of linoleum. The linoleum should be rolled and edges and seams should be weighted down until the cement has set. Very careful tests should be made of the condition of the floor before linoleum is laid and the felt should not be laid until the floor is perfectly dry.

Linoleum should be waxed and polished immediately after it is laid. It should be rewaxed at intervals to prevent the linoleum from becoming hard and brittle. There are various good lacquers available for preserving linoleums. They may be satisfactorily used instead of wax and are somewhat easier to maintain. Solid colors, other than the natural brown of battleship linoleum, jaspé and even patterned linoleums can be used instead of the natural color linoleum, although at a possible small loss in durability.

The best, and most expensive, of the frequently used "soft" floor coverings is rubber. It is available in a great variety of plain and mixed colors, it is softer than linoleum and requires very little treatment or upkeep.

Elaterite (Utah asphalt) is inexpensive and is used to a considerable extent for hospital floors. It is applied as a plastic in several coats, to a thickness of about ⅛ in., or can be obtained in factory-made tiles in a limited range of colors, with bases of the same material as the flooring.

This flooring is slightly soft so that the surface does not remain perfectly flat. This tendency is offset by the fact that scratches and indentations are, to some degree, self-healing; marred surfaces can be smoothed out without much labor. The peculiar advantage of the material is that it can be used satisfactorily as a flooring over cement in locations where moisture conditions would prevent successful use of linoleum or rubber. Grease or oils are destructive to it, however. Elaterite floors should not be used in kitchens or similar locations.

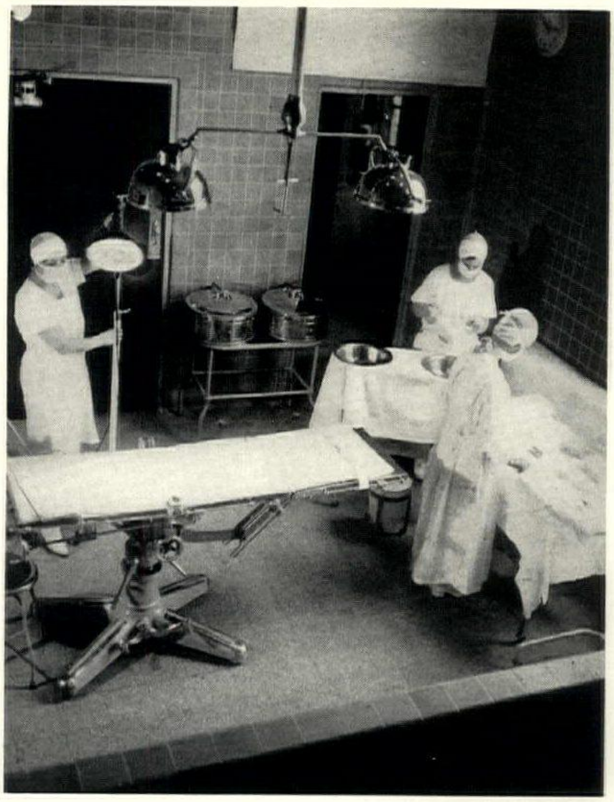
Wall Finish. All wall surfaces subject to frequent cleaning (operating rooms, sterilizing rooms, toilets, etc.) and all walls subject to abuse (serving kitchens and duty rooms) should be tiled. Matt glazed colored tiling to a height of at least 6 ft. is desirable in operating rooms. Elsewhere either white or colored tiles can be used to a height of at least 4 ft.

In main kitchens and kitchen dependencies there should be a hard wainscot. If economy is paramount, cement plaster is satisfactory, though glazed tile or glazed terra cotta blocks, 5 or 8 in. high and 12 in. long, are to be preferred. The latter are manufactured about 2 in. thick and can be obtained with trim for corners and openings. In main kitchens the presence of sooty dust renders it desirable, for facility in cleaning, to carry the tiling to the ceiling.

Where the use of tile has not been recommended for walls, ordinary gypsum plaster should be used, except in x-ray operating rooms where the walls and ceiling should be surfaced with barium plaster. This can be used instead of sheet lead for ray-proofing where economy is an object.

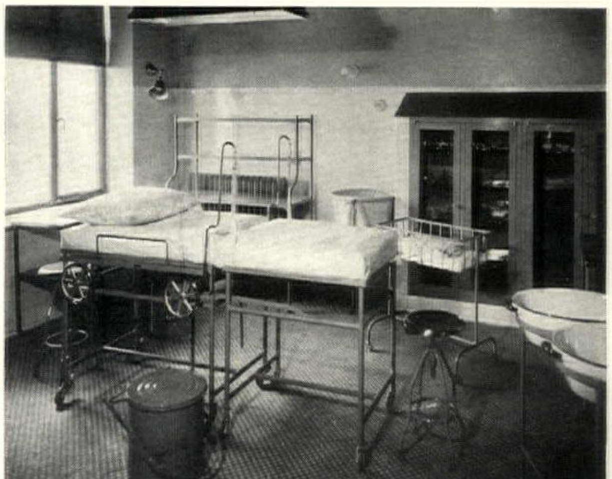
The walls and ceilings of kitchens, all rooms containing plumbing fixtures, and all parts of the operating suite, sterilizing rooms and all spaces which require frequent washing should be finished with enamel. This applies to the walls of corridors and stair wells to a height of 4½ ft. A flat surface is more difficult to clean.

Except where the use of enamel paint is suggested, plaster walls and ceilings can be finished with lead and oil or one of the many available good washable wall paints. Because of the necessarily frequent repainting, the initial painting on walls and ceilings should be done with no more than three coats.



The standards of material installations in operating rooms may vary considerably. Many hospital experts consider it desirable to tile the walls of the room from floor to ceiling. In such cases the growing tendency is to avoid the monotony of a pure white surface and to employ soft, light tones of color. The illustration above is of a typical operating room in the Passavant Hospital, Chicago, for which Holabird & Root were the architects. The walls are completely tiled and the floor is of terrazzo, laid in small squares separated by brass strips

Courtesy, Congoleum-Nairn, Inc.



The materials employed in these two small operating rooms show a radical variation from the one above. At the left the floor and walls are covered with linoleum in two tones of green. At the right the floor is of a white and gray non-slip ceramic tile and the walls are faced to a height of 5 ft. with squares of highly glazed ceramic tile

Irving Underhill Photos

Quiet corridors are essential to the patients' comfort. Noise prevention may be assured by the use of a soft flooring and the installation of a sound absorbing ceiling. The same technique is often advisable in patients' rooms as well. In the room below notice the Venetian blinds

This surface will stand a considerable amount of washing before it is destroyed and another coat of paint is required.

Trim and Doors. Doors may be trimmed with steel trim combined with bucks and frames, or, at less expense, with molded steel trim combined with bucks and frames. Flush metal trims should be No. 14 gauge and molded trims can be lighter, No. 16 or No. 18 gauge.

A cheap treatment of a door opening, affording a practically flush trim, is to use wood rough bucks, finished wood frames and No. 24 gauge galvanized iron casings having perforated or expanded metal flanges wide enough to cover the rough buck and afford a key to plaster.

Hollow metal doors should be used where fireproof doors are required by the insurance underwriters and should be of the construction and class required by the underwriters. Hollow metal doors with a single, shallow panel are available. They are fireproof and, if finished with baked enamel, are sufficiently desirable.

For general use flush veneered wood doors are most satisfactory. They should have a built-up wood core with cross rails and should preferably have cross-banded wood veneers on both faces. Less expensive are the two-paneled ogee wood doors with panels of at least three plys.

Windows can be trimmed by returning the plaster on the jambs and heads and finishing the casing with a simple, easily dusted, wood back mold. Window stools in tiled rooms should be marble; elsewhere marble, hollow metal or wood.

Stairs. Suitable stairs for a hospital can have pressed steel strings and facias with or without rolled steel moldings. Risers should be pressed steel, with metal nosings where the threads are to be cement. Steel sub-treads should be provided for treads and platforms.

If cement or terrazzo is used for stair treads and platforms, an abrasive should be used in the mixture to render the finished surface less slippery. Cement treads should be reinforced with expanded metal or reinforcing fabric. If soapstone is used for treads, it should have a slightly roughened finish, and marble for treads should be of a kind hard enough to resist wear but not hard enough to wear very smooth and slippery.

Railings should be simple, with round hardwood handrail and round balusters spaced 5 or 6 in. on centers to facilitate cleaning.

Elevators. For hospital use elevators should be large enough to accommodate a bed or stretcher and still leave floor space for attendants and the elevator operator. An elevator cab 5 ft. 8 in. wide and 8 ft. deep, inside dimensions, meets these requirements.

Essential equipment in an elevator includes three brass or bronze handrails on all sides, affording support for feeble patients and also, if spaced properly, acting as fenders to prevent damage to the sides of the cab.

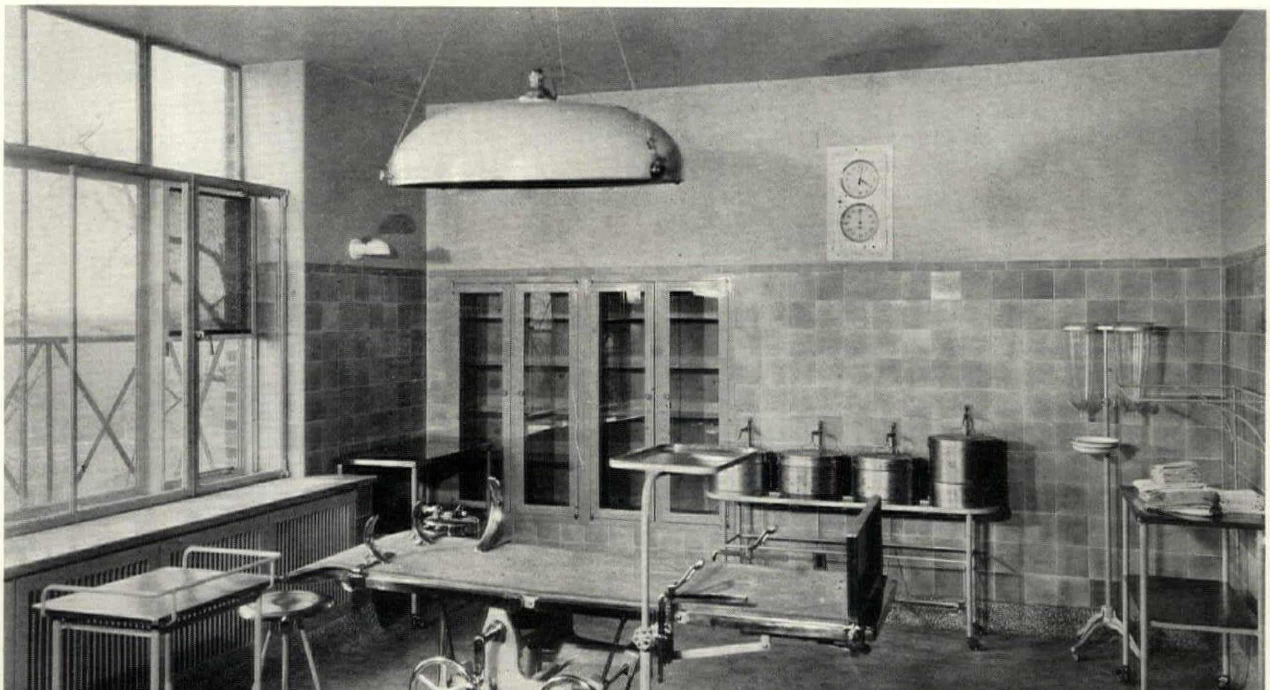
Elevator shaft doors should be equipped to open manually and close automatically, with hold-open devices for use when required. Elevator cars should have solid doors when space conditions permit or else motor driven safety gates. The use of "lazy-tong" gates should be avoided. Both shaft doors and car doors should have electrical interlocks to prevent the operation of the car before both shaft doors and car gates have been closed.

Ordinarily the best control for hospital elevators is the semi-dual push button type. This permits manual operation in busy hours and automatic service when traffic is light. Any elevator which is to be used by patients in a hospital should have a fully automatic self-leveling device.

It is earnestly recommended that all of the finish and equipment used in a hospital be of the best and most durable nature, as maintenance costs are serious items in the operating costs of such buildings. The use of inferior materials does not result in an economy in the space of a few years, as the high cost of maintenance of poor materials soon offsets a saving in initial expenditure.

Courtesy, Congoleum-Nairn, Inc.

As in this children's ward, a linoleum strip in the center of a terrazzo floor is an effective means of reducing sound. In the operating room below notice particularly the coved terrazzo base, the completely enclosed radiator, the flush metal cabinets and the glass screen at the window used to prevent possible drafts. The tiling is a matt finish to avoid an objectionable glare due to reflected light



FIRE PREVENTION AND PROTECTION

BY

ISADORE ROSENFIELD

BECAUSE persons confined to hospitals are usually helpless their lives there must be more thoroughly safeguarded than is usual under normal circumstances. Building laws in States and cities usually demand certain minimum requirements for hospital fire safety, yet the architect's moral responsibility goes far beyond the legal requirements. It is his duty to insist that all hospital buildings be of fireproof construction whether building codes demand it or not. Many hospitals in rural districts are not under the jurisdiction of codes but they are likewise greater fire risks as they are distant from fire-fighting apparatus.

The structure, materials and equipment of hospitals must be as nearly fireproof as possible, and the architect must combat any "penny wise and pound foolish" arguments on this subject that may be put forward. In the long run the fire-safe hospital is the cheaper investment, if money is to be considered, for it is lower in maintenance and repair costs and also commands the lowest insurance rates, the latter being a worthwhile yearly item of savings. A case in point is that of an institution which saved $5,000 every three years (the normal length of an insurance contract) by spending $1,500 on a few fire doors and minor structural changes. The publications of the National Board of Fire Underwriters should be consulted, and by availing himself of the services of the board the architect can render a distinct service to the hospital.

Disastrous hospital fires have resulted from unsuitable construction, inadequate fire detection apparatus and the absence of the simple yet effective means of stopping fires at their inception. The control of fire and smoke through proper planning and construction has been thoroughly investigated by the National Board of Fire Underwriters and their recommendations are available to all architects.

Special hazards in hospitals are in the food departments, the basement and boiler rooms, the x-ray laboratory and film storage, pharmacy, anæsthetizing rooms, operating rooms and oxygen chambers. It is essential that these portions of the building receive special attention structurally and that they be fully equipped with fire detection equipment. Sprinkler systems should be installed in the portions of the building having the greatest hazard. It is particularly important to have sprinklers in the x-ray vault, and the deluge system with unsealed sprinklers is particularly adaptable.

In the operating rooms the anæsthetic agents are usually highly combustible and explosive and are easily ignited by sparks either physical or electrical. Tile or terrazzo floors in rooms where anæsthetics are administered should be broken up with strips of brass so grounded as to make sparks impossible.

The sprinklers should of course be in addition to adequate standpipe provisions. Chemical extinguishers for rooms of special fire hazard must be chosen so that the type of extinguishing medium will be best suited to control the particular type of combustible materials involved.

Immediate fire detection is life insurance for patients and personnel, and false economy may be the forerunner of disaster. It is the architect's responsibility to choose the most efficient type of detection apparatus. Regardless of the system chosen, it is important that the fire alarm be silent as far as the patients are concerned, to avoid panic and harmful results to patients. Gongs should of course be sounded in the quarters of the personnel or nurses' home. The best protection is obtained with fire detection apparatus which not only gives a warning to those in authority in the hospital but which also is connected to an outside central service station under constant supervision, so that alarms are transmitted to fire departments without waiting for the usual telephonic communication.

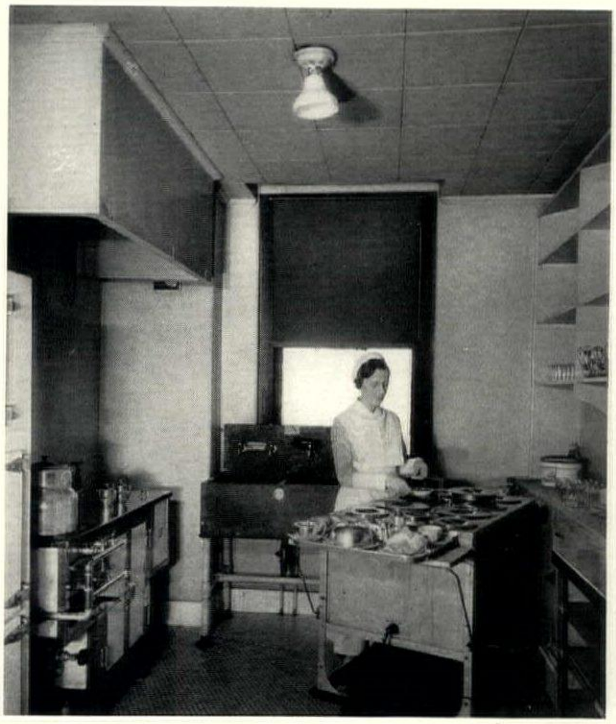
In many instances immediate notification to the fire department is essential. The best fire detectors are, of course, automatic with auxiliary manually operated units. One of the most effective and economical systems operates on the principle of a sensitive detector operated by the expansion of air in a small copper tube, less than 1/12 inch in diameter, which causes the alarm to be sent automatically. It acts on the rate of rise in temperature rather than on a certain fixed temperature being reached. Fire detection apparatus is so easily installed and so small and unobtrusive that it does not interfere with any architectural or structural considerations. An efficient automatic fire alarm system is often installed where expense prohibits the installation of a complete automatic sprinkler system or where the operation of sprinklers might cause excessive water damage.

Periodic tests of the fire detection and fire fighting apparatus should be made as well as a thorough inspection to see that fire hazards do not develop in the operation of the hospital.

CONTROLLING HOSPITAL NOISES

The following paragraphs have been compiled from research information furnished by CHARLES F. NEERGAARD, hospital consultant

SINCE noises within the hospital are most trying to the sick, their prevention must be stressed. This need not be costly if provisions for noise control are included in the methods and materials used in the construction. For acoustical treatment, structural insulation and quiet equipment, two cents per cu. ft. is a generous cost allowance, which may often be saved elsewhere in the construction. In two hospitals recently completed the total of such an expenditure averaged $85 per bed, including major precautions against noise in nurseries, labor rooms, dining rooms and dishwashing rooms, in addition to acoustical installation in the patients' quarters. The following paragraphs cite a few possibilities of noise control that will do much to assure hospital quiet.



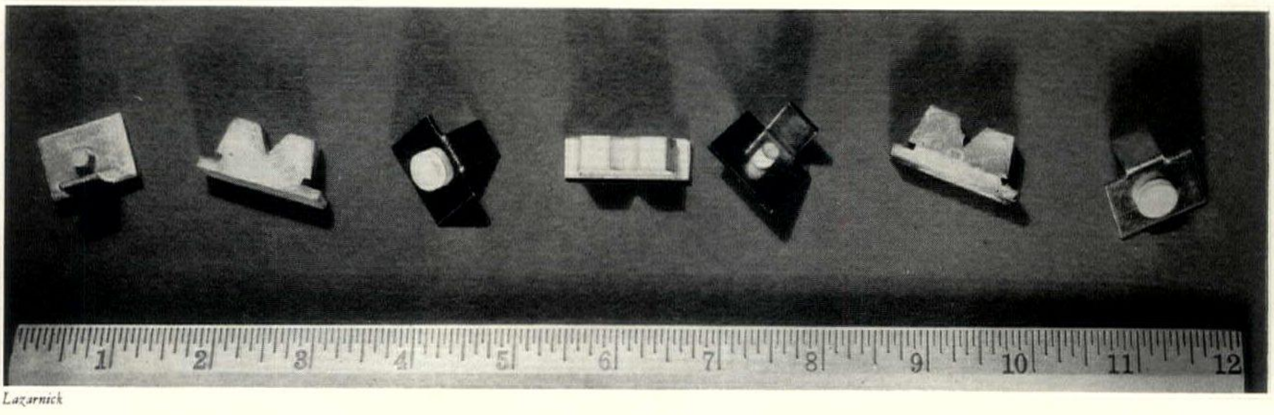
Since much noise originates in the diet kitchen, an efficient acoustic treatment is necessary. The rubber bumpers shown below reduce the noise of metal kitchen cabinets

Structure-borne Noises. Much may be accomplished by planning. The power plant and laundry should be separated from the hospital proper or should be structurally isolated from the rest of the building by soundproof walls, floors and doors. Machinery should be mounted on special anti-vibration platforms, and flexible couplings should be used wherever practical for connections between machinery and pipes. A covered space for delivery trucks will serve as a sound baffle.

Around all centers of noise sound insulated construction should be used, such as in the enclosing partitions of the dietary department, the operating rooms, maternity wards, utility spaces, x-ray rooms, etc.

Elevator installations should be the best procurable. In every instance a micro-leveling device should be used to avoid the bumping of beds, stretchers, wheel chairs and trucks from the floor to the elevator cab. Wherever possible the elevator machinery should be separately enclosed and the enclosure lined with some sort of acoustical material.

Plumbing Noises. Many water noises may be eliminated by provision and control of the proper water pressure. Too great a pressure is often the cause of noise, and reducing valves must be properly adjusted or they will be extremely noisy when



Lazarnick

fixtures are operated. Supply mains should be large and should be supported on insulated lead hangers, securely fastened at close intervals to prevent pipe vibration and to keep pipe away from structural members of walls and floors. If the mains are concealed, they should be in chases with ample space for insulation all around them. If the pipes are covered with a heavy coat of cork insulating paint and packed with some effective insulating material, the results are usually excellent.

The usual tendency to expose all pipes that may need repairing necessarily results in noise. It has often been overdone; carefully installed soil pipes with proper clean-outs seldom need repairs that involve building destruction. They should be boxed in and well packed with insulating material, as an unfilled pipe chase or a hung ceiling serves as a sounding board sensitive to the vibration of the water flow. The ends of all risers should be cushioned.

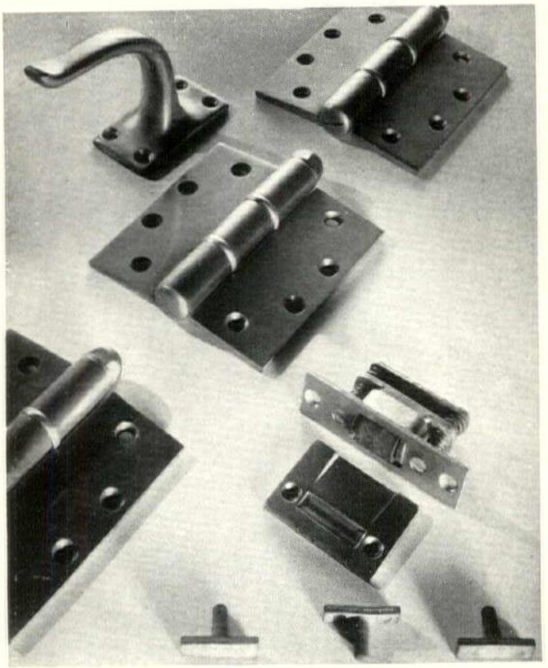
Air-borne Sounds. Many sounds incidental to the usual activity of hospital personnel may easily and economically be confined to their area of origin by the use of sound absorbing materials. The surface of the acoustical treatment must be as durable as plaster and should continue its efficiency even under repeated washings and paintings. The cost of sound absorbing materials, applied, ranges from 20 cents to $1 per sq. ft., and absorption values vary from 10 to 85 per cent. Within these ranges are materials particularly suitable for corridors, dishwashing and utility rooms, patients' spaces, etc. They should be installed during the construction of the building as an integral part of the finish in all such areas.

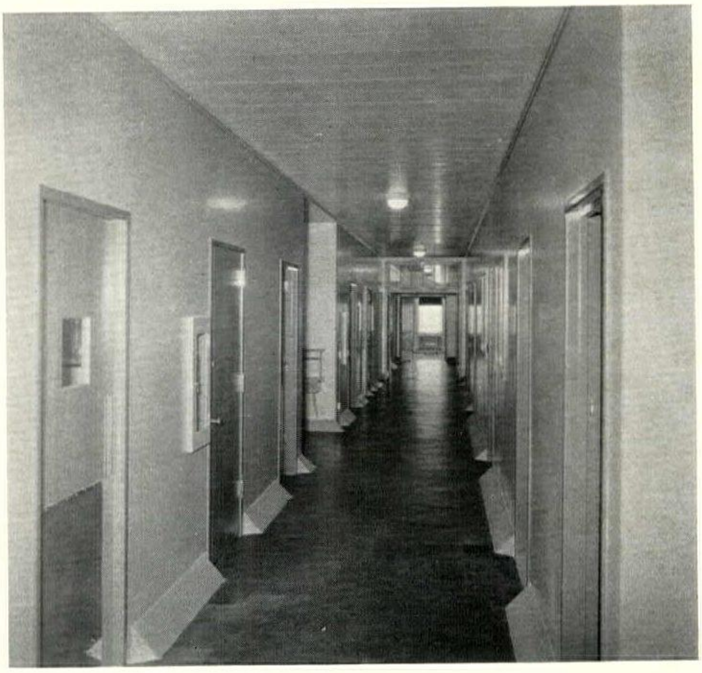
To control sounds passing through the windows, and, with windows closed, to provide properly tempered ventilation, unitventilators may be installed of the type originally developed for schools.

The installation of air conditioning in hospitals adds to the problem of assuring hospital quiet. Although the practise of lining ventilating ducts with a sound absorbing material is satisfactory in many instances from the acoustical point of view, the surface of the material tends to disintegrate and corrode, particularly in humidified air.

There has been developed a method wherein cylindrical sections of standard pipe insulation dimensions are molded of exfoliated mica. These tubes are slipped into an ordinary sheet metal ventilating duct and nested in a manner which might be compared to an egg crate, the metal duct being filled with a series of small tubular ducts. The walls of the tubes exposed to the rapid air currents filter out a major part of the objectionable noise. The frictional resistance is small and the mica, besides having notable sound absorbing qualities, is both fireproof and waterproof.

Much noise can be eliminated by the selection of proper hardware for doors, cabinets, etc., throughout the hospital. The equipment shown below, will do much to reduce the noise of clicking latches, slamming doors and the rattles caused by drafts and improper alignment. The hardware, installed, costs about $5 per door less than the noisy office building hardware now in common use.

