No. 1

TRAVEL REPORTS

Visit of Charing Cross Delegation to European Hospitals

KING EDWARD'S HOSPITAL FUND FOR LONDON

PUBLISHED BY

GEO. BARBER & SON LTD., FURNIVAL STREET, LONDON, E.C.4

Price 1s. net, post free

King Edward's Hospital Fund for London
10, Old Jewry, E.C.2

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VISIT OF CHARING CROSS DELEGATION TO EUROPEAN HOSPITALS

Members of Delegation ..	Sir John S. Stewart-Wallace, C.B., Member of Council.	
	Mr. Norman C. Lake, D.Sc., M.D., M.S., F.R.C.S., Senior Surgeon.	
	Dr. H. W. C. Vines, M.A., M.D., Dean of Medical College.	
	Dr. A. Doyne Bell, M.A., D.M., B.Ch., M.R.C.P., M.R.C.S., Physician to Children's Department.	
Purpose of visit	To study methods of hospital design and planning in Europe.	
Hospitals visited	Switzerland ..	The Neue Bürgerspital, Basle.
		The Polyclinic of the Kantonsspital, Zürich.
		The Kinderspital, Zürich.
	France ..	The Hôpital Beaujon, Paris.
	Sweden ..	The New Southern Hospital, Stockholm.
Date of Visit	May, 1947.	

VISIT OF CHARING CROSS DELEGATION TO EUROPEAN HOSPITALS

FOREWORD

We, the undersigned delegates of Charing Cross Hospital, appointed to visit certain recently-built hospitals in Europe, beg leave to submit the following report on :—

The Neue Bürgerspital in Basle ;
The Polyclinic in Zürich ;
The Kinderspital in Zürich ;
The Beaujon Hospital in Paris ; and
The New Southern Hospital in Stockholm.

We have to thank King Edward's Hospital Fund for London for undertaking the financial responsibility of the tour.

Our special thanks are due to :—

Professor Henschen ..	Professor of Surgery in the University of Basle ;
Dr. Allgower	Assistant in the Surgical Division of the Bürgerspital, Basle ;
Herr Bauer	Architect of the Bürgerspital, Basle ;
Herr Erb	President of the Baukommission ;
Sister Erika Kallenberger	Of the Bürgerspital ;
Professor Franconi ..	Professor of Pædiatrics in the University of Zürich ;
Professor Rossier ..	Professor of Medicine in the University of Zürich ;
Professor Nager ..	Professor of Oto-rhino-laryngology in the University of Zürich ;
Herr Haefeli and Dr. Fietz	Architects of the Kantonsspital, Zürich.
The Chef de Personnel ..	Beaujon Hospital, Paris ;
Professor Sahlgren ..	Medical Superintendent of the Southern Hospital, Stockholm ;
Professor Sjoquist ..	Neuro-surgeon to the Hospital ;
Dr. Malmnas	Obstetrician to the Hospital ;
Mr. Gustav Witting ..	Secretary of the Southern Hospital Building Commission ;

who showed us hospitality and courtesy and gave us freely of their time and experience.

We have implemented our report on our observations with certain conclusions which we believe to be relevant to future policy in the building of hospitals in this country.

Until quite recently the planning of a hospital has been left largely to the architect. For certain aspects of the work, such as water-heating and space-heating systems, power and lighting plant and other services, specialist advice has been sought. Specialist advice has also been felt necessary when the design of operating theatres and X-ray departments has been in question, where the more highly specialised techniques of surgery and medicine are practised. But in the design of wards and waiting-rooms, kitchens and consulting rooms and all the supposedly less technical aspects of hospital layout and equipment the doctors and the patients have shown a certain want of interest, and the architect has borne a large burden of the responsibility. This is not to suggest that in the architect's hands hospital design has stagnated. On the contrary, in this country before the war much ingenuity and imagination were being exercised in the planning of new hospitals, and some fine modern buildings resulted.

Still, the conception that a hospital is, in essence, a machine to be worked by doctors for the benefit of patients, leads to the conclusion that both doctors and patients should be invited to share in the planning of the machine from its earliest stages. This conception was placed before King Edward's Hospital Fund for London and its acceptance by the Fund resulted in their sending a small delegation abroad to study methods of hospital design and planning in Europe. More particularly was it the object of this delegation to see recently-built hospitals *in action*, to see the good and the bad, and, if possible, to discover how such results had been achieved. The delegation consisted of a surgeon, a pathologist, a physician and a layman experienced in hospital administration and representative of the patients' interests.

It should be clear that the patients' interests and the interests of those working in a hospital are fundamentally identical, though at first glance, and in matters of detail, they may on occasion appear to be at variance. It is such occasions that give rise to controversy to decide nice points of balance between apparently conflicting claims. Thus a procedure which will undoubtedly contribute to a patient's comfort may make such a heavy demand upon a necessarily limited nursing-staff as to result in the ultimate inconvenience or discomfort of many other patients. Or conversely, while the design of a department may result in a doctor being able to deal with many more patients than formerly yet it may be so over-mechanised and impersonal as to give the patients a sense of mass-production and imperfect work. There is probably only one way of coming to a solution of such balanced problems, and that is by experiment.

One of the striking facts which emerged from this tour was the extent to which the experimental approach has replaced tradition and guessing in the solution of the problems of hospital organisation on the Continent.

At Zürich the experimental ward block mentioned on p. 22 affords a concrete expression of this experimental attitude. A hut has been built attached to the old hospital building with all services, heat, light, water, telephone, etc., laid on. In its internal aspect and fittings it resembles in every particular half the ward-unit contemplated in the new hospital. To this unit patients have been admitted for the past two or three years and its advantages and shortcomings have been discussed at periodic meetings of the planning committee. Architects, medical and lay men and nurses have contributed to these discussions and as a result substantial alterations have been made from time to time. In a somewhat similar experimental layout and planning at the Stockholm Southern Hospital, we were told that even the walls were shifted to try out various shapes of floor.

Such experimental methods are expensive both of time and material, and it may be that to-day and in this country we shall have to be content to study the past experiments of others, and interpret the results in the light of knowledge of local needs and materials available.

There is one important aspect of hospital design in which it is sometimes believed that doctors and nurses take little interest, and that is the beauty of the buildings. Such an accusation could certainly not be brought against the planners of most of the hospitals which the delegation visited. There was much evidence that good taste and sound functional planning are far from being incompatible. Though this is no place to canvass the essential beauty of the useful thing or the usefulness of beauty, it can be safely asserted that work is better done in graceful than in ugly surroundings. A hospital should not aim to be a monument. It may well be that scars heal and germs die as quickly in hideous as in fair surroundings but, if the happiness of the patient during his enforced stay in hospital is a consideration, there can be no doubt where the choice will be. The hospitals for which plans are now being laid in this country will be the first to be built after the passing of the new National Health Service Act. They will be our first truly national hospitals, and it is right to expect that æsthetically and functionally they should be able to meet the criticisms of the world at large to which they will surely be subjected.

In Zürich we were told that the sanction for the building of their new hospital had been the wish of the people ascertained by means of a referendum. Though this mechanism for expressing a public desire is not available in this country and though informed opinion is

certainly divided on some aspects of the contemplated services, there will surely be found few to doubt that the old methods of financing the hospital services were not likely to prove adequate under modern conditions. The modern hospital is costly to build and equip, and a costly machine to run efficiently and humanely. It is greatly to be hoped that those who are now laying the plans of the first of these public hospitals will not find that their schemes are stultified by any false economy, timidity or want of imagination.

Medical science is not static and the best-conceived buildings and machines of to-day will in theory begin to be obsolescent as soon as they take shape. Nevertheless, it should be the aim of those who plan, those who build and those who finance the enterprise that, on the day of its opening, the first new national hospital shall be, in all its many aspects, the finest thing of its kind in the world.

JOHN STEWART-WALLACE,
Member of Council.

NORMAN C. LAKE,
Senior Surgeon.

H. W. C. VINES,
Dean of Medical College.

A. DOYNE BELL,
Physician, Children's Department.

31*st July*, 1947.

REPORT

I. INTRODUCTION

1. The approach to the building of any new hospital, especially a new hospital on a new site, must necessarily be experimental, for there are few—if indeed any—of the essential units which have reached a phase of accepted standardisation warranting their automatic repetition from building to building. In these days of slow building—as of slow printing—a hospital, like a textbook, may be almost out of date by the time of its completion, so that the initial planning must try and look, not to the past nor even exclusively to the present, but more especially to the future so as to obtain the greatest possible flexibility of internal structure combined with a degree of standardisation of the external components of the shell which will allow of easy alterations to admit developments which at first cannot even be foreseen.

2. When visiting a number of hospitals, it is hardly possible to do more than make a rather superficial examination and gain general impressions. Time is one limiting factor, the endurance of the guide and mentor is another, and a third is the sense that the visitors feel of the burden their presence gives to the hospital administration. The ensuing report of the visit to certain hospitals abroad made by the delegates of Charing Cross Hospital under the kindly ægis of King Edward's Hospital Fund, must therefore be more of a summary of impressions than a highly detailed technical description.

3. The hospitals visited were the new Bürgerspital in Basle, the new polyclinic of the Kantonsspital in Zürich, the Kinderspital in the same town, the Beaujon Hospital in the environs of Paris and the Southern Hospital in Stockholm.

4. It may be convenient to give first a few general notes about these hospitals individually and then to consider the arrangements of the essential departments and services of an imaginary hospital by way of summarising the various features noted in the hospitals visited.