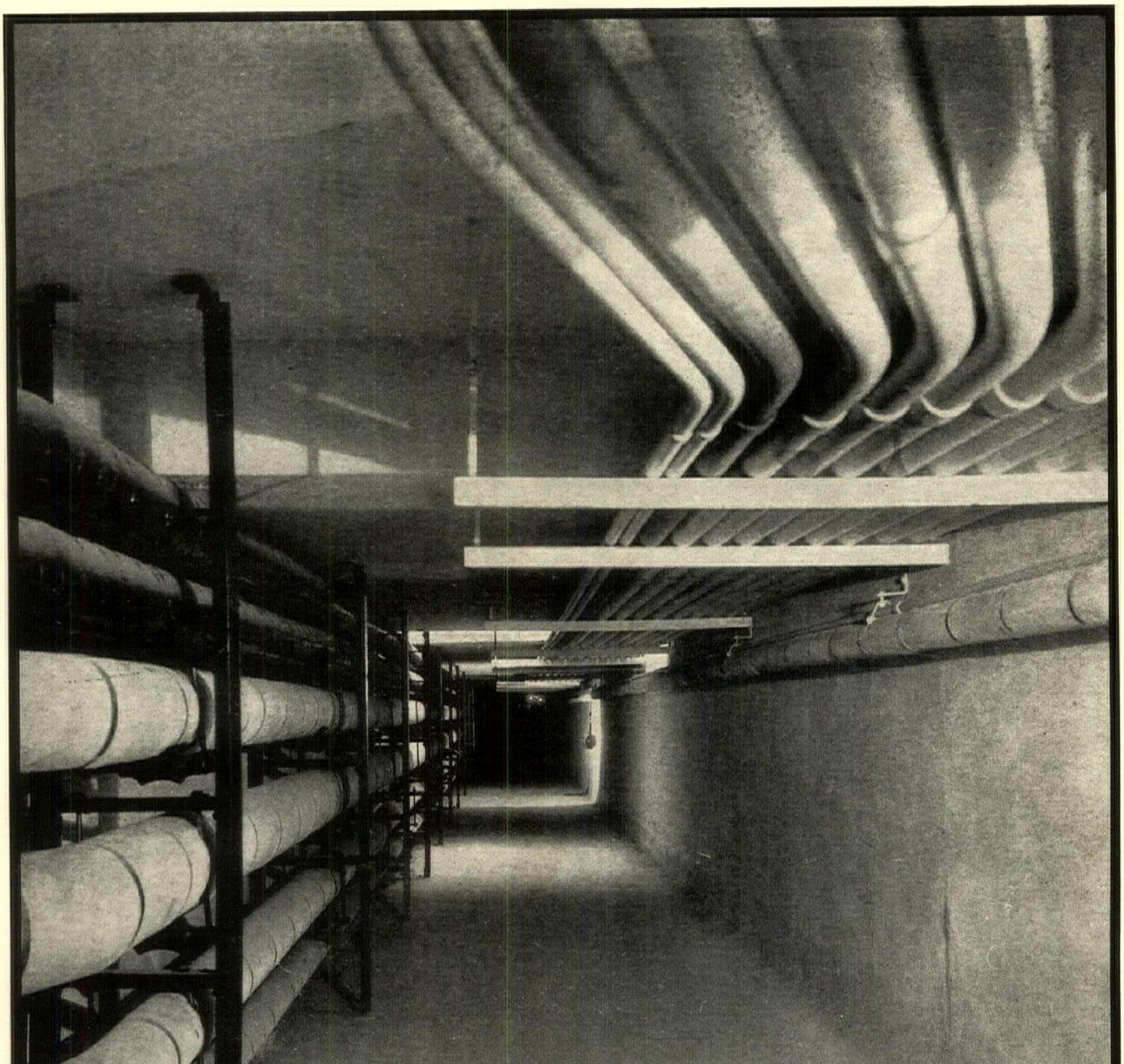




Hospital hardware consisting of adjustable friction hinges, a soft rubber roller in place of the usual noisy latch, an arm hook in place of a knob, and a sound absorbing ceiling, such as that shown at the right, are efficient for muffling noise in corridors

ENGINEERING & BUSINESS

HEATING AND VENTILATING SYSTEMS . . . HOSPITAL SANITATION EQUIPMENT . . . FOOD SERVICE REQUIREMENTS . . . AN ANALYSIS OF COSTS AND CUBAGES . . . OUTLINE CHECK LIST . . . REFERENCES . . . NOTES ON ELECTRICAL EQUIPMENT . . . ARCHITECTURAL FORUM DATA AND DETAILS FOR HOSPITALS



Woodhead

ARTERIES, VEINS, NERVES . . .

HOSPITAL HEATING SYSTEMS

BY

ALFRED KELLOGG

CONSULTING ENGINEER

A HOSPITAL heating plant naturally begins with the boilers and their equipment, but in order to determine the type and sizes of the boilers for the several hospital utilities, the system of heating to be installed must first be given consideration.

System of Heating. While hot water is the almost universal system in use in Canada for hospital heating, in the United States low pressure steam, in one of its several forms, is more usual. In hospitals of up to 60 to 75 beds, the two-pipe vapor system, with trap return of the condensation to the boilers, will serve admirably, but in larger hospitals the heating system becomes more complicated.

A vapor-gravity or vapor-vacuum system, carrying steam pressures from 4 ounces to 2 pounds in the former case, or a vacuum of from 4 to 10 in. in some instances, will prove entirely satisfactory in the majority of hospitals. With reasonable care in operation, results from either system will compare favorably with the more expensive hot water installations, and usually at lower installation cost. In the writer's judgment, better temperature control may be obtained from a vapor-steam system, with less complication of operating devices.

In the majority of hospitals, the condensation from the heating system can be returned to the boiler plant by gravity flow, thus avoiding the need of one or more vacuum pumps. Where this is possible, the vapor-gravity system may be installed. With this system in its simplest form a modulating radiator supply valve and a thermostatic radiator trap, with connecting steam and return piping, are all that is required for obtaining varying room temperatures by either manual or automatic control.

Orifice Control. To insure an even distribution of steam throughout the system of supply piping to the radiators, it is urged that an orifice be placed in each radiator connection, either in the valve itself, or between the valve and radiator. A system of piping, where orifices are not installed, will supply steam in excess volume to the radiators nearest the boilers, while those at the far ends of the mains get their supply much later.

The "Zoning" System. This is a forward step in modern heating practise. The zoning system of piping permits carrying a lower steam pressure on the south or protected sides of buildings, and supplying the required higher steam pressure to the north side or exposed rooms. Very frequently the north side of a building will demand a pressure of 1 to 2 pounds for comfort, while rooms on the sunny side will be equally comfortable with steam supplied at from 2 to 4 ounces pressure.

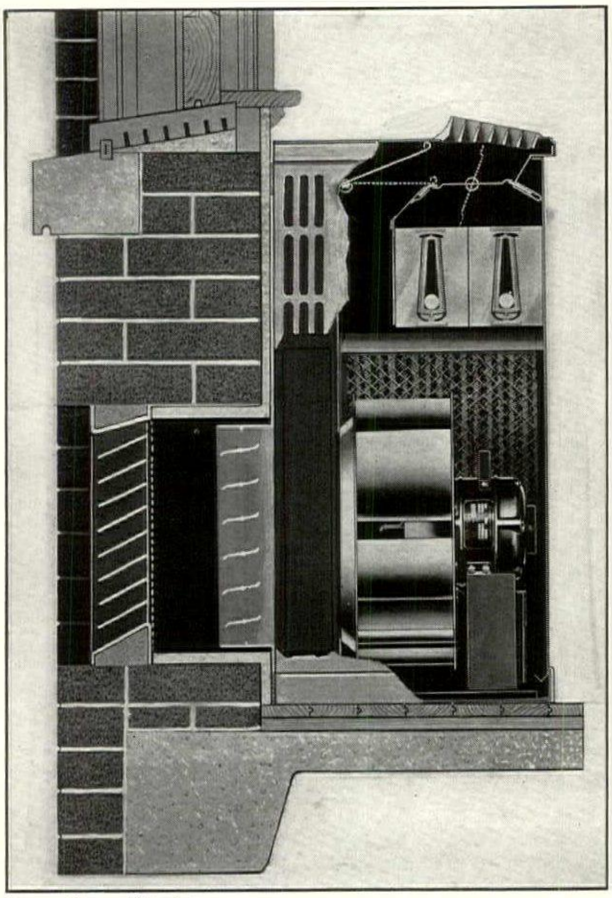
Steam pressures may be under either manual or automatic control from a central point. The writer at present inclines to the use of manual control, inasmuch as it is not usually necessary in practise to have to vary the zone pressures more often than two or three times a day, and this requires no other effort than the turning of a knob on the control board where all pressures and temperatures are automatically indicated or ascertainable. Two or more zones may be required.

There are many installations of zoning systems operating under vacuum ranging from 10 ounces to 25 ounces, requiring vacuum pumps and appropriate pressure regulating devices, usually with a combination of manual and automatic control. Such systems make use of the latent heat of the vapor below the pressure of the atmosphere, and claims of equivalent savings are made therefor.

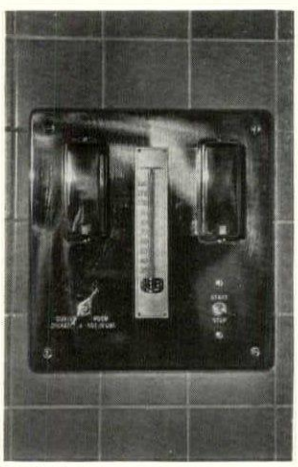
Operating Room Control. From 60 to 90 cu. ft. of outdoor air per minute, heated sometimes up to 85°, has been considered necessary in operating rooms. Schemes ranging from the direct radiator, with or without an air supply through a slot in the building wall for the admission of outdoor air, to the quite elaborate double partition with radiator between, together with sliding sash, transoms, etc., have been employed. Some of these are quite costly to install, require much cleaning and are only indifferently satisfactory.

A unitventilator set into an embrasure in the wall under a window, taking its supply of air through the wall at all times, both for heating and ventilation, has been successfully used recently. No direct radiators have been installed, nor recirculation of the air in the rooms made possible. Temperature is maintained automatically for operating and non-operating conditions by means of two graduated acting thermostats mounted on a wall panel connected to a lever-handle switch.

The thermostat for operating (patient) conditions

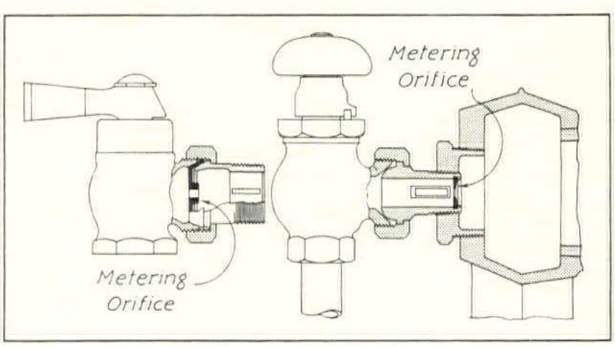


Courtesy of Herman Nelson Corp.



Woodhead

Above is a cutaway view of a typical unitventilator used successfully to heat and ventilate operating rooms without the installation of direct radiators. The temperature is maintained automatically for operating and non-operating conditions by thermostats, shown in the panel at the left. Below are illustrated two types of metering orifices to insure an even distribution of steam to radiators



being set at any point up to 90°, actuates the mixing damper of the unitventilator and maintains the required room temperature, and at the same time supplying from six to seven air changes an hour.

The thermostat for non-operating conditions is set as desired, and actuates a pressure switch stopping and starting the fan of the unitventilator. It also controls a pneumatically operated valve in the steam supply line to the heating element in the unit. The thermostat panel also contains a toggle switch for hand operation of the motors of the unitventilators.

The operating room units are supplied from the regular lighting system, and from the system of automatic pneumatic and thermostatic control used elsewhere in certain portions of the hospital. In this instance a ventilating fan in the roof space withdraws a volume equivalent to the volume delivered into the rooms by the unitventilator, thus balancing the air system and preventing the odor of anæsthetics from reaching other rooms.

The "panel" system of heating, to some extent employed in England, has not, so far as is known by the writer, been employed in hospital heating. It consists of a system of pipes cast into the concrete ceilings of rooms to be heated, and is generally intended for the forced circulation of hot water.

Boiler Plant. For steam heating sectional cast iron boilers may be satisfactorily used for the smaller hospitals, with an auxiliary steel boiler for providing high pressure steam for laundries and medium pressure steam for kitchens and sterilizing, in which case reduction in steam pressure for heating may be effected through suitable reducing valves. Many small installations of two cast iron boilers carrying sufficient pressure for heating, with one 10 to 15 h.p. high pressure steel boiler for the sterilizers, etc., are proving entirely satisfactory.

In some plants where the laundry work is done in commercial laundries, sterilizing and cooking are done by electricity or gas, thus avoiding the installation of a high pressure boiler. Such means, however, are not suitable for the larger hospitals, and it will be found that the general tendency today, in hospitals of every size, is toward the installation of high pressure steel boilers.

Available Fuels. The fuel to be burned will be determined primarily by its cost and to some extent by smoke ordinances. Natural or artificial gas is looked upon as the ideal fuel, especially the former. Boilers designed solely for coal or oil fuel will not prove economical for gas fuel. Fuel oil is an especially satisfactory fuel for the hospital plant where obtainable at a reasonable cost.

One feature is of special importance in making a cost comparison between coal and oil. Usually the steam load in hospitals drops off by noon or shortly after, as the larger cooking operations are usually finished for the day, and the heating and sterilizing demands are at a minimum. This in many cases permits cutting one boiler out part of the time.

A "smoke nuisance" may be as easily created with fuel oil as with bituminous coal, since it depends upon the character of the installation and the skill used in operation. Only by the use of gas, coke and anthracite coals may the plant be considered free from the liability of objectionable smoke. Of moment also is the freedom from ashes and dust about the plant and the attendant noise and cost of ash removal, where gas or oil is the fuel burned.

Firing Methods. The many factors of fuel types and the proper equipment for firing each for maximum efficiency must be discussed in detail with an engineering specialist in combustion practise. The types of mechanical stokers and the provisions for proper draft are best determined with such expert advice. Coal and ash handling machinery will usually prove an economical investment in plants of 1,000 hp. or larger.

Fuel Saving Devices. Boiler instruments will usually prove a wise investment in all but very small hospital plants. These simple instruments will enable the hospital authorities to check operating results hourly, converting guesswork to certainty.

Hot Water Requirements. The amount of water for the several departments varies both with the type of hospital and the administration. The designing engineer must analyze all possible requirements and provide the equipment accordingly.

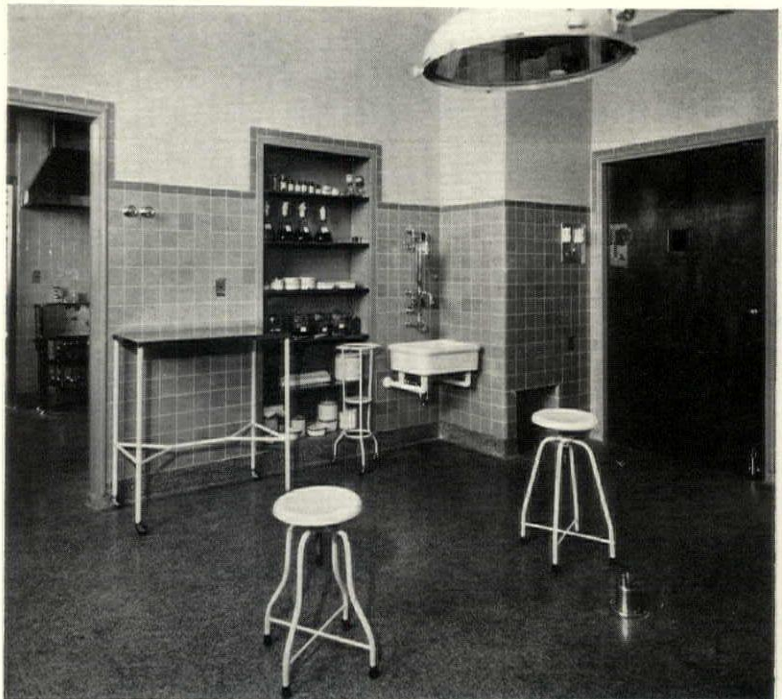
Water at 140° F. will be found sufficiently hot for general purposes. For the laundry the temperature should be 180 to 200°.

Schedule of Water Requirements. Based on the average patient day, including daytime staff of physicians and nurses equal to one and one-quarter times the number of patient beds.

	Average	Maximum
Total hot and cold for average hospital uses — no laundry	135 gal.	220 gal.
Total hot and cold — with laundry	175 gal.	280 gal.
Hot water only — no laundry	38 gal.	60 gal.
Hot water only — with laundry	68 gal.	105 gal.

For hydrotherapy equipment, consisting of one needle-shower and rose spray, perineal stool and sitz bath with liver spray and control table, as used in psychiatric hospitals, the momentary demand may require 60 gallons of water per minute, of which 20 gallons would be hot water and 40 gallons cold water. These are averages. Cold water also might be required for water softener equipment and as cooling water for a refrigerating system. These would increase the demands given above. If the waste condenser water is utilized for flushing toilets and similar purposes, a considerable saving in cold water may be effected. If the waste water from the laundry washers is passed through a suitable heat

Weber



Woodhead

At the left is a control board for the zone system of heating. At the right is a view of a typical operating room heated by the unitventilator system. The thermostatic controlling device is on the tile wall at the righthand side of the picture exchanger, much of the heat may be salvaged before the waste passes to the sewer, thus saving steam for heating the laundry water.

It is desirable to install hot water tanks in duplicate to insure a constant supply at all times. In all except very small hospitals a hot water tank or tanks for general purposes, furnishing water at about 140°, is desirable, and another tank or tanks for the laundry at 180 to 200°.

The small hospital will of necessity be obliged to depend upon one, or at most, two tanks. Care must be exercised in their installation to insure reliability in operation and continuous service. Where a hospital with a laundry has to rely upon one tank, it should be of large holding capacity, and the temperature thermostatically controlled at around 140°. The laundry and kitchen supply of hot water should be taken from this tank and passed through an instantaneous type heater for raising the temperature from 140° to an average of 190°.

Continuous Baths. In psychiatric hospitals water for continuous baths must be provided, and the supply of hot water should be taken from tanks used for no other purpose. The temperature must be accurately maintained at 98° in the tubs for long periods, and the volume is considerable. It is advisable to provide at least 120 to 200 gallons per hour per tub. With the hot water supply at an average temperature of 160°, and the cold water at from 50 to 55°, and both at 40 pounds pressure at the mixer, a continuous flow of 98° water through the tubs of from 3 to 5 gallons per minute will be provided.

The supply of hot water is usually taken from a tank heated by steam through pipe coils. Recording instruments are provided for the water temperature and are a most essential part of the equipment.

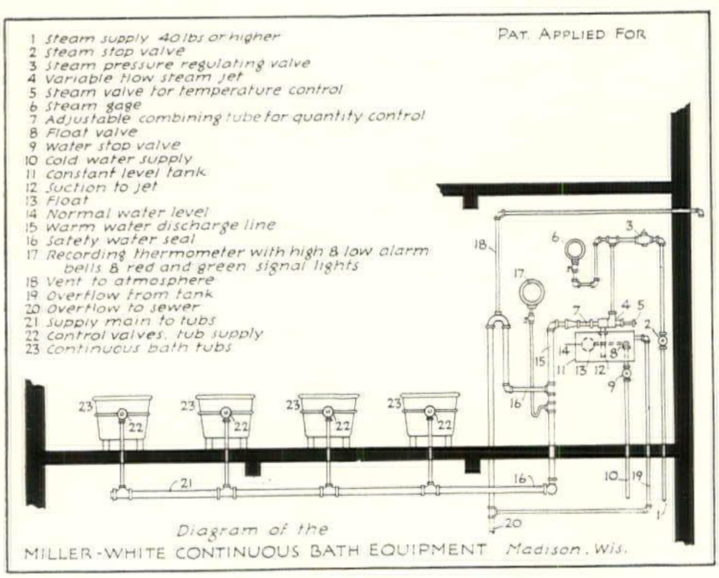
There is now available a new and unique method of providing hot water for continuous flow baths. The installation consists of a suitable tank provided with a constant water level float valve, from which the water for the baths is lifted a few inches and at the same time is heated to the predetermined temperature by a specially designed variable flow steam jet, supplied with live steam at a constant pressure (30 to 40 pounds).

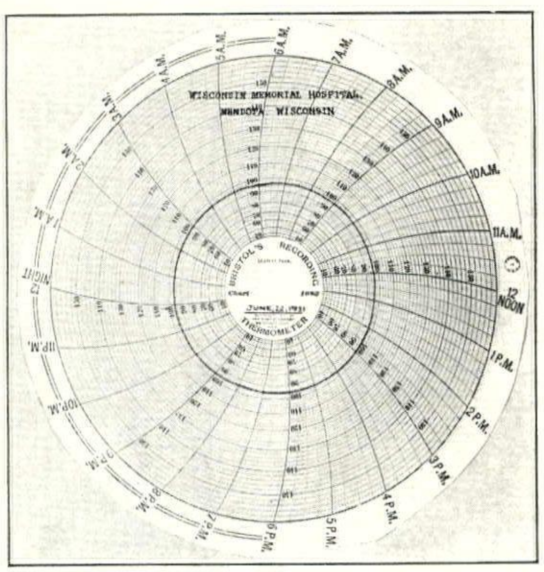
So long as the water level in the tank and the steam pressure remain constant, the resulting temperature of the tub water must also remain constant. The steam supply, which also determines the amount of water delivered to the tubs, is always under the control of a nurse. A simple water seal arrangement of piping fully protects the patient from steam in case of loss of water at any time.

As the cold water supply is heated only to the bath temperature, there is no danger of scale formation from the mineral salts the water supply may hold in solution.

High and low temperature, audible and visible alarms are provided with the recording thermometers, which, with the control valves, are mounted on a suitable panel near the tubs. The chart illustrates the degree of control obtainable, and the drawing shows diagrammatically the arrangement and pipe connections.

Materials and Quality. Where so much depends upon reliability of service and freedom from excessive upkeep, only materials of known reliability should be considered, and the workmanship of installation should accord therewith. Tanks for both





At the left is a diagram indicating equipment for a new method of providing hot water for continuous flow baths. The chart at the right, taken from an actual installation, shows the constant temperature at which the water is maintained hot and cold water should be built of materials suitable for the available water. While copper tanks for hot water are generally looked upon as offering greater resistance to corrosion, yet with water to be found in many localities wrought iron or mild steel will serve equally well.

In general, however, it may be said that all copper-lined steel tanks and copper (not brass) pipes are indicated where ground water or deep well water is the available supply. This applies also to the entire hot water circulating system.

The use of either wrought iron or mild steel pipe for the high pressure and hospital heating systems is common practise. The quality of the water supply and quantity of the boiler make-up required will usually determine the choice.

The welding of steel and iron piping systems is becoming common practise. In all but the very small sizes the cost of fabricating is less than the common screw or flange fitting system, and welding insures entire freedom from subsequent leakage.

Valves for nearly all purposes necessarily have to withstand daily, and frequently hard, usage, and the best of materials and design are essential. Valves of 2 in. and smaller should be all bronze, while larger valves may be iron body, with bronze mountings. Valve seats, disks and wedges should be replaceable.

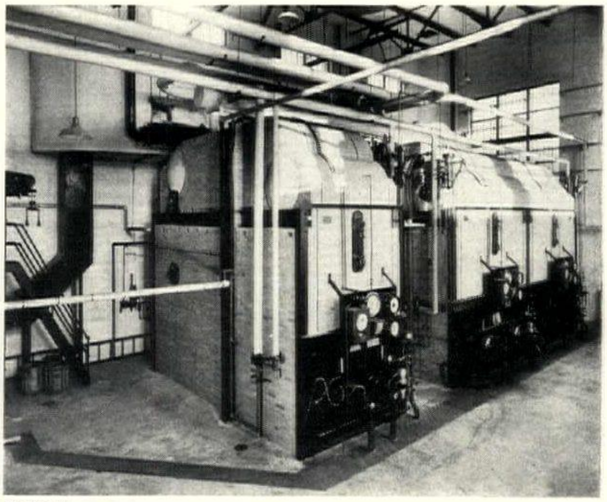
Radiators. The cast iron radiator has been very largely replaced by a lighter and more efficient design of attractive appearance. It may be obtained with widely spaced tubes for hospital uses, where convenience of cleaning is essential.

The copper fin-tube or cast metal radiator for concealment in walls and partitions or in metal cabinets is of the convection type, occupies very much less space and weighs but a fraction of a cast iron radiator. The fins or convection surfaces are very closely spaced, and may hold lint and other waste. Special cleaning brushes however may be provided for keeping the surfaces reasonably clean.

In the small hospitals, electricity or gas for heating single radiators for such locations as operating rooms, rooms in the maternity suite and similar apartments should be installed for use during the off-heating season. Inasmuch as the larger hospitals employ high or medium pressure steam the year round, separate mains and connections should be made to radiators installed for the purpose.

Radiant or convection type electric heaters may be similarly installed to meet special needs in private rooms and elsewhere. These are usually plugged in the electric utility outlets, with which all the rooms should be abundantly supplied.

Hospital Ventilation. Hospital authorities do not agree among themselves on the proper conditions to be maintained, nor do architects and engineers.



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A hospital boiler room. The three boilers shown have an approximate total capacity of 1,200 hp.

Twenty-five years ago it was considered necessary to install either a plenum fan system or an indirect gravity outdoor air supply to all rooms. The former were most times expensive to maintain and operate; the latter, from inability to keep the radiating surfaces even tolerably clean, became almost immediately unsanitary, failed to supply sufficient warmed air to keep the building warm, and in most cases had to be supplemented or wholly replaced by direct radiation.

With the abandonment of the plenum fan and the gravity indirect systems of supplying air, the custom of air supply through a direct-indirect radiator, placed in the outer wall of the patients' rooms, was resorted to and has been in general use for a number of years, although it is open to the same objection on account of inability to keep the air passages clean.

For the removal of the air from one- and two-bed rooms, it is not the general custom to provide vent flues. In wards of from four to eight beds it is desirable to provide one or more vent flues to the roof, or to an exhaust fan serving many rooms.

Such a method for the supply and removal of air from patients' rooms is necessarily very inexact and depends wholly upon natural air currents, both within and without the hospital. The cubic contents of the average one- and two-bed rooms approximates 1,650 ft. per patient bed, and the natural leakage from the rooms will be at least one to one and one-half times the cubic capacity of the rooms an hour without opening windows. This will serve to remove 28 to 42 cu. ft. of air per minute per bed. To be sure, this does not apply to rooms for patients suffering from certain ailments which require special provision for an abundance of outdoor air. The open window for the supply of outdoor air is quite generally in use in hospitals at the present time.

It is manifest that the location of the hospital will determine whether the air admitted to the patients' rooms through windows is sufficiently free from odors, dust, smoke and other gases. Some form of deflector placed under the lower sash will serve to diffuse the incoming air. As the radiator is usually placed under the windows, the heat currents rising therefrom will heat the incoming air and aid in diffusion. Window sash are now obtainable that accomplish the same purpose.

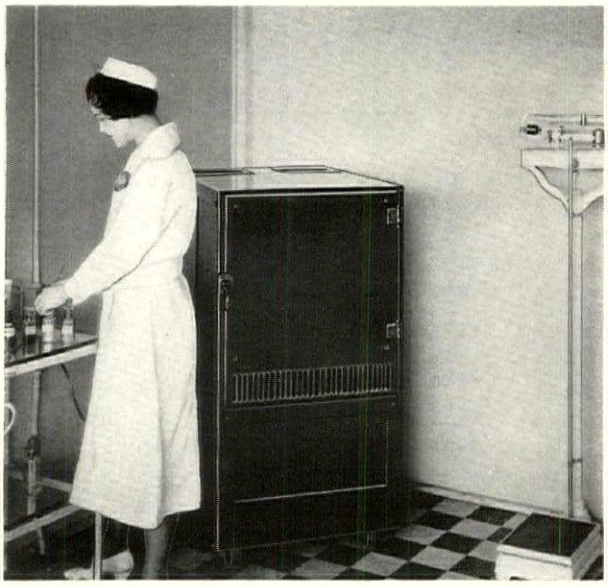
Street noises may now be greatly minimized by new devices which are said to eliminate 75 per cent of the noise coming through sash opened at the bottom without obstructing the air passage.

The public spaces and waiting rooms should be supplied with an abundance of outdoor air by mechanical means; and many believe that the entire out-patient department should be positively ventilated.

Forced ventilation by exhaust fans is necessary for all toilet and utility rooms, diet and general kitchens, autopsy and operating rooms, laboratories, sterilizer rooms and the radiographic department suite. The boiler and refrigerating machinery rooms and laundry require liberal ventilation also.

Air Conditioning. The conditioning of air for hospital needs consists primarily in rendering it free from dust, gases and odors, for use in ventilation, and to add to the comfort, and to hasten the recovery, of the patients by maintaining the proper degree of humidity and temperature.

Where the control of humidity is to be considered, the air washer or conditioner, which will also remove most of the dust and odors (but not soot), will provide means for the purpose. With this equipment cold spray-water will be required, obtained from driven wells, or water chilled by ice or artificial refrigeration. With proper control this device may also be satisfactorily employed for controlling the room temperatures. Installed in this and the smaller unit type equipment, heating surfaces are also included for warming the conditioned air.



Where the natural humidity of the air is not too great a portable cooling device is of value

Such equipment for generally supplying air for ventilation and comfort in the larger hospitals may be of a size to serve the entire building or major portions thereof, in which case it would be located at some central point for distributing the conditioned air by means of ducts and flues to the several rooms.

Where, however, but few rooms are to be treated individually, a small compact cabinet type unit may be installed in each room. These units require scarcely more floor space than the conventional direct radiator, and during the cold months provide properly controlled hot water heat, together with washed and humidified air for ventilation. During the hot, humid months the same equipment provides the properly controlled cooling effect without other change than the forced circulation of cold water in place of hot water through the coils.

The piping to these units is somewhat more complicated than will be found in the usual heating installation, but there are certain advantages obtainable from their use which should be considered:

1. When any room is not occupied, the entire unit may be closed off, or simply the heating element kept in use, that the room may not become too cold during unoccupied periods.

2. When desired, the air conditioning element may be stopped by closing a valve and natural outdoor air, properly warmed, delivered to each room, of definite volume for ventilation during occupied periods. In such cases, where outdoor atmospheric conditions provide indoor comfort, a saving in operating expense may thus be effected.

For cooling only, the portable cooler no doubt will prove of value in many instances. These devices hold from 200 to 300 pounds of ice, and, where the natural humidity of the air is not too great, afford a degree of comfort for the patient not obtainable otherwise. The cost of operation is low.

Air conditioning is steadily coming to be considered a prime necessity in operating rooms, the maternity suite, fever and convalescent wards and in all or a selected number of private rooms. Its use is urgently recommended in children's hospitals. The air conditioning of premature birth wards requires special devices for maintaining high and low temperatures and varying conditions of humidity, both of which must be under accurate control.

Installation and operating costs may not be definitely stated in a short article, but for many uses in hospitals any reasonable expense should be subordinated to the results to be obtained. Careful engineering must be employed in the design and installation, in order that the operation of the plant by nurses and attendants may be kept simple.

FOOD SERVICE FOR HOSPITALS

BY

EDWIN M. LOYE

MANY hospital patients today judge the institution by the excellence of its food service. Few problems give the hospital administrator more difficulty and concern than this subject of food. The building committee and the architect have often considered hospital food service as a necessary evil which, unfortunately, has a part in the structure of the hospital plan. The architect may find himself serving as referee in debates between the doctor and the dietitian on food service requirements.

After all, the institution is operated for the patients who must have as nearly ideal food service as possible. A few years ago an authority stated in jest that he thought the hospital of the future should, in addition to having a nurse for each patient, have the services of the best French chef. While the architect can hardly provide the cook, he must provide equipment which others can use efficiently.

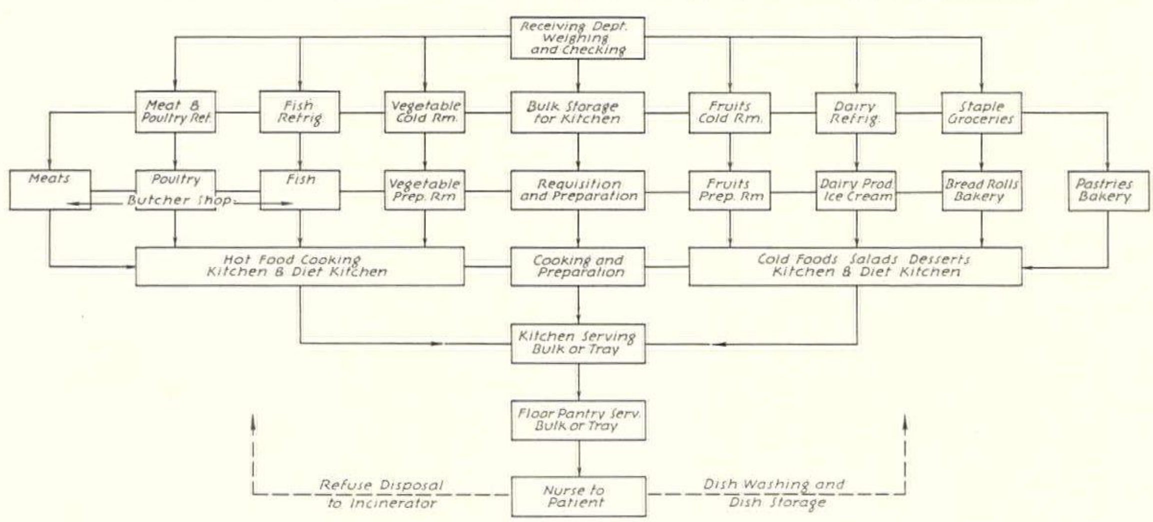
The entire hospital personnel also must eat. In the general hospitals today there are about as many of the latter group as there are patients. To aid in determining the total demand, a classification of patients is necessary.

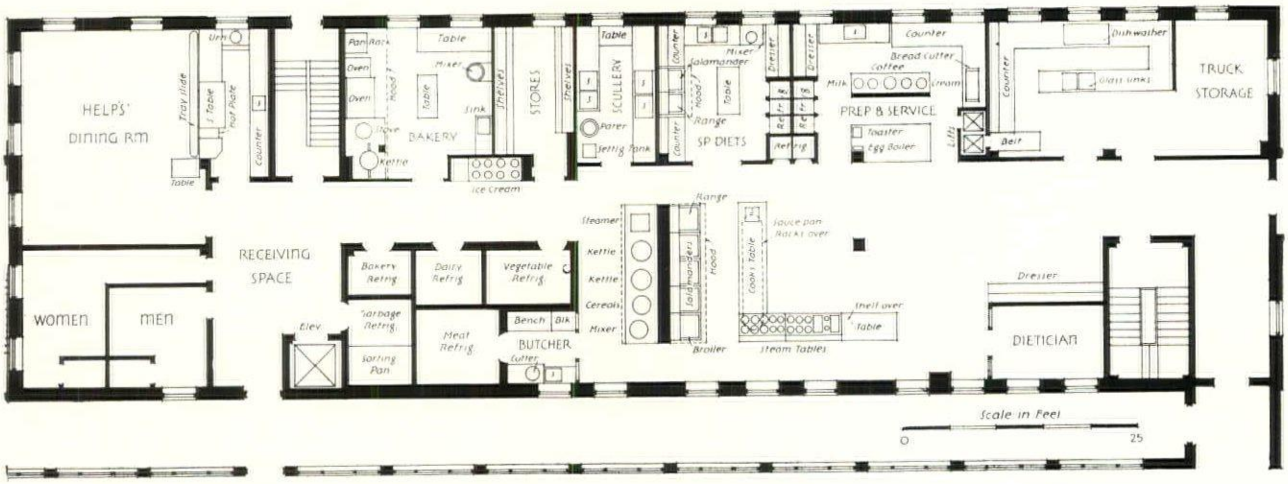
It is assumed that the material in this discussion applies to the general hospital of 100 to 300 bed capacity, having one main kitchen, adjoining diet kitchen, and all personnel served in the hospital. Hospitals of over 300 bed capacity have such heavy food service demands that it is found economical to divide such services into separate branches, as, for instance, a private patients' kitchen as well as a ward kitchen, the nurses to be served in the separate nurses' home buildings.

General food service and special diets must be provided for: private patients, semiprivate patients, group nursing patients, ward patients, children, infants, isolation patients. These classifications include men, women and children; bed, ambulatory and convalescent patients.

Personnel Food Service. Various types must be provided for: Superintendent, house staff and internes (*in hospital dining rooms, separate residence; provision for families; number of meals per day*). Hospital offices and administration clerical staff, dietitian (*in hospital dining rooms or outside; number of meals per day*). Nurses — superintendent, supervisors, graduate, undergraduate, training school instructors and assistants, special, nurses ill in infirmary (*in hospital dining rooms, in nurses' homes, outside maintenance; number of meals per day, cafeteria service, three meals or less, number of sittings each meal in dining room or cafeteria*). Male and female general help; male and female kitchen help (*resident or outside dining room or cafeteria; number of sittings each meal*).

DIAGRAM OF FOOD SERVICE FROM RECEIVING ROOM TO PATIENT





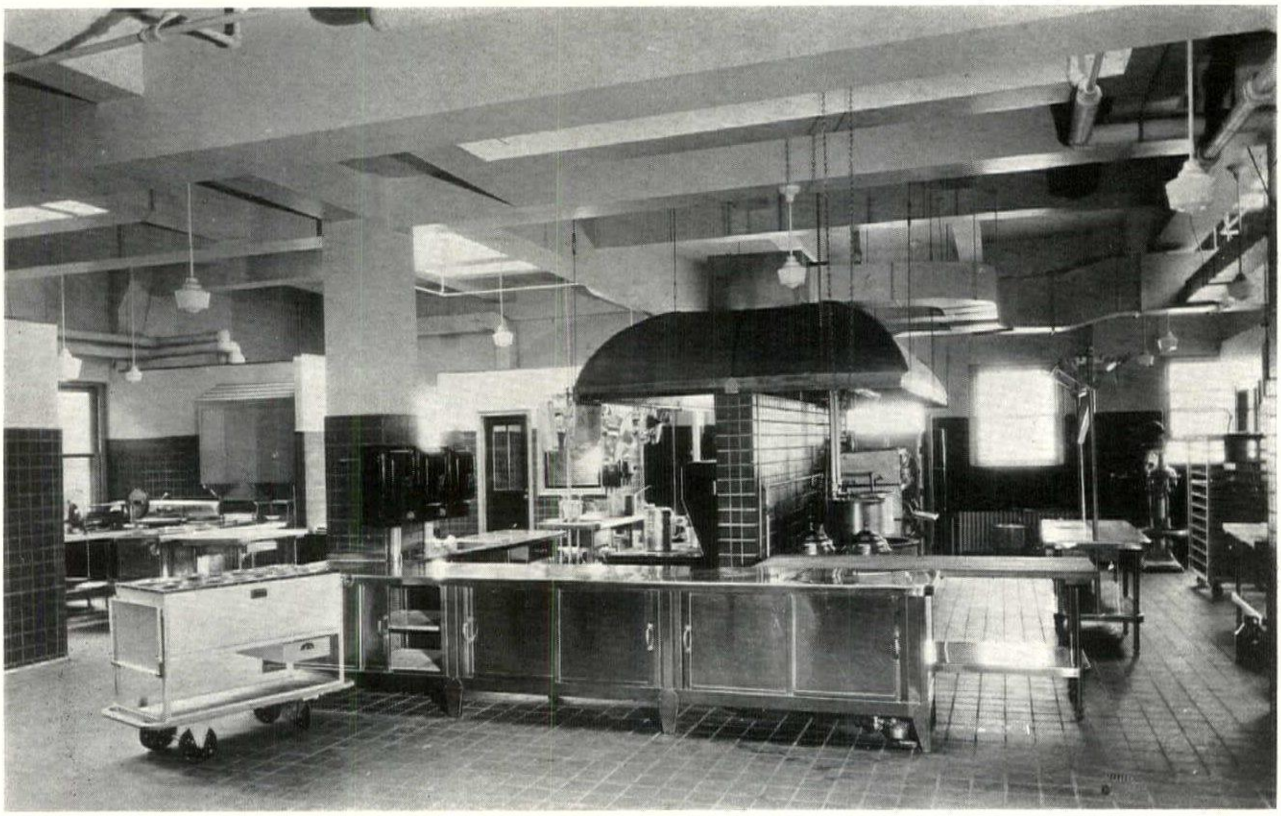
The kitchen for a large hospital is often as complete as that of a hotel or restaurant. The drawing above is the kitchen layout for the United Hospital, Port Chester, N. Y., for which Hood, Godley & Fouilhoux were the architects, Charles F. Neergaard, consultant. Below is a general view of the kitchen in the York Hospital, York, Pa., for which The Ballinger Co. were the architects and engineers

The relation of these dining room units and the separation of some groups from others are individual problems for each hospital.

With the establishment of the approximate total number of persons to be served (keeping in mind the necessity of providing for growth of the hospital), the type of food service should be selected which is best adapted to the individual hospital program requirements.

The plan should be arranged to locate several dining rooms adjacent to a single serving pantry having communication as directly as possible with the kitchen. Dishwashing, a noisy process, may be done in a sound insulated room near at hand, or the dishes may be sent to the dishwashing department of the main kitchen. Thought should be given in planning to reduce the crossing of the routes of service from pantries or serving rooms with the lines of personnel circulation.

The help groups work on eight-hour shifts and so



are not given the regular three meals. For personnel on night service it is often found advantageous to serve light lunches from a smaller kitchen or serving room so that the main kitchen may be closed.

Patients' Food Service. The fundamental steps in the service of food to the patient are: (1) receiving and storage of food and supplies; (2) food preparation and cooking; (3) food service to patient. The return of soiled dishes and refuse disposal are also a part of our problem.

The space necessarily occupied for the first two steps, before service to patient, makes impossible, with consideration of other departments of the hospital, the placing of this kitchen in a position accessible to all patients' rooms and wards for direct service. However, freshly cooked and prepared food must be sent from the kitchen to patient without delay.

The three principal systems devised for dealing with this problem are the bulk service, the tray service and the centralizing service, with hundreds of proponents for each.

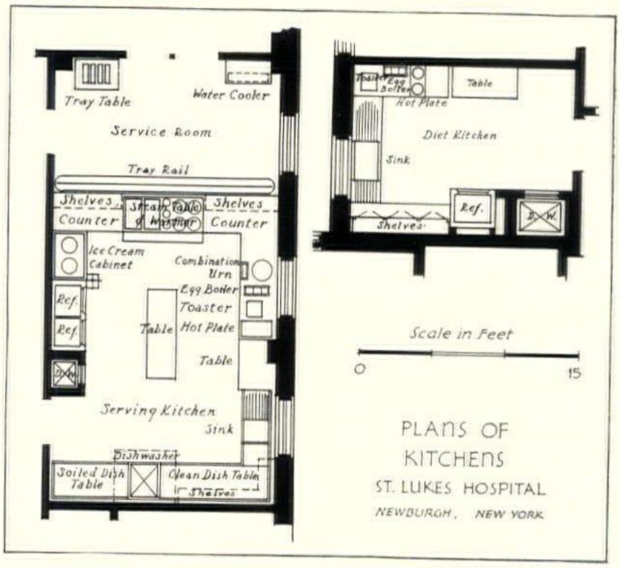
Bulk service is the method employed in the sending of prepared food in large quantities to the serving pantry where it is set up on trays for service to the patient. Sufficient pantry area should be provided for the "tray set up" service to keep the bulk food hot. Steam tables, small ranges, and hot plates are required in this scheme for keeping prepared foods in good condition and for cooking small quantities for individual service. Refrigerators must be installed in each serving pantry.

The bulk service pantry becomes then a secondary serving kitchen with dishwashing and dish storing space. The central dishwashing service near the kitchen may also be adopted in this plan, if desired.

Bulk service may be employed for ward, semi-private and private patients. For ward service, heated bulk food carts are used. Electrically heated bulk food carts may be procured in different sizes to serve from 25 to 80 patients. If carts are used for transporting food to patient's floor the hot foods are often served to the patient directly in the ward or corridor after the cold foods have been arranged in the "tray set up" pantry space.

Much of incidental service between regular meals may be prepared without drawing on the main kitchen for supplies, which may be considered an advantage. Supervision of supplies in the various serving kitchens or pantries is more difficult than with the centralized main kitchen where all is controlled at that one point.

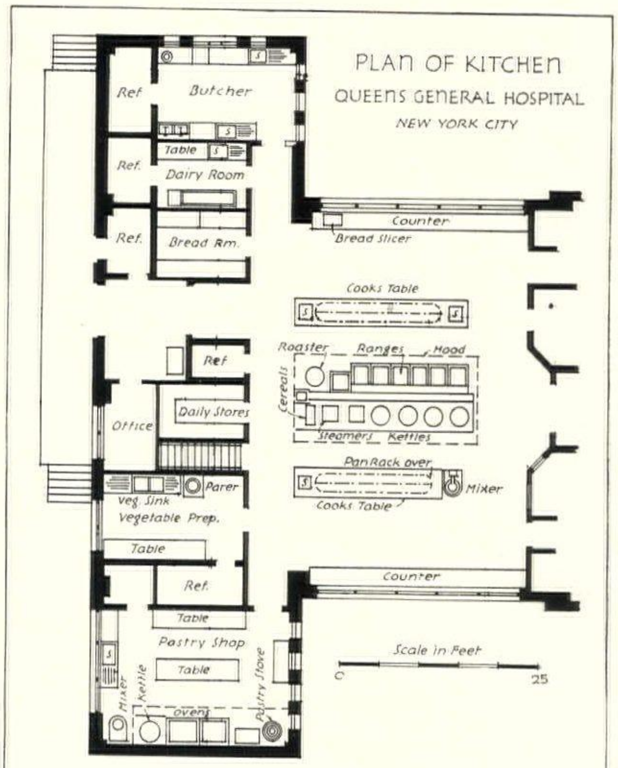
Tray service is employed to send individual portions of food, which have been set up on trays in a serving space adjacent to the cooking location of the main kitchen, to a serving pantry conveniently near the patient's room. These trays may be sent by



PLANS OF KITCHENS
ST. LUKES HOSPITAL
NEWBURGH, NEW YORK

dumb-waiter or elevator in racks or carts, and if there is a long travel to the pantry, heated tray carts should be considered. They may be obtained in sizes for this service to accommodate from 20 to 40 patients per cart. A hot plate and refrigerator should be located in the service pantry to take care of any interval of delay in service. No steam table is required in the pantry and the refrigerators may be smaller than those specified for the pantries of the bulk system.

Facilities for incidental service between meals should be considered in the serving pantry. Coffee may be prepared in small quantities there or may be



PLAN OF KITCHEN
QUEENS GENERAL HOSPITAL
NEW YORK CITY

made centrally in the kitchen and sent to the patients in thermos containers. Individual refrigerator space for private patients for gifts of fruit, etc., should also be considered.

This scheme is satisfactory in many ways and is employed more and more in the service to private, semiprivate and group nursing patients. It keeps central kitchen preparation and cooking and "tray set up" under one control. Special diets are prepared in diet kitchens adjoining main kitchen. All orders are easily accessible to dietitian for control. It centralizes dishwashing service adjoining main kitchen. A generous area for "tray set up" is required adjoining main kitchen to facilitate prompt service.

Centralized service and a modification of the tray service is best illustrated in the hospitals of the "Bacon Plan" where the central kitchen communication to the patient is made by specially built dumb-waiters at locations bringing the completely set up individual tray to a station near the patient's room or ward and the tray may be taken immediately to the bed without the necessity of a serving pantry.

It is possible, then, to have unified control of all service up to the dispatching of the tray to the patient from this one centralized location, with the kitchen easily accessible to all these vertical lines of transmission.

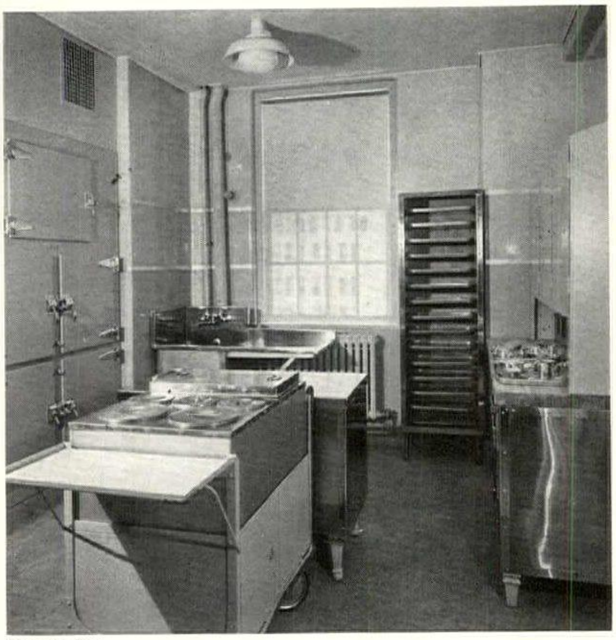
The aim of this service is to reduce to a minimum both the number of steps in the operation, as well as the elapsed time required for the food to travel from the point of preparation to the patient. Centralization of this type is probably not so flexible in adaptation to all building and site conditions as the decentralized service, but where the preliminary program permits special emphasis on the food service the other departments may be satisfactorily adapted to the scheme. This new trend toward efficiency in food handling is bound to have further developments toward better food service for patients.

TABLE OF APPROXIMATE AREAS REQUIRED FOR FOOD SERVICE

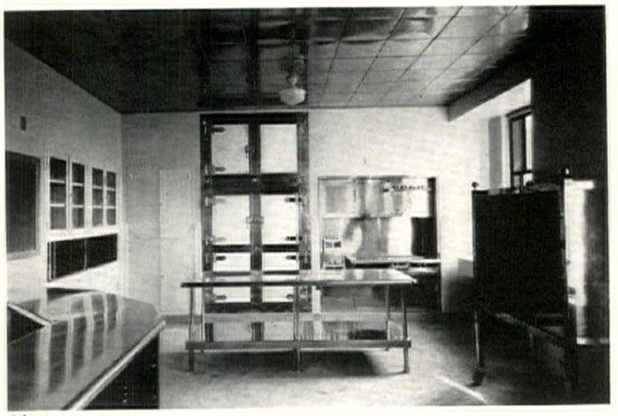
Bulk Food Service	*Kitchen, Including Diet Kitchen, Preparation Rooms, Kitchen Stores*	*Floor Pantries*
100	2,200 Sq. ft.	180 Sq. ft.
200	3,800 Sq. ft.	200 Sq. ft.
300	4,500 Sq. ft.	220 Sq. ft.
600	8,000 Sq. ft.	400 Sq. ft.
Tray Service		
100	2,800 Sq. ft.	160 Sq. ft.
200	4,200 Sq. ft.	180 Sq. ft.
300	6,500 Sq. ft.	200 Sq. ft.
600	9,000 Sq. ft.	320 Sq. ft.
Centralized Service		
100	3,500 Sq. ft.	None
200	5,000 Sq. ft.	None
300	7,200 Sq. ft.	None
600	12,000 Sq. ft.	None

Typical for general hospitals where personnel number is about equal to bed capacity shown at left.

Conclusion. To assist the architect in the general requirements of food service, a table showing approximate areas required for the different systems is given. The traffic diagram on page 457 is also given to assist the architect with his plan. If he has clearly in mind the direct process from receiving room to patient, an efficient layout may be secured by applying the theory to exact conditions.