5. THE BEAUJON HOSPITAL, CLICHY, PARIS. The interest of this hospital lies perhaps in its history for at the time of its completion in 1935 it was a new departure in the hospital pattern of Western

Europe and it may perhaps be looked on as the prototype of modern building in this part of the world. The hospital suffered a good deal during the war when it was occupied by the Germans who removed much of the furniture and equipment ; latterly it was occupied by the Americans who helped to replace some at least of the lost machinery. So the hospital is sadly in need of repair and re-decoration and of new supplies of all kinds of equipment, bedding, furniture and the like as well as of the more technical instruments ; but beneath these disadvantages there are to be found a number of structural features some of which have not yet appeared in this country but may be seen again in the most recent buildings of Switzerland and Sweden.

6. The hospital is a vertical building of 14 floors—about six floors above the optimum for convenience and comfort, but it was an exaggerated reaction from the pavilion type. It provides married quarters for its staff, a residence for 20 porters and a day-nursery where its day workers can leave their children free of charge. There are the early stages of the free use of large glass windows, glass screens and glass bricks which so characterises the most recent buildings. Internally, the smaller ward unit of 16 beds in one room together with a number of single rooms was an advance towards modern ideas from the old 24-30 bedded ward. The patients' food utensils were all sterilised in the ward kitchen, instead of the more doubtful use of " marked china " which still prevails in this country. There are chairs and tables in the polyclinic waiting halls instead of the wooden benches which persist in many of our hospitals and which we saw reproduced afresh in one of the most recent hospitals in Switzerland. The radiographers work the X-ray plant by distant control from behind a screen, a practice now incorporated in recent hospitals. Finally there is the system at the Beaujon of having no admission of patients to the general wards at night which was more recently followed at Stockholm. In so experimental a building in 1935 there were bound to be mistakes and the chief error appeared to us to be that while the hospital was built vertically, the departments were planned laterally in an attempt to make each floor an independent unit. But as each floor contains some 100 beds, the position arises that one sister controls a whole floor and is unable to maintain an adequate supervision of the patients. We were shown round the hospital by the Chef de Personnel, M. Audri, to whom our best thanks are due for his kindness. An illustrated pamphlet about the hospital can be obtained from the office of the Directeur Général de l'Assistance Publique, 3 Avenue Victoria, Paris IV.

7. The Kinderspital, Zürich. This special hospital for children was built in 1893 and from time to time parts have been rebuilt though one of the original blocks is still in use. The most recent rebuilding completed in 1938 included the main entrance hall, the polyclinic and

the students' lecture theatre. Teaching seems to be limited to lectures and demonstrations in the theatre and contact between the students and the patients is not practised. In this hospital are received cases of the acute specific fevers from the locality, as the " fever hospital " as we know it has never been developed. The hospital buildings are pleasantly arranged at the periphery of a central garden-space which is free from buildings except for a small isolation block in which contacts of infectious cases are placed for observation. There are private beds in the hospital both for medical and surgical cases. We were shown round under the kindly guidance of Professor Franconi.

8. THE KANTONSSPITAL, ZÜRICH. The new polyclinic, completed in 1945, is the only active part of an extensive rebuilding plan of the Zürich Hospital Centre. This is also for teaching students as a university clinic and at the time of our visit the Pathological Department was nearly completed and the kitchen building had just been begun. The hospital will be partly under the control of the Cantonal Health Department as a public hospital, and partly under the Education Department as a university school. There are at present no new wards but an experimental ward unit has been set up in the grounds and has been running for two years. The polyclinic contains many points of interest in design, structure, equipment and administration and in some respects the visit was the most interesting part of our tour. Our guides in general were the architects, Herr Haefeli and Dr. Fietz; the latter gentleman has made a special study of the demands medicine may make upon architecture and with his colleague has even designed much of the furniture of the polyclinic and some of the technical equipment. The medical side of the departments were shown to us by Professor Rossier (medicine) and Professor Nager (oto-rhino-laryngology) who were at great pains to explain to us the methods of the medical organisation. A small lunch party was arranged for us by Councillor J. Heusser, of the Cantonal Public Health Department, and no trouble was spared to make our visit friendly and instructive. The building structure is highly technical and publications in relation to it and to the complete project are :—

(1) " Kantonsspital Zürich, I Bauetappe 1943–45." Der Polikliniktrakt—a reprint from the technical journal " Werk," Heft 11. November, 1946.

(2) Universitätsklinik Zürich, Ausbau—Projekt 1940—published by the Buildings Department of Canton Zürich.

9. THE NEW BÜRGERSPITAL, BASLE. Completed in 1945, the new part contains some 700 beds for general surgery and medicine with an isolation block for infectious diseases and tuberculosis. There is also a new kitchen and residential wing, the kitchen supplying both

the old and the new parts of the institution, and finally there is a new polyclinic. The departments for maternity, gynæcology and diseases of special organs, together with the main laboratories, are in the old part of the hospital. In the new polyclinic the central area of the block is devoted to teaching, and consists of two large lecture theatres with their service rooms, a students' snack bar and cloakrooms. Here we were most kindly received by Herr Erb of the Baukommission who arranged for us to be shown over the hospital by Professor Henschen ; for our further assistance the Professor brought with him his assistant, Dr. Allgower, and his ward-sister, Sister Kallenberger. Herr Bauer, the architect, and his son were also of the party. A very comprehensive technical description of the hospital is published as a reprint, entitled " Das neue Bürgerspital in Basle," from Schweiz Bauzeitung, Bd 127, Nos. 16 and 17 April, 1946.

10. THE SOUTHERN HOSPITAL, STOCKHOLM. A large and massive building with the flat unrelieved surfaces which seem to be rather characteristic of Swedish domestic architecture. Completed in 1944 the in-patient block consists of a central T-shaped block with two L-blocks on either side and some ancillary buildings. Its site is magnificent and being built on solid rock the question of its weight hardly arises ; the ancillary buildings are connected to the main block by underground passages blasted out of the rock and there is an extensive " air-raid shelter " where about 1,000 patients could be housed and nursed. It is not officially a teaching hospital but some small facilities for teaching have been incorporated as many of the senior staff are university professors or of professorial standing. The hospital is still incomplete, lacking about 200 beds and the large staff restaurant which is yet to be built. There are also planned an after-care hospital of 300 beds and a training school for nurses. Here again we were received with great kindness and a lunch party was arranged for us at which we met some of the staff. Our guide was Herr Gustav Witting, Secretary of the Southern Hospital Building Commission, whose unfailing energy and detailed knowledge filled us with admiration. At the time of its opening this hospital was described in several English journals* ; in addition there are two Swedish publications dealing with it :

(1) Byggmästaren—No. 12, 1944—Stockholm.

(2) Teknisk Tidskrift : Argäng 74—Häfte 26, June 30, 1944.

11. Some general facts about these hospitals are shown in Table 1. The reference letters will be used in the text to refer to the different institutions instead of their full names :—

* vide *Lancet*, November 3, 1945 (Cederström).

TABLE I.

Hospital Ref. letters	Bürgerspital Basle BB	Polyclinic Zürich PZ	Kinderspital Zürich KZ	Beaujon Paris BP	Southern Stockholm SS
Completed ...	1945	1945	1938 (part)	1935	1944
Population served	500,000	—	—	600,000	300,000
Beds	730	(800)	400	1,100	1,200
Capital cost (£) ...	2½ mill.	(5¼ mill.)	—	6 mill.	3½ mill.
Annual cost (£)...	½ mill.	—	—	—	½ mill.
Total staff ...	—	—	—	544	1,200
Nurses ...	300	—	150	—	700
Nurse/Patient ...	1 : 2·3	(1 : 1·5)	1 : 2·7	—	1 : 1·7
Students ...	150	(250)	+	(+)	+
Private Beds ...	+	+	+	—	+

Except in the case of BP when the 1935 rate of exchange was used, the costs have been worked out at the current rates of to-day. The bracketed figures under PZ refer to the estimated figures of the institution when rebuilding is complete : the actual polyclinic building cost about £500,000. In regard to to-day's prices the figures for PZ are the most relevant : in 1935 the estimated cost was about £2¼ million and since that day the cost of building per cubic metre has risen about 86 per cent.

12. HOSPITAL LAY-OUT. The form of these large hospitals seems to be fairly standardised on the principle of two separate blocks, one for in-patient and one for out-patient services connected by transverse corridors. The central administrative rooms were sited in the main hospital buildings and not in a separate administrative block. In BB they were next the visitors' hall in the out-patient building : in BP on the connecting corridor between the main entrance and the in-patient block, and in SS in the lower floors of the central T-block of the in-patient building. Within reason, it is desirable to plan for an excess of rooms above those allocated for specific purposes, as the demand for more space arises generally sooner than later.

II. ADMINISTRATION

13. All the hospitals we visited were owned and controlled by the city, the canton or both jointly—and not by the State. In Sweden there are only three voluntary hospitals in the country, two in Stockholm and one in Göthenburg. The general basis of finance was that the hospital submitted an annual budget to the owning authority and any deficit at the end of the year was met from public funds. Since the municipality usually owned more than one hospital and was in fact responsible for the health services of its area, the buying of food and other supplies was central and in bulk. In BB, KZ, PZ and SS there were private beds for the use of patients of the senior members

of the staff. At BB there were 39 private beds of the first class for which patients paid full private fees, and 70 beds of the second class for which reduced private fees were paid, making 109 fee-paying patients. At SS there were 93 private beds, working out at five or six for each of the heads of departments. In general, hospital patients paid for hospitalisation and then recovered their expenses from their insurance societies ; if they were wholly destitute their expenses might be paid by some charitable society. At SS for instance the patient paid about 6s. a day for the first fortnight in hospital and 4s. 8d. thereafter ; maternity cases were only charged 1s. 4d. a day for the fixed period of ten days' stay, in order to encourage the birth rate. Out-patients paid about 4s. per visit to the hospital. These contributions do not cover the cost, for this is nearly 30s. per in-patient per day so that a good proportion of the maintenance costs must come from the public funds. In Canton Zürich the mandate for building a new hospital is obtained by means of a cantonal plebiscite after due publicity to the plan in the press.