Fuermann Sons



Schuster

Depending on the type of food service employed in the hospital, subkitchens are necessary at various places throughout the building. At the left is a typical floor diet kitchen in the Passavant Hospital at Chicago, Holabird & Root, architects. Above is a floor serving kitchen in the Christ Hospital, Cincinnati, Ohio, Tietig & Lee, architects

HOSPITAL SANITATION EQUIPMENT

BY

EDWARD F. STEVENS

IN PLANNING for the care of the physically and mentally ill, sanitation is one of the principal code requirements in the process of erecting the hospital. The needs of the hospital are such that special problems and conditions are met which must be solved by the architect or his sanitary engineer. It is not the intention in writing this paper to take up the obvious details of general plumbing or those covered by building codes, but such special features as apply to modern hospital sanitation.

Water Supply. Assuming that the water supply is that provided for the community, there may be the necessity of further filtration and softening to give the water the ideal quality for the institution. There are many excellent devices on the market to choose from, but upkeep and efficiency should be carefully considered in making the choice.

Before specifying the kind and quality of piping to be used, a careful analysis should be made of the water to ascertain its action on different metals and one chosen that is best adapted for the character of the supply. Sometimes it has been found that a cheaper iron pipe will withstand corrosion better than the more expensive materials.

If the water supply is not suitable for drinking purposes and further purification beyond filtration is desirable, distillation of the water is resorted to. A distilling plant may be placed at a high level and the distilled water passed through a "palatable" device and cooling system. This same distilled water may be piped throughout the institution through tin-lined pipe for all surgical and laboratory supplies. (See mention under *Lavatories* for temperature control of distilled water.)

To prevent condensation on cold water piping and loss of heat from hot water piping, all runs of piping should be covered with a suitable pipe covering.

Fittings. One of the most recent economic developments in water piping is the screwless copper pipe connection and the stream-line copper fittings, tending to economy and durability, together with ease of removal of pipes in case of repairs or alterations.

Hot Water. There is a constant demand for hot water for baths, toilets, laundry and kitchen uses. The common method of providing economically this constant supply is to install hot water storage tanks in convenient locations, the temperature of the water being thermostatically controlled and the source of heat being the steam supply. Automatic steam heaters without reserve tanks have proved a marked success, particularly in psychopathic institutions where the continuous bath, with its tremendous flow of warm water, is in demand. This method is also of advantage for laundry and dishwashing purposes. For small units where current is available at a minimum cost electricity may be used to advantage as the heating element.

Fire Protection Lines. While the patients' section of an institution generally has constant supervision during the entire twenty-four hours and hand extinguishers are effective in any incipient fire which may occur, the store rooms, the laundry, the kitchen, etc., should have more adequate protection, either with an approved sprinkler system or with standpipe and hose, or both, and it is considered good practise to provide a reasonable number of standpipes together with outside hydrants, automatic alarms, etc.

Valves. Adequate valves and controls and frequent by-passes through the system should be provided so that an accident in one section would not cripple the functioning of all others.

Plumbing Fixtures. With the heavy duty demanded, the stability, soundness of construction and durability of materials used are of vital importance to economical maintenance, particularly for the wearing parts, such as valves, faucets, pumps, and automatic devices.

The screw thread of the faucet or tap, for instance, always entirely concealed, can be a source of great annoyance and expense unless properly designed for durability. The trap and outlet from every plumbing fixture should be more than merely a water seal. All parts should be as accessible as the bowl or sink itself, and of sufficient area readily to drain the receptacle.

The finish of the exposed metal piping, traps and fittings must be carefully considered for durability, ease of cleaning, etc. Economy may be shown by finishing the exposed pipes, traps, and all but the valves or cocks with paint or enamel. Where plated

Figure 1 (left). Distilled water outlet in operating room with electric reheater; also showing aspirator attached to floor drain. Figure 2 (above). Another distilled water outlet for surgeons' scrub-up, with exposed reheater and elbow control

it would seem that in the long run chromium plating would conserve labor over nickel plate on the exposed finish of the metal, although the first cost may be somewhat greater.

The material for the actual fixtures should be governed by the location and importance of the use; for instance, while a plain cast iron sink may function perfectly well in the boiler room or garage, a vitreous china bowl or sink would be economical in the operating room or ward. Non-corrosive metals, such as Monel metal or stainless steel make for economy of maintenance in the kitchen, laboratory, and wherever metal is desirable. Plain glass or vitreous glass for shelves often prove the most efficient, because of the ease of maintenance, but should never be used where extremely hot instruments or receptacles are to be placed thereon.

WASTE FIXTURES

Drainage. Assuming that proper disposal of sewage is provided either by public sewers, filtration beds or septic tanks and that the trapping and venting comply with standard practise, extra precautions should be taken to insure that all traps are readily accessible for cleaning and that clean-outs be installed in all concealed waste piping at every point necessary to enable every portion of the interior of the piping to be cleaned out. It is also wise to provide *access* to concealed piping, as obstructions sometimes cannot be removed through the clean-outs. Stoppages caused by insoluble materials can generally be prevented by proper education of the personnel, but the simpler the system of piping is made, the greater the efficiency of the building. Where drainage occurs from sinks and receptacles into which acids or strong corroding solutions are poured, the traps and connections at least should be made of ferro-silicon iron or other acid-resisting material.

Where there is a possibility of back pressure on the sewer lines through surface flooding or other causes, back pressure or "tide" valves should be provided on all lines. Drains from refrigerators and plaster sinks should first drain into small open sinks or fixtures to prevent food contamination and to facilitate cleaning.

Water Closets. The water closet used in close connection with the patients' rooms should be selected (a) for its quiet action and (b) for completeness of flush. With a small installation the lowdown vitreous tank, with quiet filling ball cock, has shown economy. In the larger institutions, the flush valve is recommended. It should be chosen for its sturdiness and long life and should be adjustable for quiet action.

With the modern idea in hospital planning of making each room and ward more or less "self-contained," that is, with a service station adjoining, the water closet should be designed for the emptying and cleaning of the bed pan and other utensils. This would require a water closet bowl of larger size and provision for a water supply which can be directed into the utensil with proper control, either jet, hose, or swing arm. With a fixture of this nature, two adjoining rooms may be served. (Figure 4.) In the children's department, it is desirable to have closets with the seat near the floor, and with all closets throughout the institution the open front or Crescent seat should be used.

In the psychiatric department or hospital the water closet should be particularly rugged, with integral seat and water supply under control of the attendant, with special accessibility to the drain pipe.

Slop Sinks. Every fixture functioning as a waste receptacle should have the traps accessible, with means of flushing the walls of the receptacle. For the house maid's hopper for emptying of floor washing water, the simpler galvanized or enameled iron may be used, but for the more important hospital fixtures vitreous china, slate, soapstone, stainless steel or Monel metal will show economy.

For the general disposal of bed pan waste it is common practise to use one of the many varieties of bed pan emptiers or sterilizers and some of the essential points are: (a) ease of action, (b) complete automatic cleaning of the utensil and (c) complete automatic cleaning of the inside of the hopper. The sterilizing feature introduced by some manufacturers should, in the writer's opinion, be cared for in a special sterilizer or steamer distinct from the hopper. (See section on *Sterilizers*.)

Floor Drains. There should be a water supply to every floor drain within the hospital for flushing and periodically filling the trap. The floor drain in the operating room, if desired, may be economically connected with the aspirator, carrying the waste either through a receptacle or directly into the drain. (Figure 1.)

CLEANING FIXTURES

Sinks. The kitchen sink may be a menace because of uncleanliness and to avoid this the fixture, with the supplies controlled outside the fixture, should stand free from any wall or partition, and should be capable of being cleaned outside and inside. A swinging arm supply or close-up study adds to the efficiency and beauty of the fixture.

Lavatories. Absolute cleanliness is necessary and to that end some of the essentials are: (a) minimum contact with the wall or floor; (b) a free, visible and cleanable overflow; (c) a trap which may be cleaned to the water line; (d) durability of material for basin and fixtures; (e) possibility of using water supply as a scrub-up fixture, when needed.

Figure 6 shows a patient's bowl of vitreous china, standing free from the wall. It will be noted that the supplies from the back wall, which is tiled, are so

Figure 3. Combination fixtures in nurses' workroom, showing flushing rim hopper, wash tray, scrub-up and work shelf

Figure 4. China water closet, with extended lip, Crescent seat, flushometer, and bed pan washing device on the wall

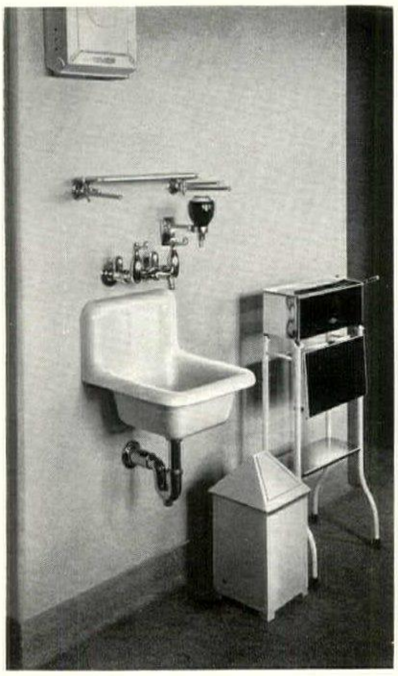


Figure 5 (left). Typical fixture for small examining and clinic rooms. Figure 6 (above, left). Porcelain standard and bowl, wrist action valves, celluloid standpipe, and integral hooded shut-offs. Figure 7 (above, right). Wall-suspended type similar to Figure 6

designed that the fixture may be used as a scrub-up with valves of wrist or elbow type control. The overflow, when wanted, is a celluloid non-breakable standpipe, leaving the inner surface of the bowl perfectly free for cleaning.

In the scrub-up bowl for the surgeons the requirements of construction and detail may be carried one step further. The surface and construction of the bowl is so formed as to prevent any "back spattering" while in use and the water supply is wholly controlled by "elbow." These bowls are supported on iron chairs concealed in the wall so that a minimum support is visible.

The fixture shown (Figure 2) is one commonly used where distilled or sterile water is conducted to the operating rooms and shows an exposed reheater. A concealed type recently perfected is much simpler in control and maintenance. The operating valve should not only be capable of operation by the elbow but by the head as well. The reheating may be accomplished by high pressure steam or by electricity.

Special small units occupying but little wall space may be provided for the examining rooms of the out-patient and dental departments. (Figure 5.)

Bath Tubs. While the actual "tubbing" of the patient is rarely resorted to in the general hospital, the occasional need for convalescents and special cases makes it desirable to provide a limited number throughout the hospital, one to about every thirty to forty patients. To be of the utmost use, the tub should be set above the floor with sufficient room on all sides to allow the nurse or attendant opportunity to assist the patient in and out of the tub.

For the admitting bath, the children's bath, and in many cases the bath for the public patients, the high shallow or slab type is used, placed about 30 in. from the floor. (Figure 9.) A spray with controlled temperature is provided, making it possible always to bathe in running water. For the baby bath a heated slab is desirable. This may be accomplished both by a hot water slab or electrical unit. (Figure 8.) Where water is used for bathing the infant, the temperature should be automatically controlled, either by reliable thermostatic valve or from a special tank with visible thermometer, or both.

The continuous bath for the treatment of psychopathic cases may reach its greatest efficiency if the following details are considered:

1. Ease of adjustment of patient's comfort.
2. Absolute control of water at the right temperature. This control should be outside the patient's reach, either in an adjoining control room or in a locked cabinet in the bathroom.
3. Outlet arranged for quick emptying of the tub.
4. Durability of construction, making absolute security to floors and walls.

The tub should be set high enough from the floor to conserve the strength of the attendant in charge of the patient and should have a comfortable suspended hammock for the use of the patient.

Flower Sinks. The care of the thousands of cut flowers coming to the patients requires a special room on each floor of the large hospital provided with a flower sink and drainboard and in some cases a flower refrigerator.

Drinking Fountains. The bubbling fountain throughout the hospital is desirable for the personnel and staff; provision for drinking water for patients may be made through the same fixture. The chilling of water may be easily accomplished either with a direct ammeter unit or as a part of the refrigerating system.

Physiotherapy. Provision must be made in this department for special services, such as hydrotherapy with the whirlpool and various other baths, and for the cooling of various electrical therapeutic devices.

Dish Washing. Sanitary conditions in the preparing and serving of food are of course of the utmost value, but the cleaning of the china, glass and silver for this service is likewise most important. Silver sinks, glass washing sinks and soak sinks, as well as the main dish washer for china and trays, should be provided.

Sterilizers. This equipment is fairly standardized but improvements are continually being made for more efficient sterilization and simplification and centralization of controls. One of the major factors has been the universal adoption of air break filling devices and waste connections, and rearrangement of services to insure against contamination of the water supply.

Whether a pressure or non-pressure type of sterilizer should be selected is of course dependent on the requirements but the use of pressure sterilizers for instruments and utensils, as well as for dressings, is becoming more general and, with proper technique and operation, insures more satisfactory results. Automatic pressure reducing regulators, with suitable adjustment, on pressure sterilizers permit the sterilization of goods which in the past could be handled only in a non-pressure type.

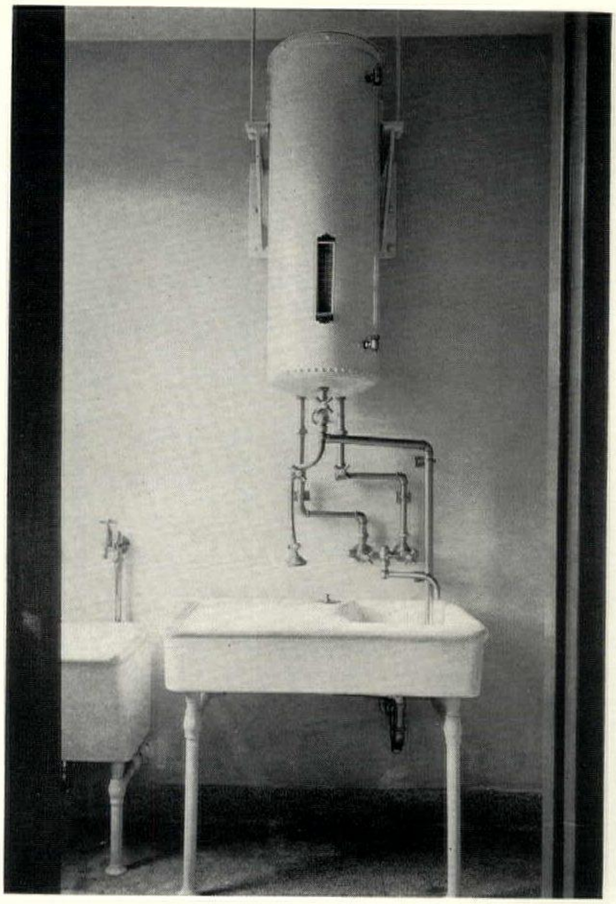
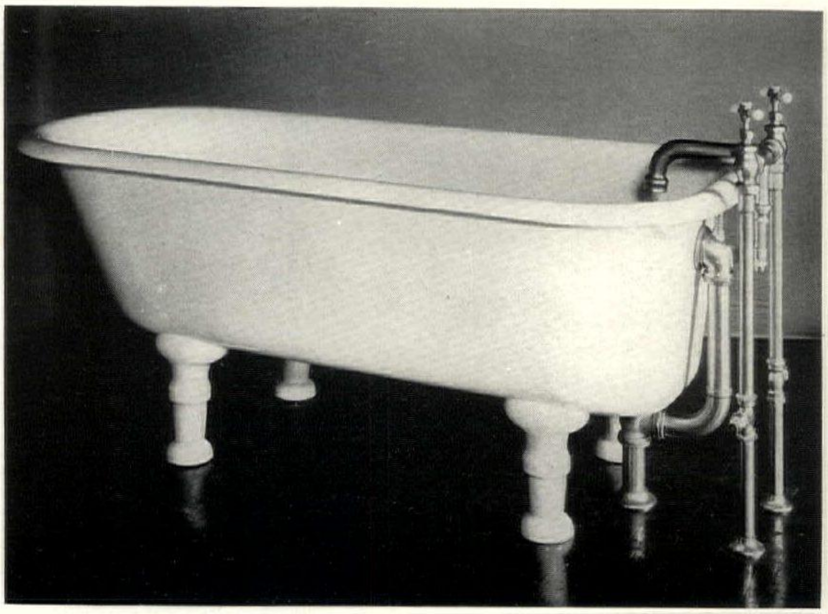


Figure 8 (above). Infants' slab bath with tank supply, slab heated with hot water. Figure 9 (below, left). Slab tub for admitting bath, showing spray attachment. Figure 10 (below, right). Hospital bath on high porcelain legs, with large inlet and waste. (Despite appearance in picture, tub is free on all sides.)



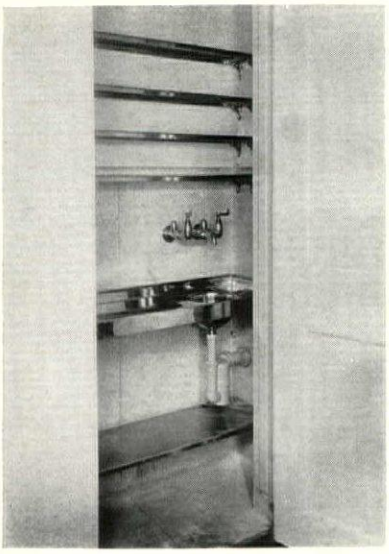


Figure 11. Medicine closet, which contains Monel metal basin and shelves

Figure 12. A four-part kitchen sink that stands free from walls and partitions so it may be easily cleaned inside and outside, equipped with swinging arm supply

Non-pressure sterilizers are necessary for certain services and in locations where the degree of sterilization obtained by this type of equipment is sufficient. For the sterilization of bed pans probably the most efficient arrangement consists of providing bed pan steamers arranged to sterilize five pans at one operation, with storage racks adjacent to the steamer which in turn is located beside the bed pan emptier. In the selection of bed pan steamers, care should be taken that these are so designed as to permit steam to reach all parts of the bed pan and insure complete sterilization.

Whether or not excess steam, which is so often the cause of damage to paint and plaster, is best removed from the sterilizers by local venting or by condensers is open to discussion. If local vents are of ample size and are installed without horizontal offsets, it is possible to obtain satisfactory results; but as a general rule it appears that the safest procedure would be to install condensers of an approved type on each individual non-pressure sterilizer at least, and possibly on each pressure sterilizer, although some manufacturers claim that condensers on pressure sterilizers may affect the operation of the equipment to some extent.

Whether pressure sterilizers should be exposed or concealed behind a partition is a matter of economy. The advantages of concealing them would seem to be sufficient to offset the initial added cost and the sterilizing room presents a much neater appearance.

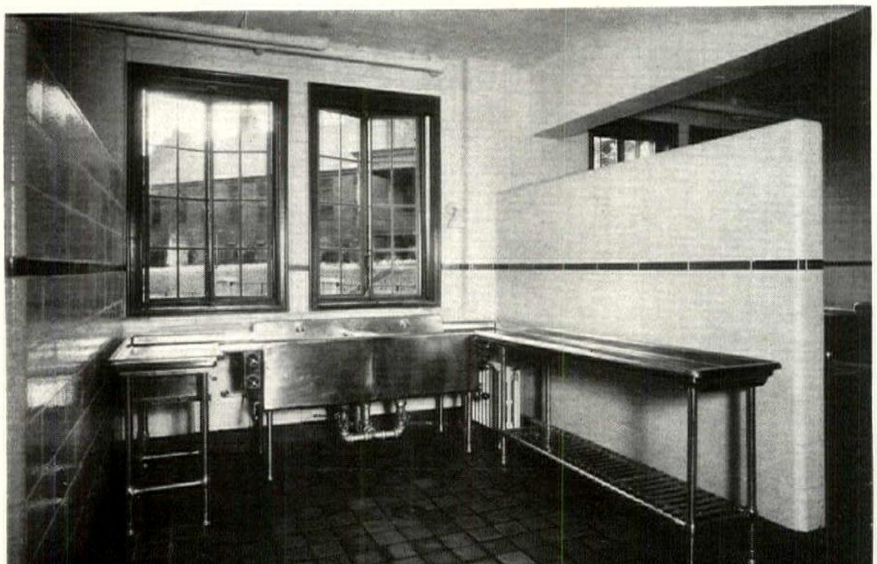


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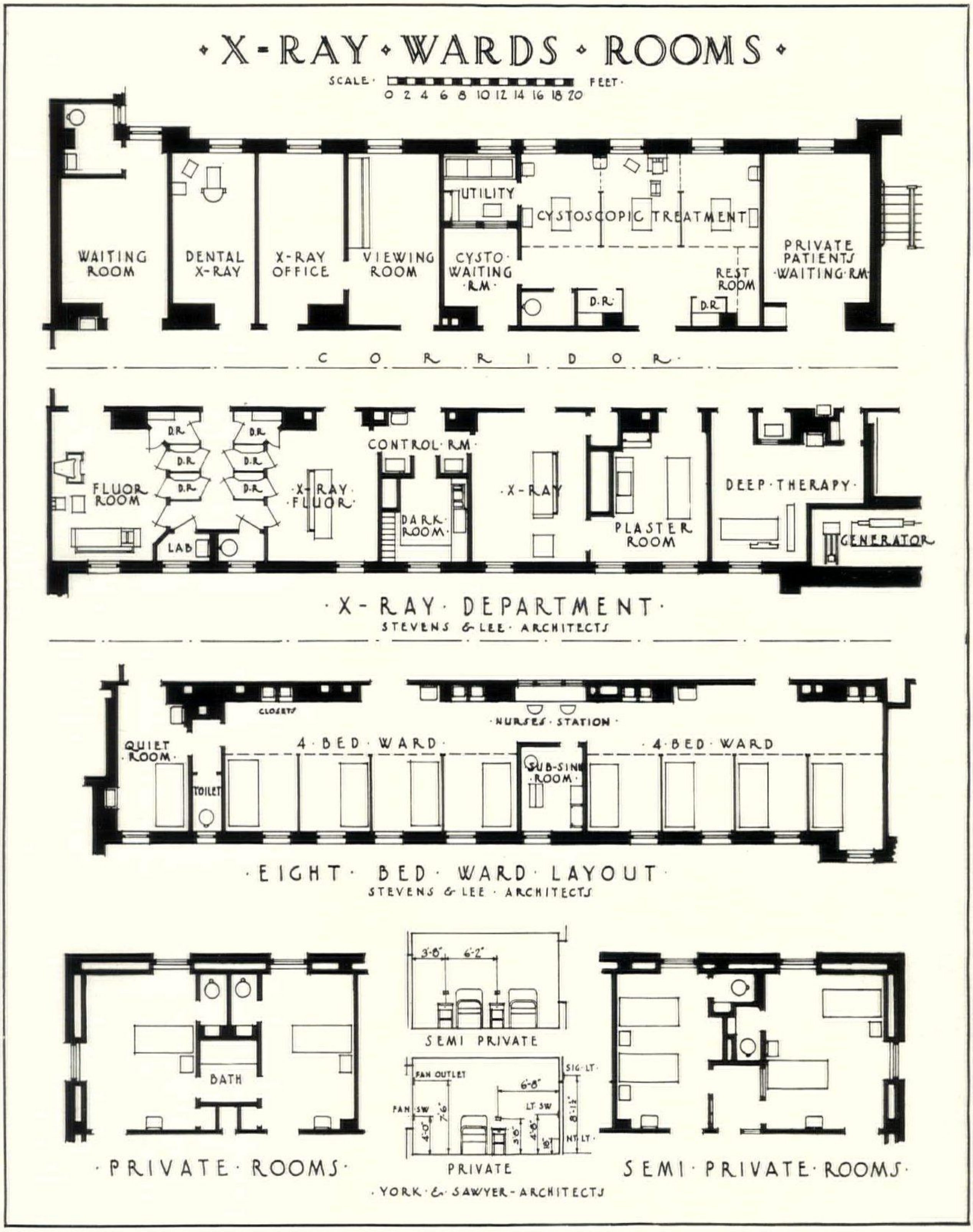
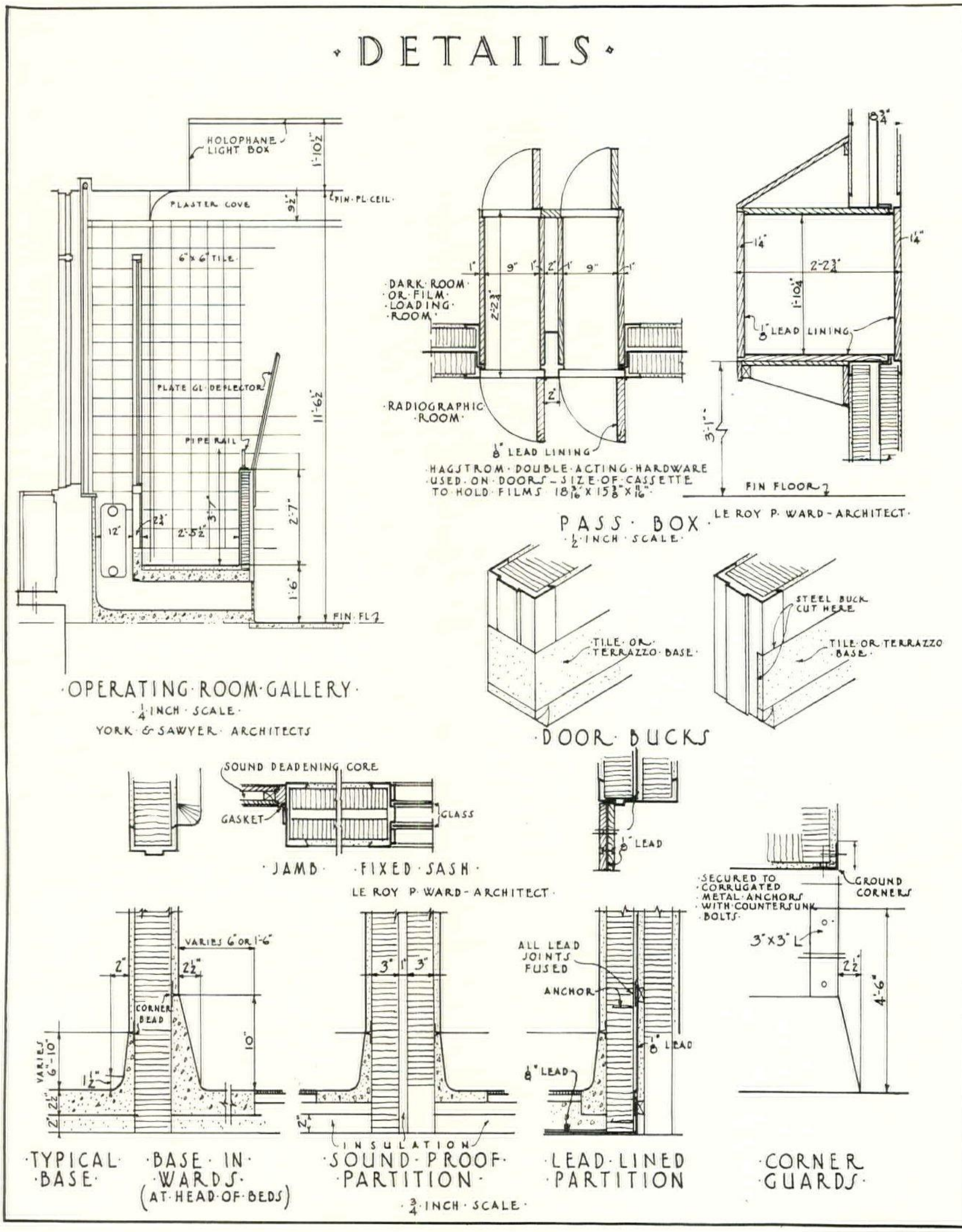
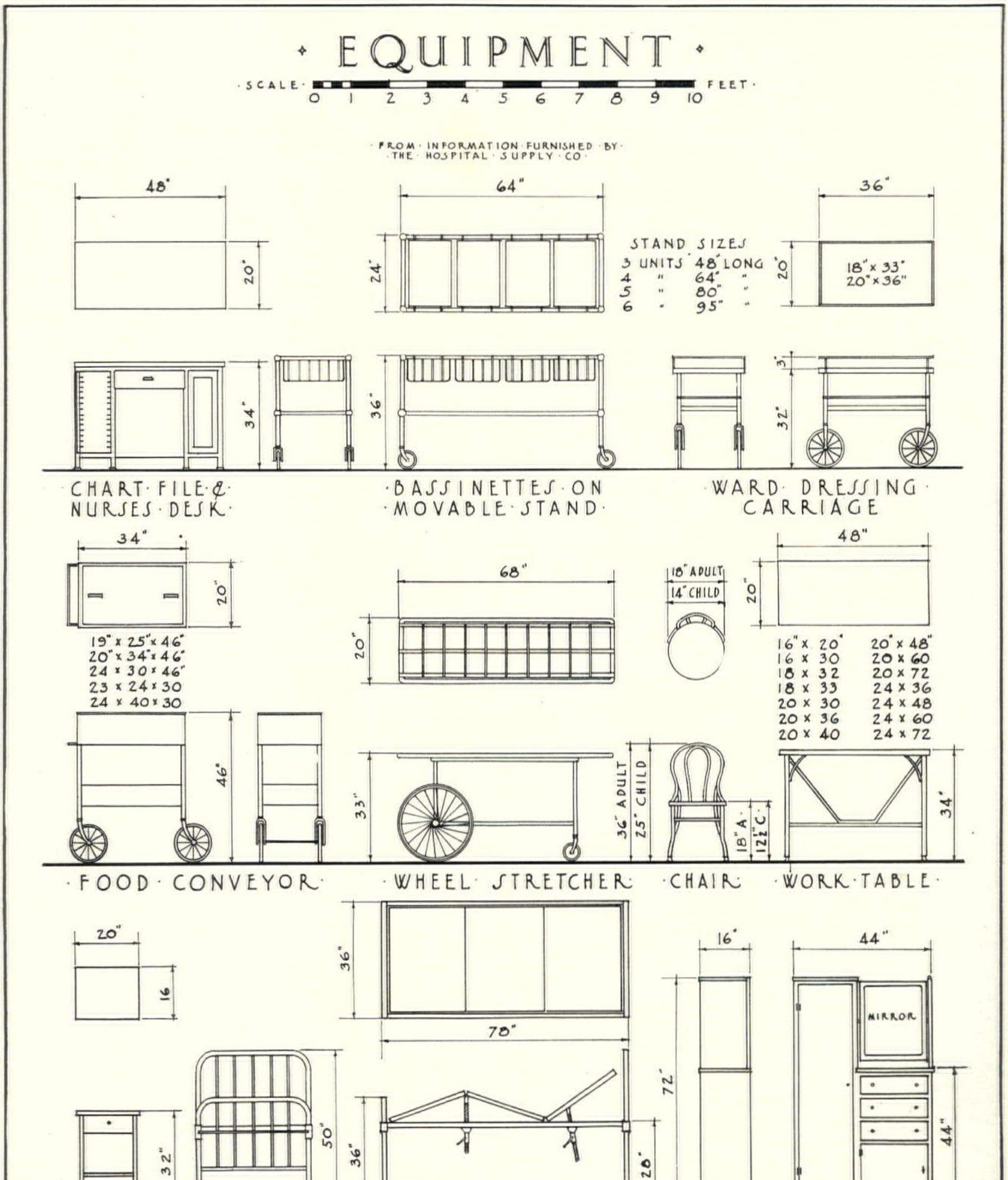
Figure 13. Special sinks for cleaning glassware and silver, as well as a main sink for china and trays, all of Monel metal



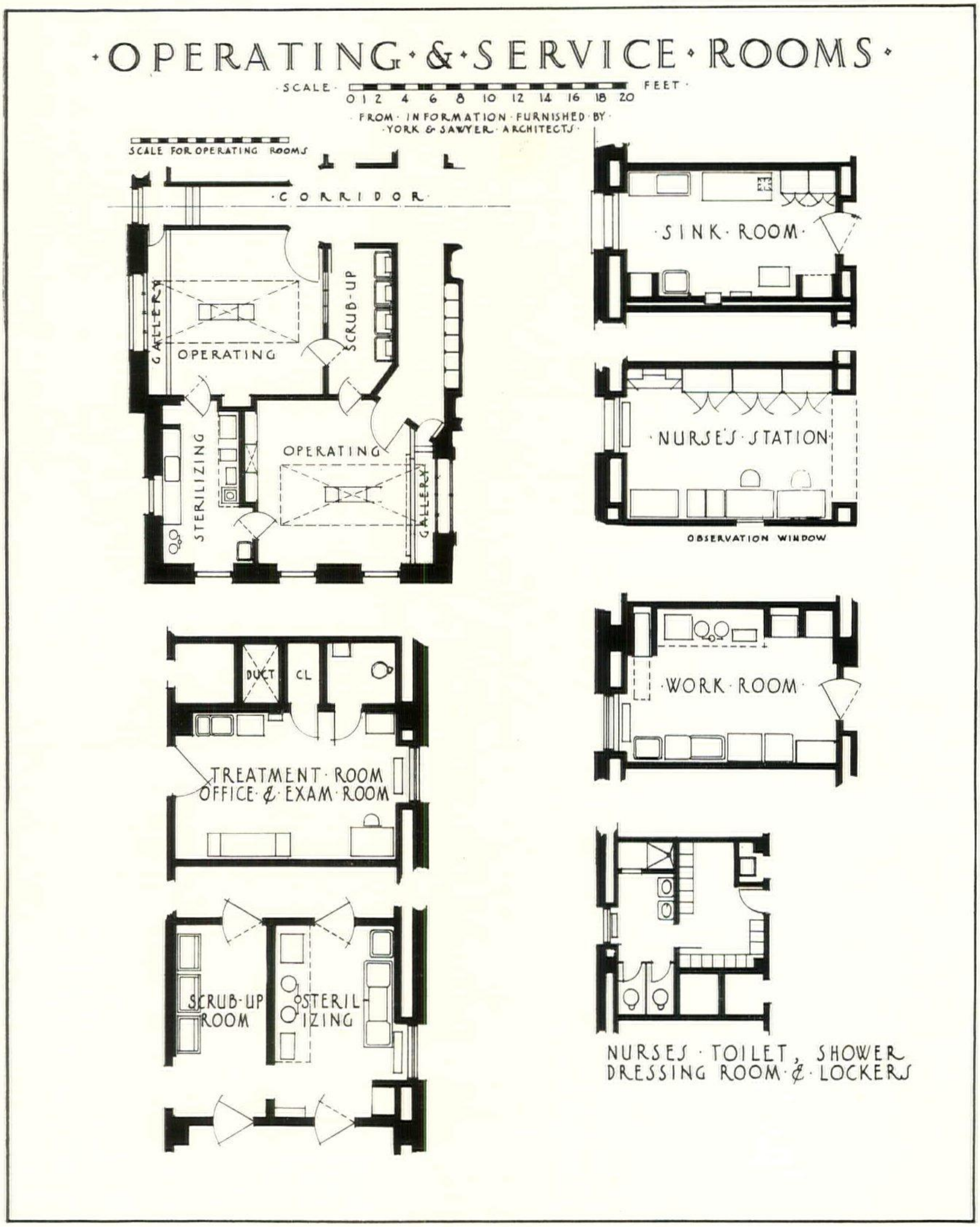
Several typical layouts as developed by two prominent architectural firms. The eight-bed ward layout has been designed to give a maximum of service and conservation of labor within a minimum of space. Some of its advantages are: privacy for the patient, easy supervision, the proximity of sub-utility and quiet rooms, and nurse's station within the ward



These details, which are reproduced accurately to scale, illustrate several important items of construction usually essential in a well-built hospital. Particularly useful are the details illustrated at the bottom of the page indicating standard partition and floor base designs which have been generally accepted by hospital authorities as satisfactory standards



Although the dimensions of many hospital spaces may vary, the minimum dimension must be based on provision for the equipment which will be used. Shown on this sheet, at ¼ in. scale, are many items essential to the care and service of patients. They may be used with working drawings to provide adequate clearances in corridors, wards and private rooms



The layouts for these operating and service rooms have been reproduced from the working drawings of York & Sawyer, architects, and embody the result of much research on actual layout and size. Particularly efficient is the arrangement by which two operating rooms are served by common sterilizing and scrub-up spaces, each having a direct access from the corridor

CHECK LIST OUTLINE FOR HOSPITALS

This check list, which stresses the technical essentials of general hospital departments, has been compiled from many authoritative sources by FREDERIC ARDEN PAWLEY. In general arrangement it follows the outline by ISADORE ROSENFIELD, published in THE ARCHITECTURAL FORUM Hospital Reference Number of December 1928

THE many complex and technical factors involved in hospital design are presented to architects and building committees of hospitals in this outline analysis. No claim of completeness can be made — that is the province of a particular consultant for each individual hospital — but this list of considerations is intended to be useful in indicating needs, their proper coordination, and as a guide to the additional information the architect must have from the hospital authorities.

BASIC GENERALITIES

TYPE OF OWNERSHIP: (a) *Governmental:* City, State, County or Federal. (b) *Civic:* Independent association, industrial, fraternal, denominational, individual or partnership.

KIND OF HOSPITAL: *General:* Teaching. *Special:* Children's, maternity, communicable disease, surgical, psychiatry, tuberculosis, convalescent, chronic, cancer, eye, ear, nose and throat, cardiac, preventorium, crippled and ruptured, orthopedic.

SIZE: Size depends on number of beds required and extent of services. Space for actual bed care of patients rarely exceeds 25 per cent of total floor area. Location in the South with required Negro segregation or other local conditions may alter the following proportionate methods of estimate of number of beds (not types):

Method A: One medical or surgical bed for each 200 of population. Proportion between two uses varies with extent of industrialization of community. One maternity bed and one bassinet for every first-born per year. One tuberculosis bed for every annual death by tuberculosis. One bed in communicable diseases unit for each 2,000 population. An additional 12 to 15 per cent of the total number of beds thus determined should be set aside for convalescents.

Method B: Number of sick in average community equals 2 per cent of population. Twenty per cent of these require hospital care. Add 20 per cent for vacant beds for peak loads, epidemics or catastrophes. Add 12 to 15 per cent for convalescents.

SELECTION OF SITE: *Location:* Adjacent to travel artery for patients, personnel, supplies and visitors. Availability of water, sewage disposal, gas and electricity. *Site Characteristics:* Cost, zone restrictions. *Orientation Possibilities:* Size and shape: room for pre-planned expansion. Topography. Non-proximity to sources of air and water contamination. Facilities relative to other hospitals' locations.

TYPE OF BUILDING: Cottage plan, pavilion, H- or X-shaped or modification, multi-story, combination of these types. Pavilion plan, based on theory of disease isolation, now discredited as wasteful of land, cubage and maintenance. Inter-floor control is necessary. H-shaped plan good for 150 beds or less, when operating facilities are properly located and nursing units are planned for visual control of patients' areas. Vertical travel more economical than horizontal. Law may require power house, etc., to be separate building.

FACTORS WORTH GENERAL EMPHASIS: Fireproof construction only. Size all services for possible future extensions. For greater flexibility make service and passenger elevators identical. Ample storage spaces are essential. Select interior finishing materials for sanitation, durability, economy and attractiveness, in that order of preference. Conduits are best placed in cinder fill on top of slab. Pipe shafts, preferably at the back of every recurring line of fixtures, should be large enough for and accessible to workmen, and have drainage and ventilation. A low intermediate story for a pipe loft permits more efficient distribution and maintenance of services. Heated tunnel connections with other buildings of a group make its plan more usable.

ELEMENTS OF A GENERAL HOSPITAL

ADMINISTRATION AND PERSONNEL: Superintendent, board of trustees, heads of departments, specialists of the staff, nursing staff, male and female servants and employes (including housekeeping, maintenance and police), medical records, social service, business office, provisions for visitors, communicating systems.

TREATMENT AND NURSING CARE: Patients' quarters. Extra-ward facilities. Nursing unit services. Nursing unit diagnostic facilities. *Additional departments are:* Medical, surgical, obstetrics and gynecology, pediatrics, orthopedics, x-ray and radium, dermatology, genito-urinary, nutrition, neurology, psychiatry, contagious and tuberculosis.

LABORATORIES AND RESEARCH: Pathology, laboratory work in most of hospital departments. Animal quarters.

X-RAY DEPARTMENT.

PHYSIO-THERAPY: Hydrotherapy, heliotherapy, electrotherapy and occupational therapy.

OUT-PATIENT AND DIAGNOSTIC SERVICES: Examination rooms, surgical dressing room, emergency room, dental clinic, eye clinic, ear, nose and throat clinic.

MISCELLANEOUS PROVISIONS: Requirements of neurology and psychiatry departments. Pharmacy. Autopsy and morgue.

OPERATING DEPARTMENT.

OBSTETRICAL DEPARTMENT.

TEACHING FACILITIES: Nursing, pre-clinical, clinical.

HOUSING OF PERSONNEL: Living, study, recreation and sleeping quarters for nurses, staff, servants and employes.

SERVICES: General circulation, services, access. Kitchens, food services, dining rooms. Laundry. Storage, workrooms, shops. Miscellaneous locker rooms, etc. Heating, air conditioning, plumbing, electrical work. Garage.

ADMINISTRATION

LOBBY AND WAITING ROOM: Develop cheerful atmosphere. Information desk. Public telephone booths in waiting room. Public toilets. Conference rooms.

BUSINESS OFFICES: General, with wicket and check counter, space for supplies, fireproof vault, equipment space and facilities, house telephone and buzzer signal to private offices. Board room with or without serving pantry.

PROFESSIONAL OFFICES: Medical director, private offices for heads of major departments, superintendent of nurses, dietetist, etc.

RECORD ROOMS: Centrally located live record room with access by out-patient, department doctors, and students. Dead record room above or below with private stair. Room for expansion. Quiet. A statistical research center requiring facilities for investigators.

ADMITTING ROOM: Bath, toilets, dressing cubicles, ventilated clothing storage (in basement).

AMBULANCE ENTRANCE: With access to receiving and public wards, emergency room. (Sometimes connected with out-patient department.)

SOCIAL SERVICE: Staff and consultation rooms, library, toilets. Student, staff and special nurses: Should have separate lockers, rest rooms, lavatories.

INCOMING AND OUTGOING DOCTORS: Should pass telephone switchboard (not in a public space) and an in-and-out registry board.

LOCKERS: Have twice as many lockers as thought necessary for private practitioners on hospital call.

POST OFFICE AND RECEIVING ROOM.

COMMUNICATING SYSTEMS: Doctors' paging system; lights, teletype, loudspeakers, messengers. Pick-up carrier. Pneumatic tube system (minimum radius of change in direction of tube depends on diameter, may be as much as 4 ft.). Built-in terminals and central station desirable. House telephones (in elevator cabs for additional messenger service). Annunciators, bells. Nurses' call system. Red-and-green doctor-and-nurse indicating light at private room doors.

TREATMENT AND NURSING CARE

PATIENTS' QUARTERS: Although 28 to 35 patients are in the ideal nursing unit (the area under one charge nurse) the large ward is not preferred; 4–6–8 bedrooms and isolation rooms, or 16-bed ward with 4–4 bed alcoves are better. Wards, semiprivate and private rooms should occur in separate nursing units.

Radio requires a central control room with two sets, aerial, double outlets for headphones in multi-bed rooms, loudspeakers in recreation rooms and possibly in private rooms. Avoid bright lights in bed patients' field of vision.

WARDS: Men's, women's, children's, maternity and nursery. Each adult patient per ward requires 800 to 1,000 cu. ft. of space, each child 500 to 800, each infant 200 to 300. There should be a minimum of 1 sq. ft. of window area for every 5 sq. ft. of floor area, and 1½ to 2 watts general illumination per sq. ft. of floor area.

SEPARATION OF PATIENTS WITHIN WARDS: (a) By portable screens. (b) By fitted or fixed screens. (c) Cubicle method, with or without curtains. (d) With curtains on rods or wires. Select quiet system. Separating, quiet, or isolation rooms, one for each ten ward patients. Grilled windows, provision to put grilles, or detention type with 5 in. maximum opening.

CHILDREN'S WARDS: Partition between ward and corridor should contain as much glass as possible. Beds separated by glazed screens. Sliding panels for visiting? Rooms specially decorated. Closets, wardrobes, or lockers. Private room for suspected contagious case.

SEMIPRIVATE ROOMS: Two to four patients. Nurse's call to work from each bed. Double room 12 x 15 ft. Steel clothes locker for each patient.

PRIVATE ROOMS: Minimum size 8 ft. 6 in. x 12 ft. Standard 9 x 14 ft.; 1,200 to 1,500 cu. ft. good practise. Lavatory in each room. Private toilet? Door need be only 2 ft. 2 in. wide and should swing *out*, for if otherwise it would be hard to help a patient fainting in compartment. Toilet with or without goose-neck or jets and lugs for bed pan washing. Built-in hand grips each side of water closet. Private bath? Bathroom floors non-slip ceramic tile, 4 ft. 6 in. glazed tile wainscot. Space for cot for special nurse or patient? Rooms *en suite* for group nursing. Provision of guest rooms communicating with private rooms. Door to corridor should be placed diagonally across room from window with head of bed at window side. Daylight and lamp preferably at patient's left. One square foot of window area for each 9 sq. ft. of floor. Sill 30 in. above finished floor. Marble or slate window stools. Overhead duplex lighting unit, 2 and 16 candles, or, preferably, louvered baseboard night light switched from door. Nurse's call, telephone jack (dictograph phone?), double radio outlet, duplex convenience outlet, electro-cardiograph and surgical vacuum outlets should be near head of bed. Flush doors 3 ft. 9 in. x 7 ft. Arm hook and door check. Door number and card holder for patient's name. All locks under a general master key for floor. Screen, dwarf, or fly doors 4 ft. 6 in. high, 18 in. off floor, arm hook and rubber bumper. Terrazzo or cement base carried through door opening as continuous mop strip. Terrazzo or linoleum floor, sanitary coved base. Rubber bed bumpers on beds now instead of ledge to top of baseboard. Walls semiflat enamel or oil painted. Light colors, colder on sunny side, warmer on shaded side. No corridor lights opposite patient's door. Nurse's call light and red-and-green doctor-and-nurse indicating light at door.

EXTRA WARD FACILITIES: Individual and common balconies or porches. Solaria (wide doors for beds). Sitting rooms for chronics, convalescents. Open roofs. Screened-in play spaces for children. Glazed or open porches. Visitors' rooms. Dining room and serving pantry for guests.

NURSING UNIT SERVICES: Floor services, administration by nurses, services for patients, storing and handling equipment and supplies, waiting room, etc., for visiting public. Patients' quarters should be oriented for sun. Services, laboratories, to north. Floor superintendent at elevator. Tube station.

CHARGE NURSE'S STATION: One for each ward. At center of nursing unit. Rail enclosure, alcove or separate glazed room. If no floor superintendent, charge nurse must have view of elevators, corridors, linen room, and all rooms of patient occupancy. Space for charts (peg board) with doctor's report table. X-ray film viewer. Pneumatic tube station. Nurse's call annunciator. Doctor's telephone booth. Special nurses' rest room, glazed off chart room with view of signal board. Nurses' toilet near station. Emergency and night lighting. Medicine closet, separate closet for narcotics and poisons with lock and red light. All medicaments in tray room?

ORDERLY STATION: In men's wards. Space in alcove off corridor for desk and chair. Lamp, signal, house telephone.

Serving Pantry: "Bacon Plan" hospitals have no serving pantries but frequent special lifts for food trays (called "subveyors"). "*Bulk service*" requires steam table or electric steam table; "*tray service*" does not, since food is taken from main kitchen in electrically heated trucks (by elevator) to ward pantries and served there. For special diets and between-time meals provide hot plate, gas, electricity, or both. Egg-boiler, toaster. Piped ice water. If dishes are washed in serving pantry, is a dish washer or a sink wanted? Sink 22 x 24 in., with rim 36 in. from floor. Swing spout with spray. For dish sterilization in contagious wards steam is necessary. Twenty-four inch drain board to left . . . or double. Kitchen cupboard with open or glazed shelves. Wood, metal, marble working surface. Built-in? Three-compartment refrigerator. Ice (floor drain), mechanical, local unit or central plant. Towel closet heated by steam or gas. Doors double-acting with sight windows. Food delivered by dumb-waiter? (26 x 30 in. with one hinged shelf. Capacity 300 lbs.; speed 200 fpm.; fireproof door. House telephone or speaking tube.) Cork bulletin board. Telephone or tube to diet kitchen. Nurses call. All equipment on coved bases. Utensil and tray storage space. Quarry tile floor, 6 in. sanitary base. Wainscot of buff or warm gray glazed tile, 5 ft. high. Acoustic treatment of ceiling.

Utility Room: At least one major utility room for each nursing unit, located not over 75 ft. from any bed. Sub-utility rooms at frequent intervals to save steps. A good size is 9 x 14 ft.

Utility room should contain: Disposal sink and bed pan washer. Built-in or free-standing on 15 in. base. Hose, automatic flushing valve. Washer and sterilizer combined is bad practise. An air break between water supply and sterilizing fixture to prevent syphoning. Battery of utensil, instrument, and water sterilizers using steam, gas, or electricity. Built-in flush to wall? Vented hood over all sterilizers. Galvanized iron-lined warming and drying closet. Vented and door 2 in. short at bottom. Sink, drainboard, wash tray with hot and cold water, steam sterilizing coil and valve. Wringer. Large work table. Bunsen burner outlet, electric utility outlet. Marble shelf for solutions. (In hot closet?) Cork bulletin board. Concealed piping. Space for soiled linen receptacle. Bed pan rack (heated?). *Sub-utility rooms should contain* fixtures necessary for bed pan technique.

Surgical Dressings or Tray Room: (Sometimes combined with tray room.) *Contains:* Gas or electric hot plate, cracked-ice box, sink, hooks for hanging hot water bags. Surgical dressings and supply cabinet, battery of sterilizers, blanket warmer, medicine cabinets, bulletin board, surgeon's sink, instrument case, wagon for bedside dressing. Space for preparing surgical dressings may be in alcove off corridor, on a wagon, in utility room, or preferably in special room.

Storage Space: Buffer between utility rooms and nearest patients' rooms is necessary. Floors should be of ceramic or quarry tile, with sanitary coved base. Wainscot 5 ft. high of glazed tile with sanitary cap. Walls above of hard gypsum plaster of a light warm color. Ceiling may have acoustic treatment. Double-acting doors with sight window.

Baths and Toilets: Lavatory required in every room or ward (to carry out aseptic technique) within sight and easy reach of doctors and nurses. Corridor lavatories in recesses on ward and private floors for doctors. Except in private baths, toilet should be separate from bath. Private toilet may have valve, jet, lugs for bed pan washing. In children's ward the fixtures may be small size with raised tub. In congregate baths, facilities should be in separate room with work space surrounding tub and stretcher. Intercommunication necessary between baths and toilets. Doors swing *out* in small compartments. Four foot, 6 in. wainscot near bath. Soiled towel receptacles. Hooks for clothing on toilet and bath doors. Tub with over rim supply, connected waste and overflow, chain and rubber stopper. Tub on 10 in. base? Continuous flow tub?

Treatment Rooms: Space for stretcher, treatment table, portable dressing table. Cabinet for dressings, instruments, utensils. Instrument sterilizer, surgeon's sink.

Internes' Office: May be *en suite* with treatment room.

Linen Room and Supply Closets: One linen (three-day supply) closet for each floor or ward. Door with grille or opening at top and bottom. No other ventilation required. Metal or wood shelves. Counter 2 ft. wide, 3 ft. high, shelf under and four shelves over, 16 in. wide, solid or slatted for ventilation. If solid, supported on metal knees 1 in. out from wall.

Clothes Chute: Metal, glazed metal, vitreous tile. Opening from utility rooms, corridor, special closet, slop sink closet. Doors kept locked; 2 ft. 6 in. square rough opening for two-foot inside diameter. Center of door 4 ft. above floor; 3 in. diameter vent at top and waste at bottom. Valved perforated ring, hot water spray near the top.

Incinerator Chute: Desirable from delivery rooms, serving rooms, etc., or near clothes chute. All chute doors kept locked.

Flower Rooms: Separate room or in connection with bath. Sink, drainboard, cabinets or shelves.