14. The internal administration of these hospitals shows some variations. At BB there was a hospital committee of management appointed jointly by the canton and the town and containing two medical members : advisory to this was a medical committee formed of the heads of departments. At Zürich the Universitätsklinik is under a lay director and at SS there is a medical administrator or superintendent who is appointed for six years with eligibility for re-appointment. At BP there is a director but we did not find out whether he was a lay or a medical man.

15. The Medical Staff. All the hospitals were planned on the basis of the " clinic " as the unit and at its head was a professor or a man of equivalent standing. This position carries with it a considerable authority and also in most of the hospitals the right to practice privately and to have private beds in the hospital. Both in Switzerland and in Sweden the heads of departments were provided with good suites of rooms, including consulting and examination rooms, with the purpose of encouraging the senior staff to do all their private work in the hospital and so to be there all day. At BB the head of a department was paid about £45 a month for his hospital work, but he also received private fees and a capitation fee of about 6s. per hour per student for teaching. At Zürich the professors are re-appointed every six years and the posts are pensionable ; the nominal age of retirement is 60 but extension to 70 is not uncommon.

16. In Switzerland the professors have a number of official assistants in addition to doctors who come from elsewhere to work in their clinics. Professor Nager at PZ had seven assistants : Professor Franconi at KZ had six. These assistants are selected by the Professor,

from candidates making application two to three years after qualification, and they work in the clinic for a minimum of one year. The chief assistant has usually had five to eight years' experience in the clinic. At BB the assistants were paid about £600 a year and if unmarried could live in the residence close to the hospital at a cost of £15 per month. Below the assistants came the internes or House Officers who at BB were paid about £420 per annum. In the surgical clinic these began to get operating experience about four months after qualification. At SS there was a total medical staff of 105 to service 1,193 beds and the out-patient clinics. At BP there was a special building of flats for married staff, not only medical staff but also the heads of certain essential technical staff, such as the chief engineer and the chief pharmacist. The building was said to house some 40 families living in three-roomed flats with individual kitchens.

17. THE NURSING STAFF. In all the hospitals we visited we were told that there was a shortage of nurses and also of domestic staff and while we did not hear of wards being closed for this reason it is probably the explanation of the low nurse/patient ratio of 1 : 2·3 noted at BB (see Table 1). In all cases where this ratio was obtained, it was generally lower than the level desired in this country. In Switzerland nurses become registered after three years' training and can then take special courses in various subjects, rising by age and seniority to become sisters without further examinations. Nurses can either live in hospital or in the town. At KZ there was a nurses' home mostly of single rooms with a few double ones. Each room was furnished with a wash basin (h. and c.); built-in wardrobe; bed; writing table; shelves for books and a telephone, making a bright and cheerful room. The nurses were not supposed to keep their working and outdoor shoes in their rooms and a stack of locking, cross-ventilated shoe lockers was provided for this purpose down the corridor; as might be expected, they were not used. At SS no residence was provided for nurses as it was thought better for them to live out. There was an emergency home for 50 nurses in case of any great catastrophe causing a sudden influx of cases.

18. The disciplinary control was in general the function of a matron with one or more assistants, except at BB where groups of nurses from other towns such as Zürich and Berne were helping to staff the hospital and each group had its own disciplinary control. At SS graduate nurses start at a salary rate of about £430 per annum and the head sister of a department is paid just under £480 per annum. The whole salary is paid in cash and no part is paid in kind for all the nurses live out. At SS and BP the nurses eat in their own dining room or in the hospital canteen; the same applies at KZ except for the nurses in the isolation block who eat "on the ward." In BB there is a nurses' dining room as one of the ancillary rooms of each ward unit; a

modification of this is seen in the plans of the Zürich Universitätsklinik where there is provision for the nursing-staff dining rooms on each floor of the in-patient building between the East and West wings. In BB two nurses also have bedrooms on the ward unit : in KZ one nurse sleeps on the unit : whereas at SS there is a night sister for every three wards. It was not easy to find out exactly how much free time the nurses had. At BB this seemed to be determined by the sister in charge of the floor. At Stockholm the ordinary nurses worked 240 hours in five weeks, but the free periods were not fixed and were arranged by the sister in charge. There were no full-time married nurses at this hospital but some part-time. At BP the nurses worked on a three-shift day, the shifts being 7 a.m.–3 p.m. ; 3 p.m.–11 p.m. ; 11 p.m.–7 a.m.

19. Other Staff. Complete details were not gone into. At BP there is a total staff of 544 for 1,100 beds and at SS 1,200 for 1,193 beds, a rather remarkable contrast. At BP there is sleeping accommodation for 20 porters and there is a good day nursery for the children of day workers. This is probably a modern essential and was also found at SS though on a much more moderate scale. The BP nursery was a separate building for nominally 25 children under 20 months of age but actually it has to take 37 at present. It is supervised by a head nurse with six assistants. All the children have a mid-day rest, a record is kept of their diet and they are weighed monthly. At the entrance there is a pram-park and cloakrooms with a locker for each child; then come lavatories and a bathroom, and a large play-room with sand-pits outside the window. On the first floor there is another large room with four play-pens and 19 cots ; a dining room with a small serving room or kitchen opening out of it with facilities for reheating the food which is sent over from the main kitchen of the hospital ; there is a refrigerator for storing the bottle-feeds which are made up in the milk kitchen of the maternity department. There is a room which was originally used for breast feeding but has now had to be given over to more space for cots. Finally there is an isolation room with one cot for any child taken suddenly ill. No charge is made to the parent for the use of the nursery. At SS the nursery is a good deal smaller though it is meant to take 40 children under six years. The provision of an adequate day nursery for the hospital workers seems to us to be an essential part of the hospital equipment. At SS particular care had been taken for the welfare of the kitchen staff. At one end of the kitchen floor there was a suite of rooms containing changing rooms with lockers, hot drying racks for damp clothes, shower and bath rooms, lavatories and a rest room.

20. Records. We gained the impression that in spite of the long time over which hospitals have existed, there is still no standardised form of record keeping. At BB each department had its own record

office and there was no central bureau. If a patient was transferred from one department to another the notes had to be duplicated. As there is a shortage of typists, the writing, summarising and typing of notes devolved upon the qualified assistants and internes. Card indexes were not used in these departmental offices ; when the case is complete, the notes are bound in books classified by diseases and the patients' names are kept alphabetically in MS. books. Notes of current and recent cases are kept in folders in filing cabinets, out-patients never handle their notes but have a treatment card for prescriptions, etc. Follow-up is by postal questionnaire and special cases are brought up for re-examination. At PZ records were again kept departmentally but there were card indexes and day-books in use. At SS all forms and note-sheets are of the same size and are bound together with wire staples. There are secretaries in all clinics and the doctors dictate notes to them. There is a central records office where records are kept by card indexes, under the patients' names, the notes themselves being stored in envelopes marked by a number and year obtainable from the index card ; a new number series is started each year. In this hospital there is a great deal of space underground so there is no particular worry about storage space, of which the method employed is rather extravagant ; X-ray films are stored in the X-ray department. Curiously enough out-patients' notes are not kept.

21. Teaching Services. None of the hospitals we visited was a full teaching school in the English sense but they were places where the students attended only for clinical instruction. This training differs fundamentally in Switzerland and France from our ideas, as it is largely theoretical and academic and limits the contact between student and patient to a notable degree. Patients seem to be used chiefly for demonstration purposes in the lecture theatres and the structural equipment of the teaching service is therefore designed to this end as will be described later (p. 51). At BB entry into a medical career cannot start before the age of 19 and the pre-medical and pre-clinical courses are done wholly in the university departments. The full course is of about 6½ years' duration and at the hospital about 130 students were attending. At the kind invitation of Professor Henschen, we had the pleasure of attending a routine surgical lecture given by him to a class of 50–60 students including five women students. The surgical lecture theatre was so arranged that minor operations could be done in it ; the students are also admitted to the floor of the operating theatres, but in none of these were there any galleries. The students do not make notes on ward cases as part of their essential training ; they do not perform post mortems under direction except very occasionally and do not attend in the post mortem room regularly except twice a week during the winter term when they are taking the course in morbid anatomy. Much the same sort of routine obtained

at PZ. In the E.N.T. department clinical demonstrations are given during term time, and during the holidays—which extend over about five months in the year—they may be able to see some patients. We saw a class in progress in a very well-fitted class-room for practising the use of the laryngoscope. Again post mortems are demonstrated to the students but they do not seem to perform them. At KZ the only part of the hospital to which students were admitted was the lecture theatre which was arranged to have a direct entrance from outdoors through a range of cloakrooms. This emphasis on demonstration to the student instead of personal investigation is reflected in the high degree of mechanisation of the lecture theatres and of mechanical aids to demonstration and it is of course very costly. It seems that in Switzerland the student does not really come into contact with the patient until he has passed his final examinations and becomes an interne.

22. At BP on the other hand unqualified students seem to be used freely in positions of some responsibility perhaps because there is a shortage of qualified men. A department may be staffed by the senior Chef de Service and under him an interne who is often not fully qualified and four student externes. If the students wish to do so they can become externes after one year's clinical training and remain externes for four years; then, still unqualified, they can be internes for four years more and for both these appointments they are paid. Alternatively they may save time by doing more concentrated theoretical work at the University and take their qualifying examination earlier. In Sweden the medical course is eight years; three years pre-medical and pre-clinical and five years of clinical work. Here the students are brought into contact with the patients as soon as they begin their clinical studies.

III. PATIENTS' SERVICE

A. Casualty.

23. At BB and SS there were special entrances for ambulances so that the out-patients in general might not see any unpleasant sights. In both instances the ambulance entry was at the back of the polyclinic block, the general entry for patients being at the front. At BP there was common entry. In no case did the ambulance drive into a totally enclosed and warmed yard despite the excessive winter cold in Switzerland and Sweden but the patients were unloaded in the open air. At BP there were " winter doors " in which an air-lock was incorporated; these locks were on either side of the main central door of the entrance hall which is not used in winter. The approach to the entry

was by a ramped-up road which seemed rather too narrow even though one-way. The ambulance patient was then taken to the appropriate out-patient department during the day time or was dealt with by the Service de Porte (see later) at night. At Basle rather similar arrangements were in use. At SS the casualty department was more elaborate. There were separate entries for medical and surgical cases, a room for the ambulance drivers, and facilities for the police to start any necessary investigations immediately ; there were the usual rooms for examination and for dressings and an artificial respiration machine of the " iron lung " type. There were three small theatres for light operative work, the more serious cases going direct to the main theatres ; no X-ray screening machine was provided on casualty, all cases going to the main X-ray department where a night service was provided. Blood for transfusions was obtained from the city Blood Bank and stored till required ; donors to the Bank were paid. Medical officers take duty on casualty for 24 hours at a stretch and there is sleeping accommodation for them on the unit. When a patient is admitted, details of the case are issued in triplicate by the registration office of the unit ; one copy is held in the office, one goes to central records and one accompanies the patient to the ward.

24. Night Services. At BB there did not seem to be any special night services and any X-ray or pathological investigation necessary has to be done by the internes. At BP and SS and at BB no patients are admitted to the general wards after 5 p.m. at BP and 8 p.m., at SS, until the following morning so that disturbance of the wards by admissions at night is avoided. In both hospitals all cases which have to be admitted at night are kept in the casualty unit till next day. At BP there are 18 beds in the casualty unit and a " strong room " for excitable cases ; two internes sleep on the unit which also contains an operating theatre. At SS there are again two internes sleeping on the unit and cases requiring operation are dealt with in the main theatres and then return to casualty for the rest of the night. There is a special lift from casualty to the main theatre block and it discharges directly into one of the anæsthetic rooms. This mobility of seriously ill patients is possible because the beds are largely used instead of stretchers so that there is a minimum of lifting. In both hospitals the only type of case admitted to the wards after hours are maternity cases. There is a good deal to be said for the principle of avoiding disturbances in the general wards at night.

B. Entrances for Visitors.

25. Excepting the children's hospital, in all the other hospitals the principle of separate entrances for visitors and for patients was in practice. Since in a 1,000-bed hospital the expected number of visitors

in a visiting period may be about 2,000, the reception halls have to be large and much space is sacrificed. At SS the visitors' hall was very large and floored with polished limestone slabs; it contained an extensive range of cloak-room space round its walls for no one is allowed in the wards in their outdoor clothes. There was a children's play-room where children could be left under supervision during visiting hours, a canteen which seemed rather small and next to it small shops for papers, tobacco and flowers. There was a direction-bureau and lavatories for both sexes. It is proposed to use the hall for health demonstrations and propaganda. The entrance to the hall was at ground level, the roadway to the patients' entrance hall above being ramped up. There was another large visitors' hall at BB, the patients' entrance to the polyclinic being separate and some distance away but at the same level. At BP the road was ramped down to the visitors' hall and ramped up to the patients' hall above. At PZ the entrance hall of the polyclinic will later be the main visitors' entrance to the hospital when this is completed and it is considerably smaller than any of the halls in the other hospitals. One cannot help feeling that though these halls can be built as impressive architectural features they are rather a waste of space which could be used in a better way, for apart from the visiting hours, they are not much used. It might be possible to reduce their size by so arranging the visiting hours that different sections of the hospital were open to visitors on different days.

26. If the visitors all arrive at the same time on the same days it is necessary to serve the hall with sufficient lifts to distribute them quickly. At BB such service was by four lifts carrying 12 people plus two carrying 6; at BP there were six lifts carrying 25 people and on visiting days the expected number of visitors was up to 3,000. At SS there were six large lifts not serving the hall directly but arranged in two batteries of three under the in-patient block, each battery serving half of the building. Unless another solution of the problem of visitors can be found it seems that not only is the large hall inevitable but in a 1,000-bed hospital it must be served by a special battery of some six lifts each carrying 20–25 persons.

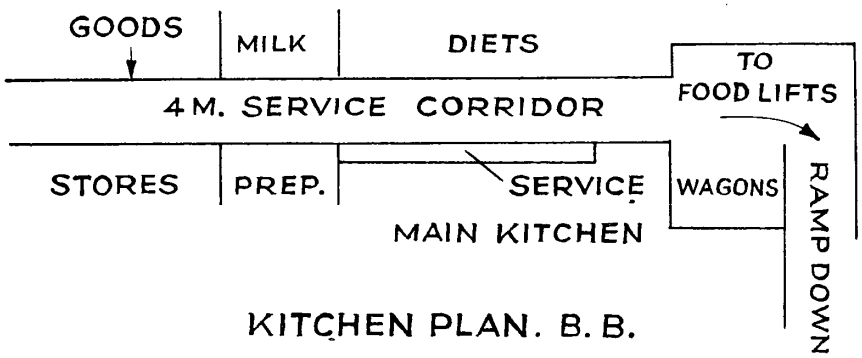
27. CHANGING-ROOMS. A feature of the SS staff entrance was the provision of changing rooms on a considerable scale, an implementation of the rule that no one should take their outdoor clothes into the in-patient part of the hospital. For the nurses there were changing rooms with lockers, a washing room with hand basins, bath and shower rooms; there were similar rooms for the porters and for the assistant medical staff. Foot baths and hot air baths were being put in. These rooms were in the basement and were air conditioned; the senior medical staff had their changing rooms on the ground floor. There was also garage accommodation for 50 cars for the medical staff. One object of these extensive changing rooms seemed to be the avoidance

of the carriage of infection either into or out of the hospital, and to us it seemed that from this point of view the cost of these precautions was out of all proportion to their probable value; the changing of shoes did not seem to be insisted on. But no doubt winter weather conditions in Stockholm entail very extensive changing of clothes between in- and out-doors.

C. In-Patient Services.

28. The key points in the design of a general hospital are probably the kitchen and the ward unit. Both are still in the experimental stage and the therapeutic function of the kitchen has but recently entered the stage of investigation. It may well be that in 50 years' time the whole kitchen, even including the catering for the hospital staff, may become a "diet kitchen" in the sense now reserved to a limited and often rather unhappy section of it.

29. Food and its Service.—*The site of the kitchen.* At BB and BP the kitchens were sited at ground level, at SS on the roof and in PZ when complete the kitchen will be in an entirely separate building of its own at some distance from the wards.



KITCHEN PLAN. B. B.

But while at BB and BP a single kitchen unit completely cooked the food for 1,000 patients or so, at SS and PZ this large bulk of food is broken up by distribution to subsidiary kitchens. The main kitchen prepares the food and may cook bulk foods like soups and potatoes, but the subsidiary kitchens complete the meal, make up the special diets and distribute to the wards. The subsidiary kitchens are in or over the ward blocks at the shortest distance from the wards and can distribute the food vertically by lifts or laterally by hot-wagons or by both means. At SS the principle was formulated that not more than 100 patients should be fed from a single kitchen unit allowing for 25 per cent. to be on special diets, so on this basis there was a central

kitchen and 11 subsidiary kitchens to feed about 1,200 patients. Here all the kitchens were on the roof and from the subsidiary kitchens the food was dropped vertically down by service lifts to ward stacks below. In actual practice it was found by experience that a subsidiary kitchen can serve about 96 medical patients with a high percentage of special diets, or up to 150 maternity cases whose diets are essentially normal. The projected system at PZ is similar in principle but differs in that the daughter kitchens are placed in a stack between the east and west ward blocks and each serves about 120 beds laterally; the distance to the furthest beds seems rather great. It would seem that this system has the disadvantage of bringing cooking into the middle of the ward blocks instead of keeping it on the roof where there is better light and ventilation. For the single unit kitchen as at BP and BB, it can be claimed that fewer senior cooks and dietitians are necessary than where there are subsidiary kitchens but a large distributive staff may be necessary. At BB this problem was ingeniously overcome in two ways. The electrically-heated food wagons were drawn by electric horses, and from the ground level kitchen an internal roadway for these trains was ramped down to the basement level. These electric horses were battery driven and pneumatic-tyred and the noise of the train in motion was slight. Each wagon carries food for 50 patients and their nursing staff, since at BB the nurses eat "on the wards," and the kitchen normally feeds a total of about 1,720 persons including 200 special diets, while at a maximum it will feed 2,000. The kitchen is sited on the ground floor of a wing projecting from the polyclinic and over it are the quarters for resident staff. It seemed possible that these rooms might be hot and noisy and pervaded by cooking smells. Where the kitchen is on the roof the problem of noise in the wards immediately below arises. At SS this has been solved by placing under the kitchen a narrow mezzanine about 5 feet high in which were carried all the services for the kitchen above, the air space forming an effective insulator. At BP the kitchen was in the east wing of the in-patient block at ground level, with a maternity ward immediately above it; by forced ventilation the smell of cooking seemed to be well controlled. This unit serves 1,500 people normally and distribution of the food is by service lifts close to the kitchen. The food in metal containers is placed at the serving counter on unheated trolleys, drawn across a hall and placed in unheated lifts so that it steadily cools. At SS it was urged upon us that the roof kitchen was the most satisfactory way of dealing with a difficult problem.