Stretcher and Wheel Chair Space: In corridor, wards, or in alcove off corridor.

NURSING UNIT DIAGNOSTIC FACILITIES

Metabolism Room: Now considered better located near patients' rooms than laboratory. Central metabolism station desirable for major part of work.

Electro-cardiograph: Special wiring systems for central station when required. Bedside outlets in nursing units. Portable machine for bedside electro-cardiography now used as well.

Routine Laboratory: One for every ward or floor. Access to specimen refrigerator from corridor. Flushing rim slop sink with vent hood.

LABORATORIES AND RESEARCH

Natural north light best. Location between in- and out-patient departments. Small laboratory sometimes *en suite* with pharmacy. *Large laboratories subdivided:* routine, chemistry, bacteriology, etc. Small rooms for various functions are better. Rubber tile floor with terrazzo border and coved.

Features of Laboratories: *General:* Table with oil-finished, acidproofed top with A.C. and D.C. outlets, compressed air and vacuum outlets, gas, and water outlets over a small ceramic pot sink. Other counters of soapstone, alberene stone, or acidproofed wood. Cupboard, cases, shelves, etc. Alberene or soapstone sinks. Duriron drains, lead traps, standing waste, vitrified underground sewer. Pegboard over sink, soapstone shelves each side. Gas outlets for Bunsen burners, oven, autoclaves. Electric outlets for centrifuge, incubators. Water still. *Refrigeration:* Ice, brine, or electric, 5° to 10° for sharp freezing. Steam bath.

Chemical fume hoods with glass slides. Photo darkroom. Metabolism laboratory. Small darkroom with cardiographic station.

RESEARCH: Pathology, general laboratory work. Animal operating room. Animal quarters.

X-RAY DEPARTMENT

LOCATED at activities center of hospital. Never in a basement or near dampness. Expansion should be anticipated in planning. Small cubicles for each piece of apparatus better than large room, for flexibility and ease of operation. Ventilation, protection against rays and proper illumination essential. Proximity to surgery rooms, general record room and elevators desirable.

SMALL DEPARTMENT: Combination fluoroscopy, radiography and treatment room with x-ray machine, radiographic and fluoroscopic table, plate changer, stereoscope (for viewing films), cassette transition box with fireproof lead-cored door on x-ray room side, overhead high tension wires, ceiling light and "safe light." Method of darkening room.

OFFICE AND INTERPRETATION ROOM: Desk and chair, filing cabinets, etc. Darkroom with five compartment slate sink with drainboard, hot and cold water (ice water, or ice in compartment No. 3), long counter with pigeon holes under for supplies, cabinet under with compartments for unexposed film; five outlets: two over work space, two over sink, one ceiling, all with "safe light" fixtures; fan for drying film, plate rack for drying.

WAITING SPACE: Dressing room, seat and hook strip. Toilet.

LARGE DEPARTMENT: One or more radiography rooms. One or more fluoroscopy rooms, some near the different wards (light-tight shades). Deep therapy room with machine in separate and extra-insulated room. One or more light treatment rooms. Viewing room accessible from hall. Plaster room (sink with plaster intercepting trap). Dental x-ray. Office. Darkroom. Waiting space. Dressing rooms. Plate and film storage room (underwriters' requirements). Toilet for gastro-intestinal work.

CEILINGS: At least 10 ft. in clear.

FLOORS: Resilient materials throughout, with continuous coved base. Rubber mats for prevention of shock. Static electricity may be conducted away through grounded brass strips in terrazzo floors.

INSULATION: Floors, doors, partitions to height of 7 ft. (but not exterior walls) insulated with lead (in interlocking sheets inserted in split cinder blocks?) or with barium plaster. Thickness? Construction, if large lead sheets are used.

COLOR: Dark violet and maroon have been used for whole department.

DARKROOM: Entrance by maze, special revolving door, or specially rabbeted door. Ventilation without admission of light. Maintenance of 64–65° temperature in solutions. Automatic sprinkler.

ELECTRICAL: Characteristics of current. Independent line from transformer. Supplemental wiring for flexible use and expansion essential. A.C. recommended for x-ray examination rooms.

PHYSIO-THERAPY

SEPARATE street entrance and executive offices. Facilities include waiting room, office, dressing cubicles, treatment cubicles or common room, rest room with or without cubicles, toilets, room for expansion.

HYDROTHERAPY AND MASSAGE: *May require:* Control table, shower, needle bath, arm and leg baths, douche, sitz bath, mud baths, continuous baths, electric water baths, salt, carbon dioxide or sulphur baths, massage, hot and cold packs, corrective gymnasium, swimming pool.

ARTIFICIAL HELIOTHERAPY: Bedside treatment or separate department. Individual lamps. Congregate arc lamps.

NATURAL HELIOTHERAPY: Usually combined with artificial heliotherapy. Direct sun or shade treatment, protection from view, wind.

OUT-PATIENT AND DIAGNOSTIC SERVICES

OUT-PATIENT department provides diagnostic (including x-ray) and treatment facilities through various clinics. (See page 471.) Facilities should be available without duplication to both hospital and out-patient department. Department may be in hospital building or separate with communicating passage. If in same building provide separate entrance, waiting room, information and cashier's office, toilets, isolation rooms, dressing rooms, case history cubicles, lockers and toilets for staff. Social service department. Possible double use of rooms.

TYPICAL EXAMINATION ROOM: Examining table, desk, lavatory, supplies cabinet, one or more dressing cubicles.

SURGICAL DRESSING ROOM: Simple operating table, sterilizers, surgeon's sink, supply and instrument cabinets. If used for emergency room, proximity to ambulance entrance and wide doors are essential. Tile floor and wainscot, disposal sink, dressings cupboards, splint closet, small ceiling operating lamp, portable table, nitrous-oxid-oxygen apparatus, instrument and dressing table, waste receptacle, linen hamper.

DENTAL ROOM: One or more chairs with usual dental equipment. Small workroom.

EYE CLINIC: Refracting room or rooms with 21 ft. range in at least one direction. Facilities for complete darkening. Sink, sterilizer, cabinet, darkroom. Finishes to prevent noise. Individual radio outlets good.

EAR, NOSE AND THROAT CLINIC: Examination cubicles, sink, sterilizer, cabinet, small darkroom.

MISCELLANEOUS PROVISIONS

NEUROLOGY AND PSYCHIATRY DEPARTMENTS: Provisions required for male nurses. *Hidden observation facilities:* in children's wards animal cutouts or large fine-screened openings with darkroom behind giving on playrooms. No projections on door butts. Grille heating or built-in radiators. Walls and ceilings sound-proofed. Individual ventilating ducts to isolate noise. Special rooms with grilled or detention windows with 5 in. openings.

PHARMACY: For manufacture and storage. Near out-patient department. Marble or acidproofed wood counters. Tube system delivery to various parts of hospital. Dutch door with counter. Wall and prescription cabinet, wall cupboard. Marble or slate sink with gooseneck and hose spouts. Duriron drain to sewer. Gas plate, refrigerator. All equipment on bases with case heads furred-in. Concealed piping. Terrazzo base and border with tile or terrazzo center.

AUTOPSY AND MORGUE: In basement near elevators. Hidden exit. Autopsy room equipped with disposal sink, sloped mortuary table with head rest and sink, hot and cold water, hose spray, A.C. and D.C. electric outlets, vacuum, gas, compressed air. White metal top work table.

Gas plate. Instrument wall cabinet. Floor drain. Terrazzo, ceramic tile, or treated cement floor with 4 ft. 6 in. wainscot. Morgue separate or combined with autopsy room. Table, sink, floor drain, cadaver refrigerator (32°), number of boxes, mechanical refrigeration. Trays on brackets or separate boxes.

OPERATING DEPARTMENT

GENERAL: Operating rooms need not be on top floors. Should first floor room be adjacent to ambulance entrance? Number depends on type of staff. If a restricted group, a small suite is satisfactory; if an open staff, a large number of individual rooms may be required. Are student observation facilities desirable?

OPERATING ROOMS: Huge rooms not required. Major rooms may be 18 x 24 ft., with a minimum of 14 x 18 ft.; minor rooms about 14 x 16 ft. or 12 x 14 ft. About 12 ft. ceiling height. Gray or green ceramic tile, terrazzo, or treated cement floor. Seven-foot matt tile or marble wainscot, light gray plaster of Keene's cement above. Avoid dazzling white tile. Sight windows in doors. Windows double-glazed or fitted with a special screen to prevent drafts. Brass floor strips pipe grounded to prevent explosions of anæsthetics due to static electricity. (Also in anæsthetizing room.) Sixty per cent relative humidity dissipates static charges. Surgical vacuum connections essential but not floor drain. Use of artificial lighting increasing. Automatic emergency system desirable. (If not automatic, provide luminous switch.) Avoid gas for emergency illumination. Regular illumination from a series of 200 watt lamps behind a glass ceiling with one switch for each row and a master switch, from a series of focusing floodlights, or from a special operating lamp on an adjustable ceiling mount. Intensity and color of light are controversial. Large area light sources providing about 500 foot-candles on the table more generally desirable than single large lamp. The light should be directed and sufficiently diffused to avoid glare and shadow in any surgical area or field of vision. Steady, reliable light with low temperature rise at table is essential. The equipment should not collect or scatter dust while being adjusted. General light for cleaning also required. For natural lighting by skylight or window. Northern source is preferable, with west second choice.

MINOR OPERATING ROOM: Heating equipment should produce 85° inside when outside temperature is zero. Curtain slots on window frames for room darkening, or light-lock shutters. Vitreous china surgical instrument lavatory (24 x 30) with foot or elbow valves, dressings case with marble counter, operating chair or table, an acid-proofed table, instrument cabinet and table, solution or irrigator stand, portable operating lamps.

MAJOR OPERATING ROOM: Heating equipment thermostatic control should produce 85° when outside temperature is 10° below zero. Built-in viewing cabinet for x-ray films facing the operator is required. Also floor and ceiling vents with remote control switch for fan-forced exhaust at either level. Double electric convenience outlets. Clock with second ticker, sounder, minute jumper, and switch. Nurses' emergency call. Multi-plane hydraulic operating table. Instrument and dressing table. Nitrous-oxid-oxygen apparatus. Tankless air outfit. Dressing stand. Dressing drums and drum stands. Irrigator stand. Soiled linen hamper. White metal top anæsthetist's table. Double bowl stand with arm immersion. Sanitary waste pail. Supplies, sterilizers, wash-ups, etc., preferably in separate rooms.

INSTRUMENT CASES: Preferably in corridor of surgical suite. Free-standing or built-in of baked enamel on rustless steel. Airtight, away from steam. Small tray for calcium chloride. Hygrometer. Plate glass shelves, locked drawer. Different keys to each lock and master key.

STERILIZING ROOM: Between mayor and minor operating rooms. Same surface finishes. Sometimes completely tiled. *En suite* with workroom? Metal furred-in hood with vent over sterilizers. Sterilizers built in? Disposal sink (21 x 21 in. on 15 in. base) with automatic flushing valve. Instrument sink of vitreous china (24 x 30 x 9 in. deep). White metal top table (24 x 36 in.). Battery of sterilizers: 10 x 12 x 22 in. for instruments; 20 x 20 x 24 in. for utensils; two 15 gallon tanks for hot and cold water sterilization. High pressure steam or electricity? Water still here or in workroom. Room and sterilizers should be ventilated.

SMALL LABORATORY: Equipment for quick diagnosis desirable when main laboratory is not close to operating department.

NURSES' WORKROOM: Room for storing surgical dressings, for cleaning instruments, making solutions, preparing dressings, etc. Long table, cabinets, cupboards. Set of cases for sterile and one for non-sterile dressings, marble counters. Sink 30 x 20 in. as part of marble table with 9 in. back on wall. Cork bulletin board. Dressing sterilizer 30 in. long with 16 in. inside diameter for dressings, small utensils, instruments, gloves. Vented hood over sterilizer. Gas plate. Nurses call, lights, convenience outlets.

BLANKET WARMER: Should be adjacent to major operating room, perhaps in nurses' workroom. Non-warping door. Completely lined with light galvanized iron. Shelves 1½ in. diamond mesh wire. Small radiator, pipe coil or electric heater.

SURGEON'S DRESSING ROOM: Toilet, lavatory, mirror, shower (non-slip floor, lead pan under shower). Steel lockers on bases, furred-in heads. Nurses' dressing room is similar.

SURGEON'S SCRUB-UP: In operating department corridor or in alcove within sight of operating room. Sinks, knee, elbow or foot control. Sink 48 x 24 x 7½ in. with open waste, mixing valves, sprays. Mirror, shelf, special support for heavy sink. Wainscot at sink 5 ft. 6 in.

ANÆSTHETIZING ROOM: Like patient's typical room? Not within sight of operating rooms, if possible. Room or rooms for gas drums. Storage space. Unless portable apparatus is used removable floor plate in operating room with gas outlets will be required. Forced exhaust grille with switch for fan in anæsthetizing room. Recovery rooms not always desired by hospital authorities.

OFFICE: Chief surgeon should have office in operating department. There should be a closed telephone booth in department.

OBSERVATION FACILITIES: Amphitheater, gallery between each pair of operating rooms, or risers with pipe rails in rear of operating room. Entrance outside operating room. Students' dressing room, locker room and lounge. Annunciator system from operating room.

OBSTETRICAL DEPARTMENT

OBSTETRICAL department should be cut off from operating department and have own instrument cases, sterilizers, surgeon's scrub-up, disposal, etc. Acoustic treatment of corridors and ceilings desirable.

LABOR ROOM: Or rooms. Lavatory in each.

DELIVERY ROOM: Equipped much like a minor operating room. North light with as much horizontal direction as possible preferred. Sometimes obtained from lamps behind false windows. Soundproofed walls and doors. Double-glazed windows. Must be capable of being heated to 85° when outside temperature is 10° below zero. High tile wainscot near sterilizers in delivery room. One obstetrical bed. Stand for two sterilizer drums. Dressing drums. Baby resuscitating bath. Nitrous-oxid-oxygen equipment. Table for anæsthetists. Instrument stand. Instrument and dressing table. Clock second ticker and sounder. Nurses' emergency call. Emergency lighting. Convenience outlets. Instrument cases.

SURGEON'S SCRUB-UP: Similar to those in operating department.

STERILIZING ROOM: Similar to those in operating department. Often combined with functions of nurses' workroom.

SURGEON'S DRESSING ROOM: Should have space for a cot in addition to items in similar unit elsewhere.

NURSERY: Movable brass stands, each with five bassinets. Babies' bath 48 x 28 in. with 9 in. back. Two smooth drainboards. Nickel plated copper supply tank with dial thermostat and gauge, combination hose and shampoo fixtures, self-closing concealed stops and waste strainer. Wainscot 5 ft. high. Plate glass panel in wall next to nurse's desk and chart room. Ceramic tile, rubber or terrazzo floor. Double-glazed windows. Electric incubator and dressing stand. Scales. Liquid soap container over bath. Wall cabinet with shelves. Sheet metal warming box with perforated bottom over radiator. Nursery must be capable of being heated to 85° with 10° below zero outside temperature. Crèche isolation room. Supply closet.

SERVICES

GENERAL CIRCULATION, SERVICES AND ACCESS: *Corridors:* Minimum width for children's wards 7 ft.; for adults' wards 8 ft. Corridors may be 7 ft. 6 in. if there are frequent broader spaces for turning beds. Avoid long corridors. Bends reduce noise. Desirable that ward floor corridors radiate from nurses' station with no through traffic. Spaces 9 to 10 ft. wide in front of stretcher elevators. Natural light and ventilation of corridors important. Grouping services about a common vestibule opening from corridor reduces traffic and noise. Floor rubber tile, linoleum or composition; terrazzo border and coved base. Ceiling acoustically treated. Drinking fountains with pitcher-filling arrangement essential.

Stairs: At least two sets of stairs as far apart as possible. Consult local code. Natural light preferred. Minimum width of run 3 ft. 8 in., no winders, no more than sixteen or less than three treads in a run. Stairs forming organic parts of buildings are preferred to fire-escapes. Handrails both sides. Risers not over 7½ in.; tread minimum 10 in. (varies, Duke Foundation approves 6½ in. maximum risers, 11 in. minimum treads). In children's hospitals 6 to 6½ in. risers preferred. Thickness of masonry enclosure (law)? Fireproof, self-closing doors. Extent of wire glass permitted in doors.

Elevators: Doors to elevator vestibules should be 5 ft. to 5 ft. 6 in. wide. Elevators in two-story buildings and in large hospitals separate elevators for private patients, ward patients, staff and visitors, out-patients and service, desirable. Service and passenger elevators identical for more flexibility. Different speeds according to use and run. Consider grouping for economic advantages. Push button, hand operation, or combination. Automatic leveling devices, safety devices (photo-electric door stop), floor indicator. Emergency stop button and emergency bell. House telephone. D.C. operation. Handrail three sides. Enclosed cabs. Heated elevator shaft. Not over 200 fpm. speed. Capacity 3,000 pounds? Cab 5 ft. 6 in. wide and 8 ft. deep; standard finished dimensions of shaft to accommodate a bed elevator are 6 ft. 6 in. x 8 ft. 6 in. Door 3 ft. 9 in. wide. Fireproof doors, swinging, self-closing, folding or disappearing two- or three-speed. Maximum area of wire glass allowed? Thickness of enclosure walls (law)? Overhead vs. basement location for machine room. Overhead installations transmit vibration through building. Basement installations more expensive. Floor drain essential, but plaster not necessary.

Slop Sink Closets: One or more to a floor. Door over 2 ft. wide to take floor washing machine which requires trap and floor recess. Slop sink or hopper, 2 x 2 ft., with working space. Hopper with or without back. Nozzle should be braced and have pail hook. Two slat shelves 12 in. wide and 12 in. apart over hopper. Hook strip for brooms, mops, etc.

KITCHENS, FOOD SERVICES, DINING ROOMS: Type of service required must be determined by operating personnel. Centralized food service reduces to a minimum the handling of foods. To maintain centralization there must be room for expansion when hospital enlarges.

Main Kitchen: Good light and ventilation. Location between food storage and food-carrying elevators or dumbwaiters. In upper story? Floor of quarry tile with coved base. Floor drain. Wainscot 5 ft. high of glazed tile. Bases for all equipment.

Preparation Space: Vegetable preparation: sinks, parer, tables. Meat preparation: block, sink, grinder, slicer, marble top table (similar block and table for fish). Ice cream machine, salt box, table. Space for knives, cleavers, etc.

Miscellaneous: Daily supplies and refrigeration. Access to storage. Ranges, broilers, frier, soup and stock kettles, vegetable steamers, cereal cooker, bain-marie or double boiler, water faucet over range, hood over steamers, kettles, range, vapor-proof electric, light outlets in hood, hood steam jet for fire extinguishing. Separate flue for range hood. Cook's table with pan and pot rack (from ceiling), plate warmer (steam), egg cooker, toaster, sink. Salad table, bread slicer, coffee, milk, cream and hot water urns. Pot sinks, table, mixer. Bake shop: ovens, steamproofing oven, kettles, stove, break room, large work table along wall with drawers and bins under.

Dishwashing section separated by low partition: soundproofing or sound absorbent ceiling, soiled dish table, floor drain, electric dishwasher, clean dish table, glass and silver sinks. Wall cases for utensil storage near dishwasher.

Garbage pails, garbage refrigerator, sorting room, incinerator or freezing refrigerator if garbage is to be shipped.

Serving table and warmer. Steam table and warmer. Ice cream storage cabinet. Set-up table. White metal top cafeteria service counter. Ice water, glasses. Route of tray trucks, each truck holding sixteen trays: from truck storage to trays, set-up table, cold food counter, hot food counter, elevator, maid to patient.

Ceiling lights, equipment outlets. Bulletin board. Conceal pipes and ducts. Individual vents for equipment. Exhaust fans. Condensations should be drained to a grease pit, and all lines from kitchen plumbing wastes should go through such pit or trap before discharging into main drain.

Diet Kitchen: Separate unit near main kitchen for ease of supervision. Near dumb-waiters. Floor drain. White metal top table. Pan rack. Refrigerator (35 to 40°). Electric drink mixer, juice extractor. Sink and drainboards. Dish and supply cases. Electric range with vented canopy. Cork bulletin board. Tray rack. Garbage can. Telephone or tube at dumb-waiter. Fireproof door on dumb-waiter.

Dietetist's Office: Should command view of kitchen. Desk, files, telephone.

FOOD STORAGE AND REFRIGERATION: Refrigeration for fruits, 45°; for vegetables, 45°; for meats, 34 to 36°; cracked ice bin for fish; dairy products, 36 to 40°; hardening of ice cream after making requires zero to 5° temperature. Closed metal or wood bins, open steel or wood shelving with 19 in. vertical distance between shelves (or adjustable). Three inch coved base. Room dark with temperature below 60°. Insulate all steam pipes. Hardened cement floor, buff or gray walls. Ice-making machine, ice tank, storage bin, cuber, crushed. Brine pipes, compressors and power. Drinking water cooled to 40 to 45°.

DINING ROOMS. For hospital staff, nurses, employes. One or more sittings? Cafeteria, waiter service or convertible? Separate dining rooms for non-resident nurses, doctors, etc.? Superintendent's dining room. Dining room for outpatients and visitors. Lighting, ventilation, dish storage for all dining rooms. Night employes' meals.

LAUNDRY. Location where noise of machinery will not disturb patients or staff. Acoustic ceiling. Use only steam and electric apparatus. Reclamation of used surgical gauze?

Elements: Soiled linen room, receiving and sorting space, washing, drying, ironing space, clean linen, sewing, supply rooms, servants' toilet.

General Considerations: Rotation of working processes. Light and ventilation. Nature of motors, current characteristics, type of machine control (individual motors or continuous shaft). Available steam and water pressures.

Machinery and Equipment: Removable slat flooring in soiled linen room to permit circulation of air over and under linen. Mattress disinfector. Sterilizing washers. Washers of wood, copper, or Monel metal. Sorting trucks. Soaking tubs. Water softeners. Soap tanks. Starch cookers. Extractors. Drying tumblers. Drying racks. Flatwork ironers. Prim presses, hand ironers. Sewing machines and tables (foot or electric machines, outlets). Tables, racks, bundles, cases, and shelving for handling and storing clean linen. Smooth cement walls, gypsum plaster ceiling, terrazzo floors with coved base.

STORAGE, WORKROOMS, SHOPS. Storekeeper's office, receiving room and entrance. Maids' cart, pillow and mattress storage. Cedar-lined blanket storage room. General supplies. Storage for furniture, screens, implements. Mechanical plant storage. Food, clothing, linen, record storage. Workrooms (connected with storage facilities) for fumigation, rug-cleaning, painting, carpentry, upholstering, electrical, plumbing, machine shop, orthopedic braces, and plating work.

MISCELLANEOUS FACILITIES: Locker rooms with toilets and showers for special nurses, for male and female servants. Room for watchman. Office, locker room, showers and toilet for special hospital police. Office for housekeeping department, for maintenance (engineering) staff.

SELECTED HOSPITAL REFERENCES

Bulletin No. 3 of the Duke Foundation, 1928.

A complete check list for requirements of a small hospital. Prepared by Samuel Hannaford & Sons, hospital architects.

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American Hospital of the Twentieth Century, Edward F. Stevens, F. W. Dodge Corp., New York, N. Y., 1928, 549 pp., well illustrated.

Third edition of a treatise on the development of medical institutions, both in Europe and in America, since the beginning of the present century. Twenty-two chapters giving information on all architectural phases of the hospital problem, including mechanical equipment, details of construction and finish, landscaping and remodeling, as well as an analysis of the needs of the departments of a hospital.

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Specifications for a Hospital, York & Sawyer, Pencil Points Press, New York, N. Y., 1927, 468 pp., drawings and halftones.

Complete specifications for a hospital erected at West Chester, Pa., for Chester County. Accompanied by notes, facing text, by W. W. Beach.

Modern Hospital Year Book, 12th Edition, 1932. Published in Chicago by the Modern Hospital Publishing Co. $2.50.

General editorial section followed by seven sections on various phases of hospital work, each with editorial section and purchasing guide. The most complete sort of check list. Sections on: building materials, mechanical equipment and accessories, general furnishings, equipment and supplies, clinical and scientific equipment and supplies, laundry equipment and supplies, food service equipment and utensils, foods and beverages, professional service. A catalogue section completes the book.

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Modern Hospital, published by The Modern Hospital Publishing Co., Inc., Chicago, Ill.

A monthly journal devoted to the construction, equipment, administration and maintenance of hospitals and sanitariums.

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Hospital Management. Published by Crain Publishing Co., Chicago, Ill.

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Nosokomeion, published by W. Kohlhammer, Stuttgart, Germany.

A quarterly hospital review; the official organ of the International Hospital Association. Articles are in three languages, English, German and French. Illustrations and plans are shown though they are not profuse.

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American Hospital Association, Chicago, Ill.

Valuable publications, reports and information service are available through the library of the American Hospital Association, 22 East Ontario St., Chicago, Ill. Comprehensive lists of current and standard publications and articles are compiled relating to all vital subjects of hospital construction, equipment and finish, such as color, floors and flooring, heating, laboratories, laundries, etc.

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Articles on Sound Control by Charles Neergaard, consultant:

What It Costs to Make a Hospital Quiet, *Modern Hospital*, April, 1929; How to Achieve Quiet Surroundings, *Modern Hospital*, March, 1929; Practical Methods of Making a Hospital Quiet, *Hospital Progress*, March, 1931; Control of Noise In and Out of the Hospital, *Bulletin, American Hospital Association*, July, 1932.

AREA AND COST ANALYSIS OF AMERICAN HOSPITALS

Compiled by Edward F. Stevens, F. A. I. A.