30. Intake and Distribution of Raw Materials. This is a simple matter in the case of a single kitchen unit sited at ground-floor level, but for multiple kitchens on the roof it requires careful organisation. At SS supplies were delivered at an unloading quay at ground level, weighed, and sent up by two special lifts, used for no

other purpose, to the roof kitchen. These lifts were lined with stainless steel and fitted with hooks and with intercommunicating escape doors ; there were no intermediate stopping places between the ground floor and the roof. On arrival at the kitchen floor the goods were re-weighed and distributed to the appropriate department or store. From these stores supplies were issued to the main and subsidiary kitchens, being collected by the driver of a wagon train. The stores and kitchens are all linked by one long corridor and on the side of each store facing the corridor are a battery of locker-hatchways numbered I–II corresponding to the II subsidiary kitchens. In the dairy-produce store these hatchways are refrigerated. The lockers are cleared by the driver of a wagon-train, each wagon being numbered to correspond with a subsidiary kitchen. As the prepared food was dropped by lift from each kitchen to the ward below, the size of the food distributive staff was very low.

31. SUBSIDIARY KITCHENS. At SS these are roughly 38 ft. by 47 ft. and are fitted for all types of cooking in a very compact and practical way. They are arranged as four paired and three single kitchens, the pairs having a common washing up room between them. The kitchens are all air-conditioned ; each has a special built-in refrigerator to take a milk-churn, the milk being obtained from it by suction, while over the boiling plates there is a movable arm carrying water, to simplify the refilling of saucepans. In each kitchen there is a dietitian's office and it is the practice for the dietitian to go round the wards with the medical staff and discuss with each patient individually his likes and dislikes ; from such a practice the desirability of offering the patient at least two alternative dishes within the limits of any prescribed diet would probably become apparent.

32. COMMENT. The roof seems to be the only site which combines good light, good ventilation and freedom from cooking smells, especially if the hospital site is not a large one. Ideally the use of subsidiary kitchens seems sensible, as there is then a service limited to a fixed number of patients all of whose wants can be studied individually by the dietitian. In such small units it is easier to discover and remedy deficiencies in the food service more quickly and with less general disturbance. The advantages to the patient may well outweigh the additional cost, but the chief difficulty lies in the greater number of trained cooks and dietitians required.

33. THE SERVICE OF FOOD TO THE PATIENT. In all the hospitals we visited the function of the " ward kitchen " is really that of a serving room at which the food arrives hot and does not require re-heating. At SS and BB the food is taken round in its containers or on electrically-heated trolleys to the bedside. We were told that in addition to patients appreciating this individual service, there was

a considerable saving in waste and even that the patients' stay in hospital is shortened. At BP excessive economy of service seems to have led to sacrifice of the attraction of food to the patient ; the meal is served entire in a plastic tray stamped out into a number of compartments. From the service side this has its advantages but it seems to us that the presentation of the food to any sick person would be rather repulsive. We are in agreement that whenever possible food should be served at the bedside in accordance with the patients' immediate wants, though whether the service need necessarily be done by the nursing staff rather than by less highly-trained assistants is open to question.

34. WASHING-UP. There are three points which still seem unsettled : (1) where the washing-up of patients' food utensils should be done ; (2) the composition of the utensils ; and (3) their sterilisation or not. At BB, BP and the infectious block of KZ, washing-up was done in the ward kitchen, while at SS the dirty utensils were sent back to the subsidiary kitchen and washed up there. This indicates that a further advantage of subsidiary kitchens is removing the onus of washing-up from the ward. If there is a single kitchen unit then the labour of transporting and cleansing the utensils from say 1,000 beds is obviously so great that washing-up must necessarily be done on the ward unit. We saw three varieties of utensils, china, stainless steel and plastic. The last two are less breakable and stainless steel is almost everlasting but it is rather heavy and sombre in colour, whereas plastic can be made light and decorative. The washing-up sinks we saw were in general of stainless steel and washing machines were also used so that china breakage rates would be high. It is still the practice in this country to use " marked china " for infective patients and to keep it in a separate cupboard, but the method is so open to error that its value is rather doubtful and it would seem more reasonable to sterilise all feeding utensils used by sick people. At SS the dirty utensils were first washed in the sink and then steam sterilised in a small steriliser at 130° C. In BP there are sterilisers in the ward kitchens capable of taking 96 plates and covers ; there are 45 such sterilisers in the hospital. In the isolation block of KZ all crockery is sterilised in the ward kitchen. The fittings of the washing-up section of the ward kitchen of the future might consist of stainless steel sinks and draining boards, a washing up machine, a pressure steam steriliser and plastic utensils. If the sterilisers are properly used the utensils come out almost dry and the man-power situation suggests that a larger capital expenditure on mechanisation may avoid the maintenance difficulties of insufficient manual labour.

35. THE WARD UNIT. This divides itself naturally into the fixing of a number of beds as a unit, and of the number of ancillary rooms to service them. The bed unit, i.e., the number of beds in a ward unit, is

still clearly in the experimental stage and so also is the division of the beds into sickrooms within the unit. Arranged in chronological order of construction the bed units in the four major hospitals we visited are shown in the following table :—

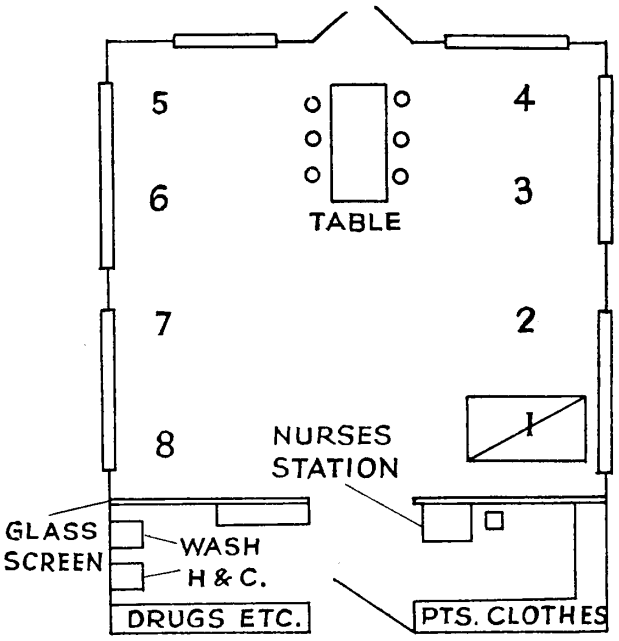
TABLE 2.

Hospital.	*Date of completion.*	*Bed unit.*	*Beds in sickrooms.*
BP	1935	94	4 × 16 30 × 1
SS	1944	16	2 × 4 2 × 2 4 × 1
BB	1945	16	2 × 6 2 × 2
PZ	?	25	2 × 8 4 × 2 1 × 1

These interesting figures show at BP in 1935 the start of the swing over from the old 30-bed ward to the smaller ward and the single room, though the unit as a whole is still much too large. In 1944 at SS comes the other extreme—a small bed-unit arranged with a 4-bed room as the maximum size. At BB in 1945 the pendulum begins to swing back to a larger sickroom of six beds and in the plans of the Zürich Kantonsspital which is not yet built, the bed-unit rises to 25 and the largest sickroom has eight beds. The increasing prominence of the 2-bed room is interesting, for it would seem an uneconomic unit unless it can be arranged that the two patients are equally ill and also get on with each other. At the Queen Elizabeth Hospital, Birmingham, these double rooms were not popular, and a 25-bed unit might be arranged more profitably as 2 × 8, 1 × 4 and five single rooms.

36. At BB and SS the bed units were further combined for purposes of service and staff administration. At BB three units plus two single-bed isolation rooms (50 beds) formed a " bed station " the unit upon which the ancillary rooms were based. At SS two bed units of 16 beds made a unit looked after by one assistant doctor with a fixed nursing staff and a defined number of service rooms. Three of these double units with a few private beds (say 110 beds) made a medical clinic while four, plus private beds, (say 150 beds) made a surgical clinic. Each group of 16 beds is in charge of a ward nurse, and the unit of 32 beds is staffed by a sister with two ward nurses (probably our staff nurses), four assistant nurses and three student nurses. The similarity of arrangement at BB and SS may be due to the fact that the chief architect of SS was called in to advise when BB was being planned.

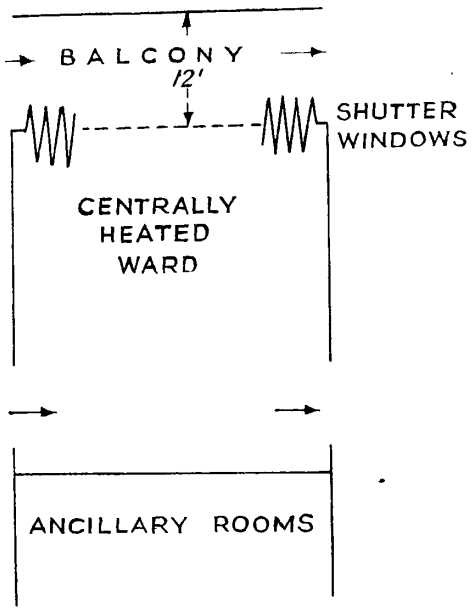
37. THE BEDROOMS. That single rooms are essential for the dying, the seriously ill and the noisy patient is now generally accepted. The problem of the larger ward is more difficult for the ward should combine the possibility of companionship and social intercourse for the patients with space and light while avoiding the institutional atmosphere of the old type of large ward. At PZ where the wards are not yet built, an experimental ward hut was built in the grounds two or three years ago for a practical trial of the paper-planned ward. It contains eight beds and one single room with the planned ancillary rooms and it can be—and has been—easily altered. The rough plan is given below but is not to scale :—



EXPERIMENTAL WARD. P. Z.

We thought that this was a very sensible piece of practical work which might be followed in this country whenever it is possible. It

appeared that the unit was working satisfactorily both for the patients and the staff and no further major alterations were contemplated. At SS where the 4-bed room is used, criticism was rather adverse ; these small rooms mean a lot of extra work for the nurses and patients do not like them unless all are equally ill, for the seriously ill are too close to the convalescent who want companionship ; there is now a feeling that an 8-bed room would be preferable. The 16-bed wards of BP were smaller versions of the old 24–30-bed wards. In all the hospitals except BP the beds were placed parallel with the window-bearing wall of the room. This now seems to be widely accepted and will be the arrangement in the Kantonsspital Zürich when completed.



ROOF WARD.K.Z.

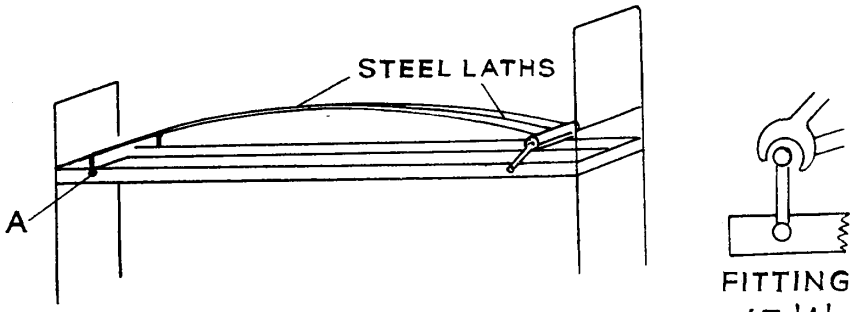
38. Other Bedroom Fittings. At SS the rooms were wired for headphones to each bed over which there was also a headlight with an adjustable metal cylindrical screen operated by a cord. The switches were on the bedside table within easy reach, the wires running to wall plugs ; there was push-button signalling to call a nurse. Each room had an h. and c. washbasin divided into two parts, the smaller being used for teeth-cleaning. Just above the skirting board immediately inside the door was an electric night light seen as a glass

panel 6 ins. by 2 ins. Neither suction nor pressure was laid on as a service to any of the wards. There was an interesting type of bedside table-locker on wheels with two drawers, one above and one below a central space ; a pull-out sliding flap could be drawn over the bed to form a bed-table fitting to two vertical supports for adjustment of height. For each bed there is a hanging cupboard in wood with a grid floor for ventilation about a foot above the room floor. The rooms are air conditioned. The 4-bed rooms are about 28 ft. by 32 ft. and have a double window 53 ins. high with three panes 2 ft., 6 ft., and 2 ft. wide. These large windows have two disadvantages ; their frames tend to warp so that they are no longer draught-proof, and as there are no sunblinds the patients do not like them as the light is too strong. At BB the bedside locker carried the reading lamp and separate bed-tables were in use. The same type of night light was used.

39. The Mobile Bed. At BB, SS and the experimental ward of PZ the beds were all on wheels with a simple locking device and the uses of the mobile bed were interesting. At BB the wheels were built on to the bed legs while at SS they were in detachable pairs at head and foot. In both places, and particularly at SS, the bed largely replaces the stretcher with a consequent reduction in the number of times the patient is lifted about. Patients go to and return from the operating theatres in their beds ; they are transferred in their beds from one ward to another ; they go in their beds to lecture theatres for demonstration ; or to the X-ray department or anywhere else. At SS the nurses or the ward maids move the patients about within the limits of the ward, and outside the ward porters are used, but we did in fact meet a nurse taking a patient back from some operation single-handed ; the bed seemed to move and steer quite easily and she managed a vomit-bowl at the same time. Two essentials for the mobile bed are that the wheels should be of good quality and have proper bearings, and that there should be enough bed-lifts. At BB these seemed to be too few.

40. The use of the mobile bed demands certain structural conditions in the building. The floor through the doorways must be kept flat and the doorsill must go. In order to avoid consequent draughts, the doors of the bedrooms at SS were fitted with draught excluders operated by the pressure of a pin against a narrow sloping metal plate immediately next to the hinged side of the door-jamb. The doors must be wide enough to take the bed easily ; at BB the room doors were about 48 ins. wide with a further opening strip of 13 ins. normally kept shut, giving an overall width of 61 ins. At SS the doors were 46 ins. wide without the additional strip. Then the corridors must be wide enough for two beds to pass. At SS the standard width was 230 cm. and at BB 300 cm. or about 10 feet plus.

41. Structurally there were several types of bed in use at SS and the standard one had a spring mattress hinged roughly into thirds so that the head or foot could be raised by a rack and rod adjustment. At BP the standard bed, used also as a couch in the examination rooms of the polyclinic, was of unusual type which had no spring mattress in the ordinary sense but obtained its spring from a convex mattress of steel laths of about 4 mm. gauge shackled together at either end by short steel strips. This mattress hinges by resting at either end on a cross bar ; at the bed-foot this is pinned to the bed-frame so that it can move, the weight of the body pushing the cross bar outwards while at the head end it is fixed. These beds felt fairly comfortable to lie on.



STANDARD BED. B.P.

At BB the beds were fitted with a metal gallows rod and strap with a handle so that patients could lift themselves ; attached to the upright was a small blackboard to which the case notes were attached and even, we were told, the diagnosis chalked up. At SS and BP the case notes were kept under a metal flap at the foot-end of the bed.

42. Ancillary Rooms. Another experimental matter is the ideal relationship between the number of beds in a ward unit and the number of ancillary rooms which should serve them. In the American book " Hospitals Integrated " the service rooms of existing English hospitals are considered to be " meagre." In the hospitals we visited there is a fairly wide variation in the ratio ancillary rooms/beds and the tendency is moving toward a ratio of 1 : 2 (see Table 3).

Table 3.

Hospital	BP	SS	BB	PZ
Completed ..	1935	1944	1945	(plans)
Unit of Beds ..	110	32	50	25
Ancillary Rooms—				
Bath	4	2	2	1
Sluice	4	2	3	1
Sterilising ..	1	1	1	1

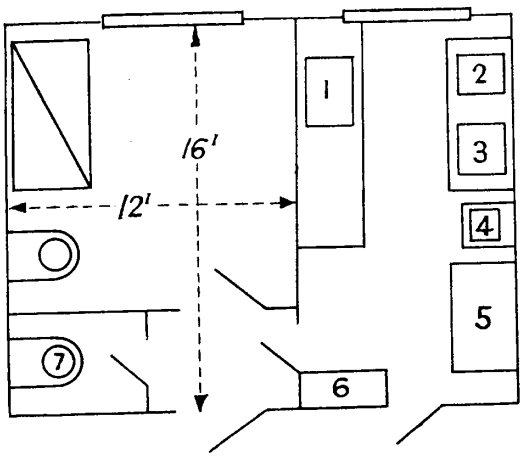
Hospital	BP	SS	BB	PZ	
Ancillary Rooms (*contd.*)—					
Treatment ..	4	1	1	1	for 2 units.
Kitchen.. ..	1	1	1	1	
Sister	—	—	—	1	for 3 units.
Duty	1	1	1	1	
Office	—	—	—	1	
Day	4	1	1	1	
Consultation ..	1	1	1	1	for 2 units.
Store	1	1	1	1	
Cleaners ..	1	1	—	1	
Patients' Clothes	—	1	—	1	
Laboratory ..	1	—	—	1	for 2 units.
Screening ..	1	—	—	1	for 4 units.
Pharmacy ..	1	—	—	—	
Ratio : Ancillary rooms/Beds ..	1 : 4·4	1 : 2·5	1 : 4·2	1 : 2·3	

In BB there are also on the ward unit a nurses' dining-room and two nurses' bedrooms but these have not been considered as service rooms. PZ is planned to be a university clinical school and so it is likely that its scale of ancillary services is on the high side. Even so there would seem to have been an attempt to keep them within limits and it may be that the service of three units by one duty room will lead to loss of efficiency in nursing. Similarly one treatment room to 50 beds may lead to some congestion there. To suit the English method a duty room and a treatment room per unit of 25 beds would be more convenient.

43. Duty Room. At SS this contains the poison cupboard, which lights up when the door is opened and a small built-in refrigerator for sera, penicillin, etc., divided into compartments fitted with grilled locking doors ; in this way drugs for external use are kept separate from those for internal use. There is a switchboard with a buzzer and red signal lights from the patients' beds ; it is only possible to turn off these lights from the patients' room. The front of the duty room has a large glass window facing into the ward corridor and it projects about a foot so that the corridor can be watched. This plan also seems to be adopted at the Kantonsspital Zürich.

44. Sluice Room. The most interesting unit was at SS based on the principle that bedpans should not be used in the wards. Those patients who cannot walk to the w.c. are pushed in their beds into a roomy lavatory and use the bedpan there : enemata are given in the same room. Patients much appreciate this practice and while many of the nurses also approve of it, there are those who complain that it

makes a lot of heavy work. It seems possible that patients may be encouraged to walk to the w.c.'s to a greater extent—and perhaps earlier post-operatively—than is the practice with us.