NAME OF HOSPITAL LOCATION YEAR COMPLETED ARCHITECT	GRACE HOSPITAL MEMORIAL DETROIT, MICH 1931 *Albert Kahn Inc*			HARBORVIEW HOSPITAL SEATTLE WASH 1931 *Thomas Grainger & Thomas*			YORK HOSPITAL YORK, PA 1930 *The Ballinger Co.*		
CLASS OF BUILDINGS	*1st Class Construction*			*1st Class Construction*			*1st Class Construction*		
PATIENTS' BUILDINGS, *General*	4 Stories	162 Beds		12 Stories	425 Beds		6 Stories &	150 Beds	
Maternity	1 Story						Basement	19 Beds	
Other Use	Dining Rms Storage Kitchen								
OUT PATIENTS DEPT.	Yes	Separate Unit		Yes			Yes		
NURSES HOME	Yes	252 Beds		Yes	200 Beds		Yes	81 Beds	
HELPS' BUILDING	None			None			Yes	40 Beds W	34 Beds M
HEATING & LAUNDRY PLANT	None			Yes			Yes	Laundry in Patients Bld	
ELEC. GENERATING PLANT	None			Emergency Set - only			Emergency Set - only		
NO. OF POWER ELEVATORS	3 Elevators - 4 Dumbwaiters			4 Elevators			3 Elevators	1 Service	
MECH REFRIGERATION	Yes - in existing unit			Yes			Yes		
NO. OF PLUMBING FIXTURES	303			620			372		
TEACHING FACILITIES	Yes - Complete in Nurses Home			Yes - Complete in Nurses Home			Yes - Complete in Nurses Home		
ACOUSTIC MATERIAL ON CEIL'GS	22.4%			12%			None		
AVERAGE CEILING HEIGHTS	10'-0"			10'-0"			9'-0"		
Analysis of Areas	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.
PATIENTS' RMS & WARDS	20,583	127	22.6	45,822.8	107.8	19.7	18,678	110.5	16.2
UTILITIES & MISC.	3,147	19	3.5	21,574.2	50.8	9.3	18,243	108.0	15.8
MEDICAL SERVICE									
X-RAY	1,776	11	2.0				2,252	14.9	2.0
LABORATORIES & AUTOPSY	2,412	15	2.7				510	3.0	0.4
PHARMACY	None						441	2.6	0.4
BIRTH DEPT.	1,962	12	2.2				4,156	24.7	3.6
OPERATING DEPT	2,208	14	2.4				3,158	18.7	2.7
OUT PATIENTS DEPT.	None			6,240.2	14.7	2.7	2,925	17.3	2.5
LOBBIES, PUBLIC SPACE ETC	3,285	20	3.6	4,012.9	9.4	1.7	2,978	17.7	2.6
LIBRARY & CHAPEL	None						323	1.9	0.3
ADMINISTRATION	2,513	16	2.8	5,353.7	12.6	2.3	5,464	32.3	4.8
LOCKER & COAT RMS	2,468	15	2.7				557	3.3	0.5
INTERNES' QUARTERS	None			7,293.4	17.2	3.1	1,456	8.6	1.3
KITCHEN DEPT.	4,903	30	5.4	10,416.7	24.5	4.5	5,556	32.8	4.8
DINING ROOMS	3,180	20	3.5	5,844.0	13.7	2.5	1,264	7.5	1.1
LAUNDRY	None			Power House and Laundry			3,519	20.8	3.1
POWER HOUSE	None			in separate Building			In Separate Building		
STORE RMS & WORK SHOPS	5,932	37	6.5	18,391	13.3	7.9	5,484	32.4	4.8
WALLS SPACES ETC EXCLUDED ABOVE	209	1.3	0.2	26,984.6	63.5	11.6	11,714	69.3	10.1
STAIRS & ELEVATORS	2,992	18	3.3	51,546	121.3	22.1	5,787	34.2	5.0
CORRIDORS	16,905	104	18.7				15,483	91.8	13.5
BALCONIES OR SOLARIA ENCL.	2,031	13	2.2	900.0	2.1	0.4	5,215	30.9	4.5
BALCONIES UNENCLOSED	2,048	13	2.3	2,578.0	6.1	1.1			
Total	78,554	853	86.6	206,957.5	333.3	88.9	115,183	683.2	100.0
ANALYSIS OF AREAS & COST	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters
PATIENTS' BLDGS	90,773	1,311,000	37,122	232,650.0	2,999,869	84,948	115,183	1,384,794	39,340
NURSES HOME	116,350	1,300,900	36,836	89,344.6	911,738.7	25,818	27,930	342,400	978
POWER HOUSE & LAUNDRY				16,054.9	305,432.3	8,649	7,159	154,906	440
Total Cost of Plant	Hosp. Bld	Nurses H	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.
GENERAL	$410,476	$394,262		$957,251.08	335,533.11	76,804.00	$628,500		
PLUMBING	60,110	30,301		163,983.01	47,412.00	43,604.00	112,800		
HEATING & VENTILATING	37,164	50,660		146,340.00	63,410.00	13,579.00	75,200		
ELECTRIC	56,478	17,132		123,429.00	28,000.00	3,450.00	60,000		
ELEVATOR	25,100	17,086		60,350.00	31,522.00		27,000		
REFRIGERATION	18,500	Incl Hos Bld		47,031.85	1,200.00		34,000		
Total	$607,828	$509,441		1,498,384.94	507,077.11	137,437.00	Total	$937,500	
COST PER CU. FT.	46.3¢	39.1¢		50.8¢	55.6¢	45.0¢	45¢		
COST PER PATIENT OR NURSE	$3,750,000	$2,020.00		$3,584.46	$2,535.89				
" " " ENTIRE PLANT				$5,100.96			$6,068.15		
BRICK MASONS	$1.50 per H			$1.37½ per H					
CARPENTERS	80 " "			1.12½ " "					
PLASTERERS	1.57½ " "			1.37½ " "					
METAL WORKERS	1.25 " "			1.50 " "					
COST PER CU METER	$16.35	$13.80		$17.94	$19.63	$15.89	$15.89		

NAME OF HOSPITAL LOCATION YEAR COMPLETED ARCHITECT	THE COTTAGE HOSPITAL GROSSE POINTE, MICH. 1928 *Stevens & Lee*			HOTEL DIEU de ST. SACREMENT QUEBEC, P.Q. CANADA 1927 *Stevens & Lee*			MIDTOWN HOSPITAL NEW YORK CITY 1929 *Chas. Butler, Stien & Vitolo*		
CLASS OF BUILDINGS	*1st Class Construction*			*1st Class Construction*			*1st Class Construction*		
PATIENTS' BUILDINGS, *General*	3 Stories	45 Beds		7 Stories	280 Beds		6 Stories	60 Beds	
Maternity									
Other Use									
OUT PATIENTS DEPT.	Yes	In Ground Story		Yes			Yes		
NURSES HOME	None			None			None	5 Beds	
HELPS' BUILDING	None			None					
HEATING & LAUNDRY PLANT	Yes	Laundry in Patients Bld		Yes	In Separate Bldg		Yes	Laundry in Patients Bld	
ELEC. GENERATING PLANT									
NO. OF POWER ELEVATORS	1 Elevator			3 Elevators			2 Elevators		
MECH REFRIGERATION	Yes			Yes			Yes		
NO. OF PLUMBING FIXTURES	118			370			158		
TEACHING FACILITIES	None			None			None		
ACOUSTIC MATERIAL ON CEIL'GS	51%			None			None		
AVERAGE CEILING HEIGHTS				11'-0"			9'-2"		
Analysis of Areas	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.
PATIENTS' RMS & WARDS	4,900	109	11.8	30650	110	23	6976	116.3	17.55
UTILITIES & MISC.	1,273	28	3.1	9430	34	7	2169	36.2	5.46
MEDICAL SERVICE	2,409	54	5.8						
X-RAY									
LABORATORIES & AUTOPSY									
PHARMACY									
BIRTH DEPT.									
OPERATING DEPT	2,551	57	6.1	5340	19	4	1946	32.4	4.9
OUT PATIENTS DEPT.				None					
LOBBIES, PUBLIC SPACE ETC	7,203	160	17.4	33,600	120	25	576	9.6	1.44
LIBRARY & CHAPEL				None					
ADMINISTRATION	2,284	51	5.6	3,100	11	2	1103	18.4	2.78
LOCKER & COAT RMS				None					
INTERNES' QUARTERS				None			1654	27.5	4.17
KITCHEN DEPT.	1,330	30	3.2	4,300	15	3	1516	25.2	3.8
DINING ROOMS	480	11	1.2	2,320	8	2½	540	9.	1.36
LAUNDRY	648	13	1.6	3,355	12	2½	391	6.5	98
POWER HOUSE	1,445	32	3.6	3,875	14	2½	2092	34.8	5.26
STORE RMS & WORK SHOPS	1,202	27	3.0	18,300	65	13½	556	9.2	1.4
WALLS SPACES ETC EXCLUDED ABOVE	12,296	472	29.7	37,455	134		4513	75.2	11.36
STAIRS & ELEVATORS	936		2.4				3260	54.3	8.2
CORRIDORS	1,604		3.9				3636	60.6	9.15
BALCONIES OR SOLARIA ENCL.	701		1.6				879	14.7	2.21
BALCONIES UNENCLOSED							2598	43.3	6.54
Total	41,262	1044	100.0	151,725	542	85	34,404	584.2	86.56
ANALYSIS OF AREAS & COST	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters
PATIENTS' BLDGS	11,694	476,580	134.95	157,500	1,907,250	54,015	39,741	400,000	11,335.00
NURSES HOME				None					
POWER HOUSE & LAUNDRY				14,340	286,500	8,115			
Total Cost of Plant	Hosp. Bld.	Nurses H.	Power Pl.	Hosp. Bld	Nurses H	Power Pl.	Hosp. Bld	Nurses H	Power Pl.
GENERAL	$183,002.21			$712,190.00		$103,300.00	$240,278.08		
PLUMBING	28,459.96			95,350.00		5,500	40,236.03		
HEATING & VENTILATING	35,874.00			89,320.00		110,750	32,124.33		
ELECTRIC	14,423.00			25,140.00		14,780	19,898.50		
ELEVATOR	6,845.00			12,000.00		12,000.	19,695.00		
REFRIGERATION	4,585.00			12,500.00			4,500.00		
Total	$273,189.17			$964,500.00		$226,330	$356,731.94		
COST PER CU. FT.	57.3¢			50¢		45¢	92¢		
COST PER PATIENT OR NURSE				$3,445.00					
" " " ENTIRE PLANT	$6,070.87			$4,287.00			$6,133.27		
BRICK MASONS	$1.57½ per H			.80 per H			$1.87½ per H		
CARPENTERS	95 " "			55 " "			1.65 " "		
PLASTERERS	1.62½ " "			85 " "			1.87½ " "		
METAL WORKERS	1.00 " "			.55 " "			1.65 " "		
COST PER CU METER	$20.23			$17.65		$15.89	$32.50		

NAME OF HOSPITAL LOCATION YEAR COMPLETED ARCHITECT	ALLEGHENY GEN HOSPITAL PITTSBURG, PA 1931 *York and Sawyer*			CHESTER COUNTY HOSPITAL WEST CHESTER, PA 1925 *York and Sawyer*			HARPER HOSPITAL DETROIT, MICH 1928 *Albert Kahn Inc.*		
CLASS OF BUILDINGS	*1st Class Construction*			*1st Class Construction*			*1st Class Construction*		
PATIENTS BUILDINGS *General*	9 Stories	220 Beds	600 Beds	4 Stories	110 Beds		6 Stories	433 Beds	
Maternity	3 "	60 "					2 "		
Other Use	6 "	320 "					Kitchen, Laundry & Service Bld		
OUT PATIENTS DEPT	Yes			Yes			Yes	In Separate Unit	
NURSES' HOME	Yes	270 Beds		Yes	58 Beds		Yes	230 Beds	
HELPS BUILDING	None			None			None		
HEATING & LAUNDRY PLANT	Yes	Heat Pl. separate Bld.		Yes	H.B.L. Pl. in Patients Bld		Yes	Laundry in Patients B	
ELEC GENERATOR PLANT	Yes						None		
NO. OF POWER ELEVATORS	12 Elevators			2 Elevators			5 Elevators - 9 Dumbwaiters		
MECH. REFRIGERATION	Yes			Yes			Yes	In Existing Unit	
NO OF PLUMBING FIXTURES	1500			180			1076		
TEACHING FACILITIES	Yes - complete in Nurses' Home			Yes - complete in Nurses' H.			Yes - Complete in Nurses' Home		
ACOUSTIC MATERIAL ON CEIL'GS				None			24.8%		
AVERAGE CEILING HEIGHTS	10'-0"			10'-4"			10'-3"		
Analysis of Areas	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.
PATIENTS' RMS & WARDS	68,160	113	15.4	11,568	105.1	21.6	51,625	119	20.8
UTILITIES & MISC	40,990	68	9.3	5,369	48.8	10.0	10,236	24	4.1
MEDICAL SERVICE									
X-RAY	4,340	7	.98				5,623	13	2.3
LABORATORIES & AUTOPSY	19,030	31.5	4.28				6,914	16	2.8
PHARMACY	1,170	2	26				None		
BIRTH DEPT	3,000	5	.68				49,655	115	20.0
OPERATING DEPT	10,790	18	2.40	2,271	20.6	4.2	6,467	15	2.6
OUT-PATIENTS DEPT	10,714	18	2.40				None		
LOBBIES, PUBLIC SPACE, ETC.	63,420	106	14.4	8,344	75.8	15.5	8,623	20	3.5
LIBRARY & CHAPEL	2,970	5	.67				814	2	0.3
ADMINISTRATION	6,220	10	1.40	1,474	13.4	2.7	6,960	16	2.8
LOCKER & COAT RMS	4,690	8	1.00				6,177	15	2.5
INTERNES' QUARTERS	12,410	21	2.80	1,185	10.8	2.2	None		
KITCHEN DEPT	14,170	24	3.20	3,252	29.5	6.1	5,588	13	2.2
DINING ROOMS	9,220	15	2.10	1,331	12.1	2.5	None		
LAUNDRY	8,430	14	1.90	1,800	16.3	3.3	5,423	13	2.2
POWER HOUSE	26,430	44	6.00	2,219	20.1	4.1	None		
STORE RMS & WORK SHOPS	28,490	47.5	6.4	1,944	17.7	3.6	2,538	6	1.0
WALLS, SPACES ETC EXCLUDED ABOVE	65,780	109.5	15.0	8,376	76.1	15.6	725	2	0.3
STAIRS & ELEVATORS	33,570	56	7.60	1,925	17.5	3.6	6,606	15	2.7
CORRIDORS							32,353	75	13.0
BALCONIES OR SOLARIA ENCL	8,290	14	1.9				8,038	19	3.2
BALCONIES UNENCLOSED	1,800	3.0	.4	2,970	27	5.5	589	1.4	0.2
Total	445,094	723.5	99.42	53,828	490.8	100.5	214,954	499.4	86.2
ANALYSIS OF AREAS & COST	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters
PATIENTS BUILDINGS	417,860	5,887,000		53,713	740,810		248,280	3,154,271	89,316
NURSES HOME	128,320	1,419,500		19,705	252,450		85,421	931,243	26,369
POWER HOUSE & LAUNDRY	24,430	461,000							
Total Cost of Plant	Hosp Bld	Nurses H	Power Pl	Hosp Bld	Nurses H	Power Pl	Hosp Bld	Nurses H	Power Pl
GENERAL	$4,983,000			$526,950			$1,365,743	$388,351	
PLUMBING	525,000			64,500			179,000	38,476	
HEATING & VENTILATING	326,000			79,500			126,111	18,742	
ELECTRIC	382,000			23,300			146,309	13,149	
ELEVATOR	216,000			13,000			90,383	7,556	
REFRIGERATION	68,000			26,000			6,507		
Total	Total $6,500,000			Total $733,250			$1,914,053	$466,274	
COST PER CU FT	Entire Plant 84¢			99¢	74¢		60.8¢	50.1¢	
COST PER PATIENT OR NURSE	$4,000			$6,670.00	$3,240.00		$4,420	$2,030	
" " " ENTIRE PLANT	$8,000								
BRICK MASONS	$1.75 per H						$1.57½ per H		
CARPENTERS	1.50 " "						1.00 " "		
PLASTERERS	1.66⅔ " "						1.62½ " "		
METAL WORKERS	1.50 " "						1.50 " "		
COST PER CU METER		$29.66		$35.00	$26.13		$21.47	$17.70	

NAME OF HOSPITAL LOCATION YEAR COMPLETED ARCHITECT	MOORE COUNTY HOSPITAL PINEHURST, NO. CAROLINA 1929 *Samuel Hannaford & Sons.*			AUGUSTANA HOSPITAL CHICAGO, ILL. 1927 *Meyer J. Sturm*			TOLEDO, HOSPITAL TOLEDO, OHIO 1929 *Schmidt, Garden & Erikson*		
CLASS OF BUILDINGS	*1st Class Construction*			*1st Class Construction*			*1st Class Construction*		
PATIENTS BUILDINGS *General*		40 Beds		8 Stories	270 Beds		8 Stories	213 Beds	
Maternity								18 "	
Other Use									
OUT PATIENTS DEPT	Yes			Yes			Yes		
NURSES' HOME	None			Yes	175 Beds		Yes	143 Beds	
HELPS BUILDING				None			Yes	28 Beds W	22 Beds M
HEATING & LAUNDRY PLANT	Yes	H.B.L in separate Bld		Yes	H.B.L in separate Bld		Yes		
ELEC GENERATOR PLANT				None			Emergency Set only		
NO. OF POWER ELEVATORS	1 Elevator			3 Elevators - 4 Dumbwaiters			3 Elevators		
MECH. REFRIGERATION	Yes			Yes			Yes		
NO OF PLUMBING FIXTURES	65			500			555		
TEACHING FACILITIES	None			Yes - Complete in Nurses' Home			Yes - Complete in Nurses' Home		
ACOUSTIC MATERIAL ON CEIL'GS	6%			None			15.3%		
AVERAGE CEILING HEIGHTS	9'-0"			10'-0"			10'-3"		
Analysis of Areas	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.	ϕ net area	ϕ-patient	% gross Fl. A.
PATIENTS' RMS & WARDS	4,100	102	20.3	40,000	150	38	48,320	192	31.5
UTILITIES & MISC	1,392	35	6.9				4,900	19	3.2
MEDICAL SERVICE	1,695	42.5	8.4						
X-RAY	"	"	"	8,600	32	8	1,920	7.6	1.3
LABORATORIES & AUTOPSY	"	"	"				4,845	19.3	3.2
PHARMACY	"	"	"	50	2	½	910	3.6	.06
BIRTH DEPT	435	10.7	2.2	2,500	9	2½	1,860	7.4	1.25
OPERATING DEPT	1,548	39	7.8	12,400	50	12	5,234	20.8	3.5
OUT-PATIENTS DEPT	Included with Medical Service						1,232	4.9	.85
LOBBIES, PUBLIC SPACE, ETC.	3,100	77.5	15.5	6,700	25	16	1,870	7.4	1.25
LIBRARY & CHAPEL	None						2,080	8.3	1.05
ADMINISTRATION	600	15.	3.0	41,200	152		3,090	12.	2.05
LOCKER & COAT RMS	200	5.	1.0				1,732	7.	1.15
INTERNES' QUARTERS	None			6,700	25	16	2,010	8.	1.3
KITCHEN DEPT	1,075	27	5.3	12,400	50	32	9,500	37.8	6.24
DINING ROOMS	500	12.5	2.4	4,260	16	4	4,050	16.	2.65
LAUNDRY							3,003	11.9	
POWER HOUSE	1326	33.4	4.0	6,000	23		19,052	75.9	
STORE RMS & WORK SHOPS	800	20.	4.0				6,250	25.	4.2
WALLS, SPACES ETC EXCLUDED ABOVE	1,433	35.	7.2				8,442	33.6	5.51
STAIRS & ELEVATORS				8,240	30	11½	6,280	24.7	4.
CORRIDORS				24,300	95	32½	34,358	137.	22.4
BALCONIES OR SOLARIA ENCL	1,535	38.5	7.6	15,760	60	14½	3,800	15	2.5
BALCONIES UNENCLOSED				1,012	5	2½	612	2.4	
Total	19,739	493.1	95.7	190,122	724	190	175,830	676.6	100.16
ANALYSIS OF AREAS & COST	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters
PATIENTS BUILDINGS	20,114	21,500	8,300	122,400	1,550,636	52,514.90	154,471	1,990,184	46,172
NURSES HOME				35,000	69,200	2,343.60	32,287	631,690	14,655
POWER HOUSE & LAUNDRY				8460	140,000	4,754.88	22,055	247,775	5,748
Total Cost of Plant	Hosp Bld	Nurses H	Power Pl	Hosp Bld	Nurses H	Power Pl	Hosp Bld	Nurses H	Power Pl
GENERAL	$106,271.00			$951,441	$300,000		$1,351,649		
PLUMBING	20,925.00			71,000	25,200		137,996		
HEATING & VENTILATING	16,437.00			90,000	16,000		152,548		
ELECTRIC	7,652.00			36,000	7,000		102,271		
ELEVATOR	5,700.00			32,000			43,700		
REFRIGERATION	4,700.00			16,000			14,868		
Total	Total $161,685.00			$1,196,441	$348,200		Total $1,803,032		
COST PER CU FT	61¢			65¢	60¢	35¢	Entire Plant 58⅓¢		
COST PER PATIENT OR NURSE	$4,231.00			$5,000					
" " " ENTIRE PLANT							$7,378.00		
BRICK MASONS	$1.00 per H			$1.35 per H					
CARPENTERS	90 " "			1.35 " "					
PLASTERERS	90 " "			1.35½ " "					
METAL WORKERS	1.00 " "			1.15 " "					
COST PER CU METER	$21.54			$22.95	$21.19	$12.36		$20.60	

AREA AND COST ANALYSIS OF AMERICAN HOSPITALS

Compiled by Edward F. Stevens F. A. I. A.

NAME OF HOSPITAL LOCATION YEAR COMPLETED ARCHITECT	ST CLOUD HOSPITAL ST CLOUD, MINN 1927 *Schmidt, Garden & Erikson*			TWO RIVERS HOSPITAL TWO RIVERS, WIS. 1928 *Schmidt, Garden & Erikson*			VANDERBILT UNIV. MED. & HOSP. NASHVILLE, TENN 1925 *Coolidge, Shepley, Bulfinch & Abbot*			HOLY NAME OF JESUS HOSP. GADSDEN, ALA. 1931 *Schmidt, Garden & Erikson*			CHICAGO LYING-IN HOSP. CHICAGO, ILL. 1931 *Schmidt, Garden & Erikson*			MONTEFIORE HOSPITAL PITTSBURG, PA. 1928 *Schmidt, Garden & Erikson*		
CLASS OF BUILDINGS	*1st Class Construction*			*2nd Class Construction*			*1st Class Construction*			*1st Class Construction*			*1st Class Construction*			*1st Class Construction*		
PATIENTS' BUILDINGS *General*	6 Stories	355 Beds		3 Stories	50 Beds		4 Stories	164 Beds		5 Stories	121 Beds		6 Stories	157 Beds		8 Stories	188 Beds	
Maternity														187 "				
Other use							Medical School - 250 Students											
OUT PATIENTS' DEPT.	None			None			Yes						Yes					
NURSES HOME	None			None			Yes	100 Beds					None					
HELPS' BLDG																		
HEATING & LAUNDRY PLANT	Yes	H.&L. in Patients Bld		Yes	H.&L. in Patients Bld		Yes	H.&L. in Separate Bld		Yes	H.&L. in separate B		Yes	H.&L. in separate B.		Yes	H.&L. in separate B.	
ELECTRIC GENERATOR PLANT	None			None			Yes			None			None			None		
NO. OF POWER ELEVATORS	3 Elevators			1 Elevator			4 Elevators			2 Elevators			4 Elevators			5 Elevators		
MECH. REFRIGERATION	Yes			Yes			Yes						Yes			Yes		
NO. OF PLUMBING FIXTURES	763			78			894						580			615		
TEACHING FACILITIES	None			None			Yes - complete in Nurses Home			~						Yes complete in Nurses Home		
ACOUSTIC MATERIAL ON CEIL'GS	16%			2.8%						8.35%			03%			13.5%		
AVERAGE CEILING HEIGHTS	10'-3"			10'-5"			12'-6" Floor to Floor			10'-0"			10'-4"			9'-3"		
Analysis of Areas	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A
PATIENTS' RMS & WARDS	36.196	147.	18.	4,006	111.3	16.81	22,300	136	.09	15,298	126.43	23.47	23,083	147	15.52	24,250	138.20	15.65
UTILITIES & MISC.	5.512	22.4	2.75	2,900	80.7	12.16	7,200	44	.03	2,085	17.23	3.2	11,758	75	7.91	11,234	64.20	7.25
MEDICAL SERVICE				985	27.05	4.12				282.5	2.33	44						
X-RAY	3,600	14.6	1.8				1,500	9	.006	1,201.5	9.93	1.85	617	4	4	1,520	8.68	98
LABORATORIES & AUTOPSY	1,075	4.3	.55				1,500	9	.006	2,113.32	17.46	3.25	585	3⅔	4	3,400	19.42	2.20
PHARMACY	287	1.17	.14				300	2	.001	134	1.1	21	383	2½	3	1,081	6.18	.70
BIRTH DEPT	3,040	12.4	1.5	685	27.05	4.12	950	6	.004	501*	4.14	.77	8,289	53	5.6	1,042	5.97	.67
OPERATING DEPT.	4,467	18.2	2.2	1,135	31.2	4.76	5,100	35	02	1,519	12.55	2.33				4,612	26.35	2.98
OUT-PATIENTS' DEPT.	520	2.1	26				18,500	113	.07				5071	32⅓	3.4	6,397	36.50	4.13
LOBBIES, PUBLIC SPACE, ETC.	1,690	6.9	.85	615	17.	2.58	1,800	11	.007	880	7.3	1.35	3,689	23½	2.5	7,450	42.60	4.82
LIBRARY & CHAPEL	3,196	12.99	1.59				4,000	24	.016	1,174	9.7	1.8	115	¾	.1	360	2.05	23
ADMINISTRATION	1,335	5.44	7	965	25.	4.05	5,700	35	.02	1,070	8.84	1.65	4,092	26	2.8	3,350	19.55	2.16
LOCKER & COAT RMS	3,483	14.2	1.75	285	8.	1.19	2,250	13	.009	168	1.39	3	4,544	29	3.1	2,260	12.90	1.46
INTERNES' QUARTERS	3,650	14.8	1.81				6,700	41	.027				6,435	41	4.3	1,700	9.71	1.10
KITCHEN DEPT.	6,975	28.4	3.55	800	20.6	3.38	10,000	61	.04	3,123.5	25.81	4.8	3,890	25	2.6	7,100	40.60	4.59
DINING ROOMS	3,635	14.75	1.8	560	16.	2.35	3,000	18	.01	1,119.27	9.25	1.73	393	2½	.3	2,723	15.60	1.76
LAUNDRY	2,845	11.6	1.45	645	18.	2.70	3,500	21	.014	1,600	13.22	2.45	5,251	33½	3.5	3,500	20.00	2.26
POWER HOUSE	9,280	37.7	4.6	975	25.4	4.09	8,800	54	.35	3,883	32.09	5.95	6,377	41	4.3	10,476	59.70	6.77
STORE ROOMS & WORK SHOPS	12,600	51.25	6.25	600	16.67	2.51	11,450	70	.04	4,000	33.06	6.15	4,748	30	3.2	5,355	30.60	3.46
WALLS, SPACES ETC, EXCLUDED ABOVE	39,530	160.	19.6	3,267	90.8	13.73	5,000			9,150	75.6	14.	25,718	164	17.3	20,087	19.90	15.58
STAIRS & ELEVATORS	6,112	24.9	3.1	930	24.1	3.92	5,700	35	02	2,840	23.4	4.36	7,671	28⅕	5.1	7,365	42.10	4.76
CORRIDORS	34,357	140.	17.	4,097	113.8	17.19	42,500	259	17	11,545	95.4	17.72	25,982	165		20,525	117.10	13.25
BALCONIES OR SOLARIA ENCL.	5,434	22.	2.7	380	10.6	1.59	3,900	24	01	1,445	12.	2.22				3,490	19.90	2.25
BALCONIES UNENCLOSED							3,600	22	01	3,200	26.4					20,600	117.70	
Total	188,803	777.20	93.95	23,820	663.27	101.25	175,300	1021	.960	68,232.09	564.63	100.97	91,009	927	80.63	169,877	775.51	101.01
ANALYSIS OF AREAS & COST	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters
PATIENTS' BLDG'S	200,875			23,830	375,697	8,716	63,000	3,358,000	95,900	65,133	778,118	18,050	148,691	2,229,372	51,720	154,800	2,066,000	479,312
NURSES' HOME		2,547,000					6,300	385,000	10,900									
POWER HOUSE & LAUNDRY			59,717				8,900	363,880	10,300									
Total Cost of Plant	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.
GENERAL	$1,099,660.06			$114,648.76			$2,327,197	$264,610	$250,094	$263,350.00			$1,150,926.17			$1,543,320		
PLUMBING	106,556.40			15,966.00			227,799			70,920.00			148,297.00			142,450		
HEATING & VENTILATING	91,921.80			13,615.00			339,325			7,487.50			101,712.00			137,500		
ELECTRIC	43,879.39			5,907.30			229,213			22,443.00			69,823.60			61,850		
ELEVATOR	16,685.00			4,144.00						5,810.00			40,000.00			50,000		
REFRIGERATION	10,690.00			4,350.00						9,117.00			24,900.00			13,175		
Total	Total $1,369,392.65			$158,631.06			$3,123,534	$264,610	$250,094	Total $379,127.50			Total $1,535,667.77			Total $1,948,295		
COST PER CU. FT.	Entire Plant 55¢			43¢			68¢	68¢	68¢	51½¢			72½¢			94¢		
COST PER PATIENT OR NURSE	$4,223.70			$3,242.50			$1,615	$2,646	$1,524	$3,340.98			$10,299.10			$11,133		
" " " ENTIRE PLANT	$3,930.40						$17,330						8,695.56			10,364.33		
BRICK MASONS							$1.50 per H.											
CARPENTERS							.85 " "											
PLASTERERS							1.50 " "											
METAL WORKERS							1.12 " "											
COST PER CU. METERS		$19.42		$15.18			$24.37	$24.00	$24.00	$18.19			$25.60			$33.20		

NAME OF HOSPITAL LOCATION YEAR COMPLETED ARCHITECT	VALLEY HOSPITAL SEWICKLEY, PA 1929 *Schmidt, Garden & Erikson*			ALBANY HOSPITAL ALBANY, N.Y 1928 *Berlin & Swern*			KINGS COUNTY HOSPITAL BROOKLYN N.Y 1931 *Le Roy P Ward Inc*			BETHEDA HOSPITAL ST PAUL MINN *Ellerbe & Company*			STRONG MEM. & MUNIC'L HOSP. ROCHESTER N.Y. 1926 *Gordon & Kaelber*			LOS ANGELES GEN. HOSP. LOS ANGELES, CAL. 1932 *Allied Archt's Association*		
CLASS OF BUILDINGS	*1st Class Construction*			*1st Class Construction*			*1st Class Construction*			*1st Class Construction*			*1st Class Construction*			*1st Class Construction*		
PATIENTS' BUILDINGS *General*	3 Stories	117 Beds		8 Stories	175 Beds	} 210 Beds	8 Stories	1380 Beds		6 Stories	143 Beds		6 Stories	182 Beds		18 Stories } 2444		
Maternity					35 "		2 "	120 Beds						167 "	500 Beds	1 Story		
Other Use					10 "									151 "		Garages, Nurses School, Kitchen		
OUT PATIENTS' DEPT.	Yes			Yes	O.patients Dept in Sep. Unit		Yes	O.patients Dept in Hosp. B		None			Yes	O.patients Dept in Hosp. B		Yes		
NURSES' HOME				None			Yes	651 Beds		None			Yes	230 Beds		None		
HELPS' BLDG.				None			None			None			None	8 Beds M.	3 Beds W.	No		
HEATING & LAUNDRY PLANT	Yes	H.&L. in Patients B		Yes	H.&L. in separate Bld		Yes	H.&L. in separate Bld.		Yes	H.&L in separate B.		Yes	H.&L in separate Bld		None		
ELECTRIC GENERATOR PLANT	None			None			Yes			None			None			None		
NO. OF POWER ELEVATORS	2 Elevators			3 Elevators			9 Elevators			3 Elevators			5 Elevators			12 long run Elevs. 5 short run Elevs.		
MECH. REFRIGERATION	None			Yes						Yes			Yes			Yes	4 Dumbwaiters	
NO. OF PLUMBING FIXTURES	213			423			1600			300			784			4572 Incl Sterilizer Sets		
TEACHING FACILITIES	None			Yes - complete in Nurses Home			Yes - complete in Nurses Home			Yes complete in Nurses H.			Yes - complete in Nurses H.			Yes		
ACOUSTIC MATERIAL ON CEIL'GS	12.6%			None			3½%			Corridor			1%			61.6%		
AVERAGE CEILING HEIGHTS	9'-10½"			10'-0"			10'-6"			9'-6"			10'-10"			11'-0" in Wards 9'-0" in Corridors		
Analysis of Areas	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A	ϕ net area	ϕ-patient	%gross Fl.A
PATIENTS' RMS & WARDS	15,094	126.8	20.	23,035	112.3	24.2	132,390	88.2	22.1	18,361	129	24.0	50,542.61	101.85	15.61	192,469	104.5	13.6
UTILITIES & MISC.	2,300	19.3	3.05	4,570	22.3	4.85	37,101	24.8	6.2	6,507	45	8.5	34,059.84	68.01	10.52	82,571	35.2	5.8
MEDICAL SERVICE	184	1.45	.25													29,801	12.6	2.1
X-RAY	1,144	9.6	1.52				6,291	4.2	1.05	1,140	8	1.5	4,335.00	8.067	1.32	16,506	3.5	.58
LABORATORIES & AUTOPSY	752	6.32	1.	580	2.84	614	2,827	1.9	.47	443	3	0.6	12,020.00	24.05	3.72	20,591	8.7	1.46
PHARMACY	144	1.21	.17	1090	5.3	1.156	2,591	1.7	43	315	2	0.4	1,984.00	3.97	0.61	3,096	1.3	.22
BIRTH DEPT.	860	7.23	1.15	1,130	5.5	1.2	2,951	24.6	5	1,663	12	2.2	4,757.45	9.501	1.46	4,229		.31
OPERATING DEPT.	1,960	16.45	2.51	4226	20.6	4.48	7,259	4.8	1.2	2,033	14	2.7	5,075.25	10.15	1.56	16,237	6.9	1.16
OUT-PATIENTS' DEPT.	233	1.95	.31				9,985	20	1.7				12,222.00	24.44	3.77	39,973		2.84
LOBBIES, PUBLIC SPACES, ETC.	1,577	13.1	2.1	13,551	66.2	14.38	21,337	14.2	3.5	18,506	130	24.1	12,850.44	25.7	3.96	57,736	24.4	4.1
LIBRARY & CHAPEL				390	1.9	4.48	833	.6	14	351	2	0.5	7,820.00	15.64	2.41	47,375	20.1	3.36
ADMINISTRATION	1,940	16.3	2.5	3,539	17.5	3.75	12,741	8.5	2.1	1,342	9	1.8	5,776.48	11.55	1.78	43,204	18.3	3.07
LOCKER & COAT RMS	1,340	11.3	1.75	1,466	7.17	1.555	4,610	3.1	77	1,420	10	1.9	3,512.11	7.00	1.0	22,836	9.7	1.63
INTERNES' QUARTERS	1,580	1.96	2.11				2,913	2.	.5	446	3	0.6	17,943.38	35.89		2,211	.94	53
KITCHEN DEPT.	2,304	19.3	3.05	6,887	33.6	7.31	22,094	14.7	3.7	2,773	19	3.6	7,080.81	14.016	2.1	34,662	14.8	2.47
DINING ROOMS	1,660	13.95	2.21	365	1.78	387	8,357	5.6	1.4	2,417	17	3.2	5,490.25	10.98	1.6	26,751	11.4	1.9
LAUNDRY	2,503	21.	3.3							1,987	14	2.6	6,372.00	12.74	1.9			
POWER HOUSE	6,819	57.3	9.05							4,010	28	5.3	6,832.50	13.67				
STORE RMS & WORK SHOPS	6,755	56.75	9.				48,877	32.6	8.1	1,378	10	1.8	14,569.39	29.14	4.5			
WALLS, SPACES ETC, EXCLUDED ABOVE	11,915	100.	15.87	12,025	58.7	12.73	74,900	50.	12.5	10,174	71	13.3	41,055.46	82.119	12.6	209,296	89.0	14.9
STAIRS & ELEVATORS	3,629	30.5	4.8	5,525	26.45	5.853	21,470	14	3.5				9,822.84	19.66	3.0	54,486	23.1	3.89
CORRIDORS	10,082	84.6	13.44	7,543	36.8	7.98	91,680	61	15.				56,267.00	112.5	17.3	83,314	77.5	13.00
BALCONIES OR SOLARIA ENCL.	650	5.5	.86	3,360	16.4	3.56	19,674	13.	3.25				12,795.50	25.59	3.9	58,579	24.9	4.2
BALCONIES UNENCLOSED	2,500	21.	[illegible]				35,971	24.	6.							95,183	40.4	7.2
Total	77,925	612.87	100.00	89,282	425.34	98.485	566,852	403.5	94.36	74,088	526	98.6	333,194.31	685.305	94.62	1,141,106	537.24	88.32
ANALYSIS OF AREAS & COST	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters	Sq. Ft.	Cu. Ft.	Cu. Meters
PATIENTS' BLDGS	75,041	883,791	19,494	94,325	1,240,000	35,116.8	643,646	8,354,433	235,000	76,349	927,000		323,750	3,973,385	140,318,006	1,408,035	16,524,032	467,960
NURSES' HOME							201,100	2,415,000	68,000				97,639	982,500	34,696,472			
POWER HOUSE & LAUNDRY							24,583	1,005,500	28,700				17,052	424,582	14,993,890			
Total Cost of Plant	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Power Pl.	Hosp. Bld	Nurses H.	Hosp. Bld
GENERAL	$451,667			$737,165.36			$3,869,000			$500,000			$604,035.43	$430,870.53	$185,855.63	$7,183,074		
PLUMBING	65,300			101,057.03			602,800						62,296.22	96,739.05	10,868.17	1,098,155		
HEATING & VENTILATING	81,100			45,997.87			297,000						52,485.90	37,758.05	327,276.11	492,435		
ELECTRIC	30,360			35,878.00			313,313						35,548.65	20,403.00	18,522.37	829,361		
ELEVATOR	4,941			66,329.73			159,000						42,583.00	11,502.00	4,180.00	432,410		
REFRIGERATION	19,787			11,416.63			37,000						2,575.00			128,745		
Total	Total $653,155.00			Total $997,846.62			$5,278,113	$1,625,000	$920,000				$799,524.30	$597,272.63	$546,702.28	$10,064,180		
COST PER CU. FT.	74¢			79½¢			63¢	65¢	91.5¢	53.9¢			58¢	61¢	55¢	61½¢		
COST PER PATIENT OR NURSE	$6,047.73			$4,875.00			$3,520	$2,500		$3,496.50			$4,609.43	$1,201.36	$1,093.40	$4,159.45		
" " " ENTIRE PLANT	$5,582.52						$5,200						$7,166.25					
BRICK MASONS							$1.92½ per H						$1.37½ per H			$1.00 per H.		
CARPENTERS							1.65 " "						1.10 " "			1.00 " "		
PLASTERERS							1.92½ " "						1.37½ " "			1.12 " "		
METAL WORKERS							1.65 " "						1.10 " "					
COST PER CU. METER	$26.13			$28.08			$22.25			$18.72						$9.00		

HOSPITAL ELECTRICAL EQUIPMENT

A summary by John Cushman Fistere of new developments and accepted standards in general and specific lighting for hospitals, as well as a review of recent trends in electrical equipment, including signal, paging, in-and-out systems

STANDARDS of hospital lighting are well established, and the possibility of inadequate or otherwise faulty illumination is extremely unlikely if they are intelligently applied.

The following foot-candle intensities for general and specific lighting have been adopted as good practise.*

Space to be Illuminated	Recommended Foot-Candles
Wards (with local illumination)	3–5
Wards (without local illumination)	7–9
Private rooms	8
Corridors	3
Operating rooms (general)	12–15
Operating rooms (table level)	200–1,200
Laboratories, x-ray rooms, etc.	12–15
Lobby, reception rooms	6–8
Night illumination (Wards, private rooms, corridors)	0.2

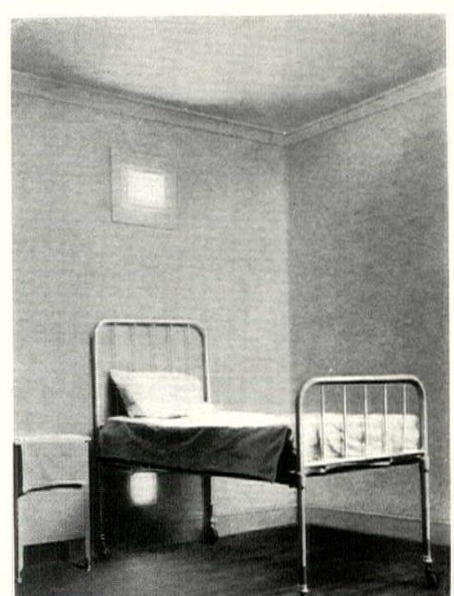
Some difference of opinion exists in regard to the type of lighting for these various purposes. Although direct lighting should never be used in wards and private rooms, it is permissible to use either indirect or semi-indirect fixtures. The first has the advantage of being less glaring, and the second of being easier to keep clean. There is a tendency in private and semiprivate rooms to omit ceiling fixtures altogether and to depend solely upon wall lights, one of which should be located directly over the bed between 60 and 72 in. off the floor. It may be set flush with the wall, or equipped with a shade or diffusing glass.

For all lights, ward, room and corridor, plain spun metallic fixtures or porcelain will be satisfactory, provided they are simple in construction, easily cleaned, and free from dust collecting pockets or ridges. Night illumination is a further requirement in these spaces. Night lights are usually set into the wall about 12 to 15 in. off the floor, and on spacing of 15 ft. or more in corridors. Although there are some ceiling fixtures which have small bulbs for night lighting, installation of this type is not common. General economy, effected through the use of night lights, is also obtainable through proper control of lights, particularly in corridors, though a central switchboard on each floor has decided advantages. For long corridors it may sometimes be advisable to install the lights on alternate circuits, so that every other light may be turned on.

* Based on recommendations of the American Society of Illuminating Engineers.

Courtesy of Congoleum-Nairn, Inc.

Night lighting for wards by a recessed floor light, having the advantage of giving light where it is needed, and of being undisturbing to patients



Courtesy of Holophane Co.

General lighting and night lighting for private rooms, from recessed wall panels

Ultra-violet Lights. Every modern hospital is equipped with sun lamps of some kind, and some already have installed ultra-violet lights in conjunction with regular illumination. A type frequently used is a dual-purpose light containing both general illumination and ultra-violet bulbs. The transformer required to operate the health lights is usually concealed in the canopy or in the fixture itself. If rooms are not set apart for sun-lamp treatment, the dual-purpose light can be effectively used in wards, particularly children's wards.

Operating Room Lighting. There are two distinct types of operating room illumination, each of which has its strong advocates. One type employs a battery of from six to twenty bulbs, which may be located in one oblong box or in separate boxes, flush with or below the ceiling, or suspended from one central fixture. The other type uses only a single operating lamp with powerful reflectors concealed in the hood, which gives almost the same intensity of light at the operating level as the battery of bulbs in the other system. Frequent arguments in favor of the first are that it throws diffused light of high intensity upon the operating cavity from wide angles, that it maintains a comfortable 10-to-1 ratio of light intensity throughout the room.

The most important facts in regard to the single bulb system are: (1) lower initial cost, (2) economy of operation, (3) a minimum amount of generated heat. It is possible in both types to use ionized glass to throw back the heat away from the operating table. If the single bulb operating light is used, auxiliary lighting must be supplied, preferably from bulbs in the canopy of the operating light fixture.

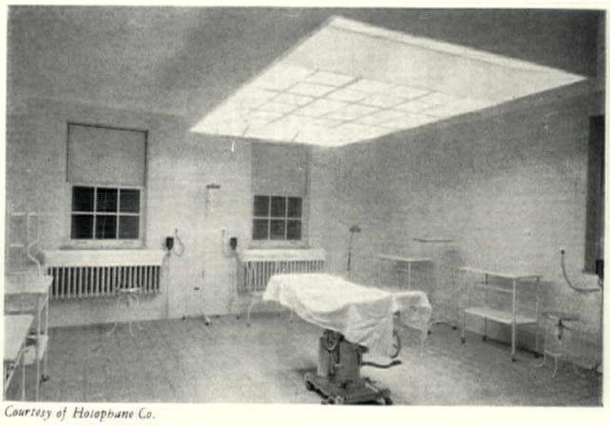
For delivery rooms, the adjustable feature of the single bulb units will throw its light at the angle required; or three or four box units may be spotted on the ceiling in semicircular fashion to obtain the proper light angle. In delivery rooms, as well as in major operating rooms, an emergency operating light will be required.

Emergency Lighting. The hospital must be supplied with a positive system of emergency lighting so that if there is a temporary failure of the normal current supply, the battery system will immediately carry the load. Although this is particularly essential in hospitals located where storms may interrupt power service, battery systems are recommended for hospitals in all sections of the country. Omission of an adequate system of emergency lighting is never justifiable on the basis of economy.

Signal Systems. There are three general signal systems in use at all hospitals; a nurses' call system for summoning nurses to patients' beds in wards and private rooms, a paging system to locate doctors for telephone calls and possible urgencies, and an in-

Courtesy of Scialytic of America

One type of single bulb operating lights that depends for intensity and direction upon the highly reflective surface of the interior of the shield



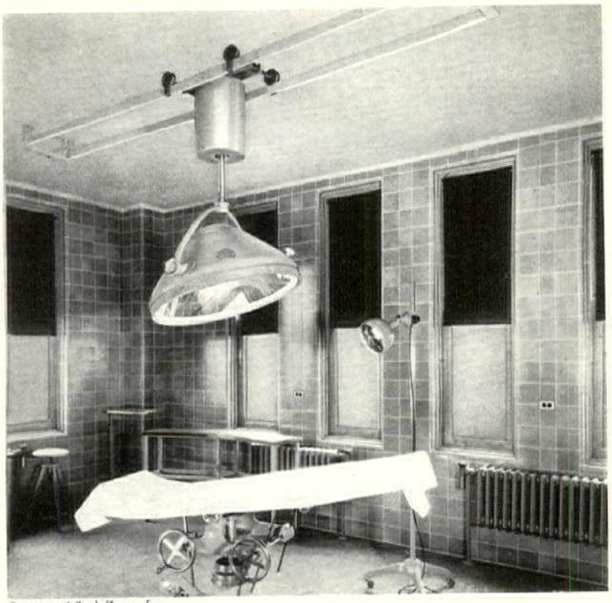
Courtesy of Holophane Co.

A multi-bulb lighting system, employing a patented type of focusing glass to concentrate the light rays

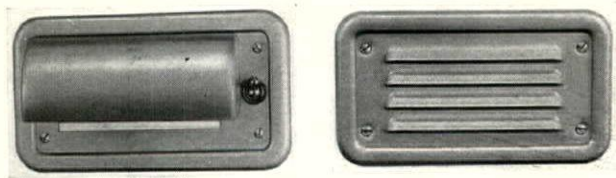
and-out system to record the arrival and departure of physicians. Occasionally the last two are combined in one. Systems may be wired for the 110 volt lighting system, or for low voltage, in which case battery current or a transformer would be necessary.

In the majority of nurses' call systems, the patient's signal is recorded in three places: by a small bull's-eye light in the plate over the patient's bed to inform the nurse answering the call which patient signaled; by a small light in the corridor over the door to the room or ward; and by a nurse's annunciator station.

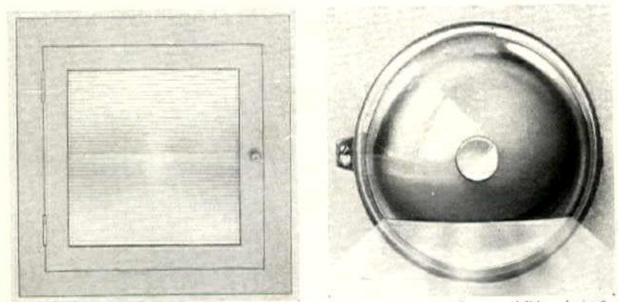
Patients' call stations may be any one of the following types: A single gang plate with a receptable for a locking call button or pull cord, preferably the former, and a bull's-eye. A two-gang plate, with one receptable for the nurse's call device, the other for a signal telephone. With this system, a transmitter, located so that the patient need not move to speak into it, sends the patient's request to the nurse's station. The answer is received by the patient through a soft speaking reproducer. This type is more adaptable to private rooms than to wards.


Courtesy of Carl Zeiss, Inc.

An operating lamp suspended from a roller track, with an auxiliary or emergency lamp beside the table


Courtesy of Erikson Electric Co.

Two night lights for corridors, wards, rooms, one with adjustable shield, the other with diffusing louvers


Courtesy of Edwards & Co.

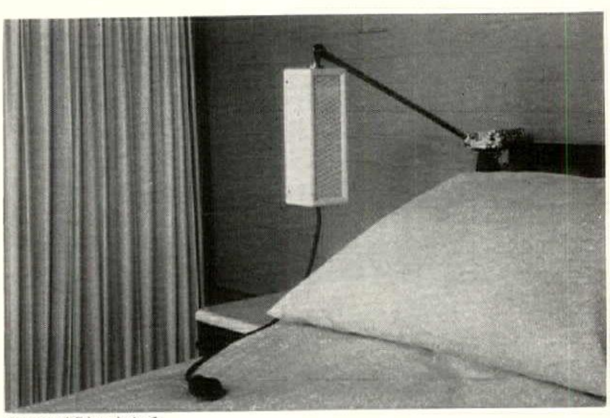
Two more night lights, one at the left set flush with the wall, the other having a shield to control light quantity

Added receptacles may be installed in the plate for a radio receiver, reading light, bed warmer, etc.

Good practise in the location of units of the signaling system is: For private room calling stations, 3 ft. 6 in. above floor line, to the right of the bed; for ward stations, 4 ft. 6 in. to 6 ft. off floor line (high enough so signal will be visible to nurse over screens or curtains); for corridor lamp stations, 8 ft. 6 in. above floor line, directly over door; for nurses' central annunciators, 5 ft. above floor, over the desk.

Nurses' signaling systems may be equipped with an elapsed time recorder which keeps a check on the promptness with which patients' calls are answered. It is usually located in the superintendent's office.

There are two distinct types of doctors' paging systems, audible and visual. In the first type soft speaking reproducers are located in the corridors, doctors' lounge, and possibly in other spaces throughout the building, with the transmitting equipment at the telephone operator's desk or in the superintendent's office. Although the equipment is designed to produce a modulated tone, audible at a distance of approximately 35 ft., objection may be raised to this type of installation because the sound is disturbing.


Courtesy of Edwards & Co.

Nurses' audible calling system. The box contains a microphone and a receptor connected to the nurses' station

The alternative is a silent, though slower and less certain system, in which the doctors are assigned numbers which flash on annunciators located in corridors, nurses' stations, and other places where doctors might be found. If strict economy is an element in selecting equipment, it is sometimes possible to have only an annunciator at the nurses' station on each floor, which may be flashed from the operator's desk, for doctors are usually required to report their presence to the nurse in charge.

A doctors' in-and-out system consists of an illuminated register located either at the doctors' entrance to the hospital or in the doctors' lounge, or at the receptionist's desk. The doctor throws the switch to light a small bulb behind his name plate when he enters the hospital, and throws off the switch when he leaves. Subannunciators are installed at the telephone operator's desk and the superintendent's office, upon which a doctor's arrival and departure are indicated by a similarly illuminated name plate.

Fire alarm systems for hospitals are invariably of the pre-signal type, which gives a preliminary alarm to permit investigation in the superintendent's office, engine room, nurses' home, and other employe rooms, before a general alarm is given. Fire alarm boxes are located in paths of exit on all floors.