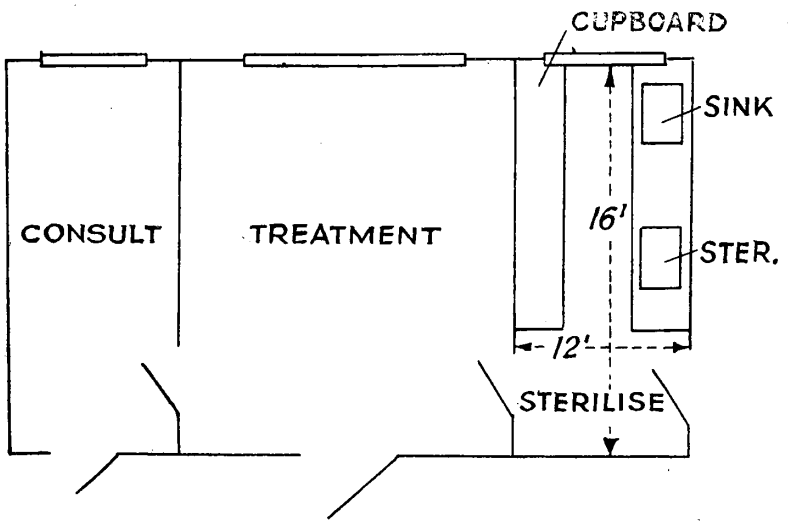
1. SINK FOR MACKINTOSH SHEETS.
2. BED-PAN AND BOTTLE WASHER.
3. BED-PAN STERILISER.
4. SLOP-SINK.
5. CUPBOARD.
6. BED-PAN STORE.
7. W.C. FOR AMBULANT CASES.

ENEMA & SLUICE ROOMS. S.S.

The use of a room of this kind together with the use of single rooms for patients who are dying or are seriously ill almost precludes the necessity of carrying screens about the wards, but we also saw in this hospital a good pattern of light and easily movable screen with a central wheeled stand and two lateral flaps framed in stainless steel or aluminium tubing. The bedpans at SS were made of stainless steel and in the sluice room they were automatically washed, sterilised by pressure steam and stored on warmed racks. The steriliser has a hinged lid in which cold water circulates to condense the steam and prevent its escape into the room. Urine bottles are automatically washed by a jet actuated by pressure downwards of the edge of the mouth of the bottle on a spring plate in whose centre is the jet. In other departments this fitting has been adapted for washing chemical flasks and even test-tubes. There was also a deep wide sink for washing mackintoshes and a rail for drying them. The whole of these fittings are a standard unit in stainless steel. This seems an efficient system which, as far as can be seen from the plans, is being adopted at the Kantonsspital Zürich and was attached to the experimental ward unit.

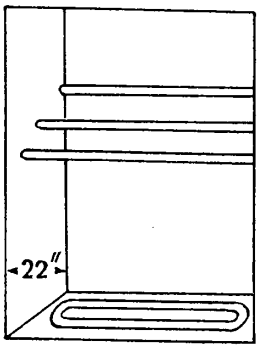
45. Treatment Room. At SS the treatment room is used for the primary examination of the patient on admission as well as for treatment; the doctors' consulting room opens off one side of it and a sterilising room off the other. The sterilising bench is a standard unit in stainless steel with two electric boiling plates at one end, a deep pressure-steam steriliser with hinged lid and lever handle, let into the

table, and a sink. On the opposite side of the sterilising room is a large cupboard with drawer stacks under it.



TREATMENT ROOM SUITE. S.S.

46. Linen Room. At SS this was about 10 ft. by 16 ft. lined with shelves about 18 ins. wide and not heated especially. Mattresses were stored in the lower shelves of one side, laid flat on specially wide shelves slotted through the party wall into the back of a cupboard in the next room. In the corridors there were simple airing cupboards let flush into the walls. They were 22 ins. deep with a raked tier of three or four wooden rods to carry linen with a hot pipe below; the cupboard was about 5 ft. high. There was also a flower room in the ward unit combined with the cleaners' pantry.



AIRING CUPBOARD. S. S.

47. SOLARIA. At BP the wards ended in open balconies which could only be used in fine and reasonably warm weather. At SS the total enclosure of the balcony space at the end of the ward gave solaria facing south which could be used at any time of the year. For winter use there was roof and floor heating. These rooms were 45 ft. wide and 20 ft. deep, with large windows arranged in three panes of a combined area of 80 ins. high and 74 ins. wide. The supporting structures were two slender bearing columns each 16 ins. wide. The back wall on which the sun fell was pale green and the ceiling was the same colour; the floor was a grey composition and the glare was minimised. The room could be used either for ambulant or bed-patients but the nurses did not care about pushing the beds out. At KZ we saw a roof ward for children with chronic septic diseases, where the front of the ward consisted of folding french windows from floor to ceiling which could be pushed back from the centre. Outside there was a roof balcony and the ward inside could be centrally heated. A sunblind came over the balcony and ward front, while the rain was kept out by an overhang of the roof. This ward could be used open to the air either in summer or winter. The traffic of the unit passed through the back of the ward off which the ancillary rooms opened. At BB there was a roof terrace partly for ambulant cases and partly for the staff. Part was half-roofed and part wholly enclosed with large glass panels. In none of the modern adult hospitals were there any balconies to the wards, except at BB where there were balconies for the rooms of the first-class private patients.

48. OPERATING UNITS. Our general impression was that there is nothing outstandingly new in these hospitals as regards the general lay-out of the main operating suites. At BB, BP, in the E.N.T. department of PZ and in plans for the main theatres there, there are separate theatres for septic and for aseptic operations; this was not the case at SS. In all cases the operating unit is planned about a central corridor and this seems to lead to some awkwardness in the disposition of the rooms for, since the scrubbing-up room must be next the theatre, the anæsthetising room becomes separated from it and may be on the opposite side of the corridor, while the staff changing rooms may be yet more remote. At BB the position of the anæsthetic room on the opposite side of the corridor was not liked; the scrubbing-up rooms were too narrow and the natural line of approach to them was through the theatre. The ventilation was inadequate as air-conditioning had been omitted on the ground of expense so that the staff found the theatres rather stuffy and uncomfortable. The floors in the theatre were of a grey composition tiling, perhaps cement and asbestos, and it was already showing wear. At SS the theatres were fitted with external motor-driven black-out blinds controlled from the sterilising room, any degree of darkening being obtainable. There was a special

ventilating plant with thermostatic control at 25° C. and humidity adjusted to 60 per cent. to avoid the risk of static discharges. Theatres were about 18 ft. high with cellotex ceilings and a 44 in. door opening with an additional flap to 56 ins. Stainless steel stools were provided in the scrubbing-up rooms. The anæsthetic room was on the opposite side of the corridor. Services of suction, sterile distilled water or saline and anæsthetic gases were not as a rule " laid on," but were produced locally by equipment on each unit ; this may have been because the theatres were not in " stacks " but were scattered about in lateral planes. At SS there were 28 theatres in all including the special departments and some were wired for high-tension X-ray plant, the transformers being in the X-ray department one or two floors below. There did not appear to be a special X-ray theatre ; other fittings were built-in viewing boxes, an automatic dry heat steriliser at 180° C. and spot-lights attached to the shadowless lamps over the tables. At PZ in the E.N.T. clinic distilled water and air pressure were laid on, one of the uses of the latter being to dry endoscopy tubes and instruments and so avoiding rubbing them : all theatre furniture other than the table was on wheels for easy movement. Control of taps for the wash basins was by knee-height levers with wide ends, and the theatre linen was kept in a warmed cupboard. An unusual service was a piped supply of soaped water at BP. At BB the wall space between the doors of the ancillary rooms opposite the theatres was used for shallow cupboards about 22 ins. deep and 7 ft. to 8 ft. high in which were housed the anæsthetic apparatus and a variety of large and small equipment. On the same side of the corridor and in the middle of the length of the unit the theatre instruments were kept in a special bay with glass stainless steel cupboards on either side and below window level, with a glass-topped central counter having drawers and cupboards under. Portable X-ray apparatus is used in the theatres. Colour schemes for the theatres were generally blue or green walls in tiling or hard plaster with grey floors.

49. ANÆSTHETICS. These were usually given by specially-trained nurses except spinal anæsthetics which were given by the surgeons. It was only in Sweden that anæsthetics were being thought of as a professional department. At the Karolinska Hospital there is an American-trained Professor of Anæsthetics who is working up a school in the subject.

50. ENDOSCOPY. The siting of this room varied in different hospitals. At SS it is in the E.N.T./polyclinic close to the main E.N.T. theatre having a common sterilising room. It was furnished with built-in viewing boxes and was wired for X-ray work. At BP the endoscopy room was in relation to the tuberculosis wards while in PZ there were two rooms, one in the E.N.T. department and the other in

the medical polyclinic opposite the special rooms for investigating diseases of the lungs.

51. MATERNITY. There were no modern maternity units at BB or PZ, so we only saw those at SS and BP. At SS all maternity cases are kept in hospital for a minimum of 10 days and every woman in labour has a room to herself. At BP for 110 beds there were four first stage rooms holding two beds each and six labour rooms or 18 beds to each labour room. The labour wards were one end of the very long corridor of the maternity unit and at the other end was an operating theatre used partly for cæsarian sections and partly for gynæcological cases. Gynæcology did not seem to be treated as a special department but as a part of general surgery. In the labour unit there was a theatre for forceps cases and a room for the toilet of the newborn. Infected or suspect cases were isolated on the floor below. In the large lying-in wards of 16 beds, the beds were arranged head-to-head down the centre of the ward with a low screen between the rows; the babies were in bassinettes at the bed-foot and remained there during the night. There was a milk kitchen for the whole unit containing a pasteurising autoclave, cooling tank, a large sink with two motor-driven bottle brushes, a peg-rack for drying bottles and a dry heat steriliser. When the sterilised bottles had been filled with one of several varieties of feed they were kept in a large multi-compartment refrigerator.

MIDWIFERY DEPARTMENT OF THE SOUTHERN HOSPITAL, STOCKHOLM

(NOTE BY DR. DOYNE BELL)

ADMISSION. Dr. Malmnas acted as guide in a tour of this department. The department has an entirely separate entrance from the rest of the Hospital. It is designed to provide a service of 130 beds. On entering the department there is a waiting-room and adjoining it a preliminary examination room. The purpose of this is to divide the cases before admission into infected and non-infected cases. The "infected" is designed to include women suffering from colds, sore throats, infected ears, skins, etc. Non-contagious infections, such as cystitis, are not separated from non-infected cases. From the waiting room and preliminary examination room separate entrances for the infected and non-infected cases lead to a bath room and sanitary suite. Here all the patients' clothes are taken away, placed in a bag with a zipper fastener, and conveyed on a continuous chain to a basement wardrobe. For the case actually in labour on admission there is a special delivery-room next door to the bathroom.

DELIVERY. There are 17 individual wards. It is a rule that no two women shall ever be in the same ward during labour ; each woman in labour is in her own single room. Near the labour wards there is a forceps theatre with room for pupil midwives to watch operations. The mother remains in the labour ward after delivery for two hours before transfer to the main ward. If the delivery takes place during the night she stays in the labour ward until morning in order not to disturb the patients in the main wards. Normally mothers and babies stay in the hospital for about ten days.

ACCOMMODATION. The total accommodation is 130 beds. This is made up of an " infected " ward unit of :—

$$\left.\begin{array}{l} 6 \times 1 \text{ bedded wards} \\ 1 \times 2 \quad ,, \quad ,, \\ 4 \times 4 \quad ,, \quad ,, \end{array}\right\} = 24 \text{ " infected " beds}$$

and four non-infected ward units consisting of :—

$$\left.\begin{array}{l} 4 \times 1 \text{ bedrooms} \\ 1 \times 2 \quad ,, \\ 5 \times 4 \quad ,, \end{array}\right\} = 26 \text{ non-infected beds.}$$

In addition, there is a four-bedded room and a day-room for mothers who prove to be not in labour : that is to say, who have been admitted by mistake prematurely. There is a special examination room in which all patients are examined before leaving the hospital. As in the other ward units throughout the hospital a special room known as the " conversation room " is provided so that the patients may talk privately with doctor, priest, husband, etc. We were told this is the only hospital which has such a room and that it was much used.

There is a small operating theatre where cæsarian sections are performed.

There is an X-ray room attached to the department. I did not form the impression that there was a separate X-ray room for infected cases. There is a room for the night duty doctor.

ACCOMMODATION FOR BABIES. Attached to the 17 labour wards are two nurseries. Premature babies are nursed temporarily in the department and transferred as soon as possible to the neighbouring children's hospital. There is therefore no incubator room, but for these premature babies special heated boxes are used. These are metal boxes with hot water jackets, the water being heated by an electric immersion heater controlled by thermostat. The hot box seen was made by Birka. There is said to be a more modern model by Aga. An isolation nursery is provided for babies suffering from infections. This is said to be unnecessarily big and has never yet been fully occupied.

The general nursery for healthy new-born babies contains trolleys of two sizes taking either four bassinettes or two bassinettes. The bassinettes are box-shaped on a stainless steel frame with removable plywood sides and metal bottoms. In cases where there is thought to be a risk of contact with a tuberculous subject, the babies are given an injection of B.C.G. at birth and again at the age of six weeks.

There is a small milk kitchen for the preparation of such artificial feeds as are needed for the babies.

An organisation for the supply of expressed breast milk is run by the Stockholm Mjolk Centralen, and breast milk can be bought at the ordinary Stockholm city dairies. A mother with superfluous breast milk is paid at the rate of 5 Kr. a litre. The price of breast milk in the dairies is 4 Kr. a litre.

There is a chapel attached to the main Welfare Department with about 100 seats. It is largely used for christenings and there are two christening days a week. It seems that these ceremonies are largely attended. There is a microphone at the font so that the service and sound effects can be heard by the mother from her bed.

TEACHING. There are 50 pupil midwives. In addition to the forceps theatre, which has three rows of steps and rails for the pupils to view forceps operations, there is a lecture room fitted with steel laboratory bench and refrigerated cupboards where daily examinations and demonstrations of placentæ take place.

The department carries out from 12 to 15 deliveries a day on the average.

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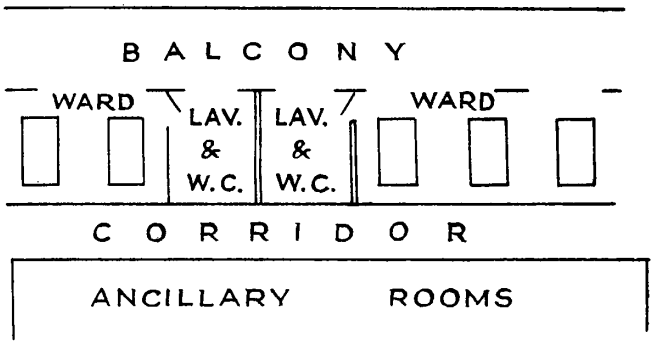
52. INFANTS AND CHILDREN. The continental practice seems to be to have special hospitals for children rather than children's departments in general hospitals. At Zürich we visited such a special hospital, part of which had been rebuilt just before the war. It contained medical and surgical wards, an isolation block for the acute specific fever cases and a polyclinic with ancillary services. The roof ward has already been described and a rather similar system of shutter-type window was used for the infants' rooms though without balconies. Infants were warded in small rooms of two bassinettes, about 13 ft. high by 9 ft. by 7 ft. 6 ins. Between the rooms there were glass partitions from the ceiling to about 4 ft. above the floor, but at the back there was a gap of about 4 ft. below the ceiling so as to get cross-ventilation. Premature infants were kept in a warmed room and incubators were not used. The infectious block had a separate nursing staff, pathological laboratory, X-ray, short-wave and ultra violet light plants, being a self-contained unit performing the function of a fever hospital. The system of isolation seemed rather complicated. There was a surgical unit in the old building under a separate surgical chief

but the Professor of Pædiatrics had the overriding administrative control. There were six assistants officially appointed to the Professor but some 20 doctors in all worked in the hospital as post-graduates.

53. Tuberculosis. At BB the tuberculosis wards were on the roof of the isolation block ; in BP they formed the topmost ward floor of the main in-patient building, while in the Kantonsspital Zürich they will form the top storey of the western wing of the in-patient block. At BP the wards were arranged as a row of single beds facing outwards to a long balcony.



TUBERCULOSIS WARDS. B.P.

The physician in charge wanted to have small wards of not more than six beds with several single-bed rooms. There seemed to be a need for both suction and pressure to be laid on in these wards ; we saw a group of eight cases of lung abscess being treated with penicillin-spray inhalers connected to bulky compressed air cylinders. The sputum-pots here were cardboard cartons for easy incineration but they were made too thin and tended to collapse, thus becoming dangerous. There was a room for pneumothorax induction and refill with a screening apparatus. In addition there were two treatment rooms, one for septic and one for aseptic operations, an endoscopy room and on the floor below a thoracic surgery unit.

D. Out-Patient Services.

54. As has been stated earlier, it seems to be the accepted practice that the out-patient department should be in a distinct building wholly separate from the in-patients except for cross-communication by two or more corridors. The only exception to this is the maternity department which is either located in a separate building of its own or has its

own separate exits and entries removed from those of the general hospital patients. In general the mass of the out-patients are dealt with on the ground floor, the upper floors being used for the special departments, radiology, laboratories and in some cases the main operating theatres, so that the out-patient building is often referred to as the "treatment block." We gathered the impression that the comfort of the foreign out-patient is studied less than it is with us. In none of the hospitals was there an out-patients' canteen of easy accessibility: at SS there was a canteen in the visitors' hall which could be used by out-patients but it was on a lower floor. The waiting rooms in this hospital were provided with jet-drinking fountains and indeed with china spittoons like small wash basins with a flushing tap. At BB and SS the polyclinics worked nominally on the appointments system but at both places we were told that it broke down through pressure and patients might have to wait two or three hours. The types of seats provided varied a good deal. In BP, the oldest hospital, there were separate chairs and tables to sit at : in BB there were new hard benches with rather straight backs, arranged in rows ; in KZ there were no waiting rooms but the same type of wooden bench was attached to the walls of the corridors in the polyclinic. In SS there were chairs in ranges of four and tables ; in PZ there were rather peculiar chairs built together in pairs or ranges of four. The level of comfort did not strike us as very high.

55. Male and Female Cases. Methods of separating the sexes in out-patient clinics have a very considerable influence on construction and in each hospital it was dealt with in a different way, suggesting the experimental approach to yet another problem. At present at SS in the surgical clinic men are seen in the morning and women in the afternoon, but this is unsatisfactory and the difficulties appear to be such that entirely separate male and female clinics are to be built, a costly process involving duplication of buildings, of services, of ancillaries and of staff. In the surgical polyclinic at BB there is a common waiting room on one side of the passage and two clinics, one for men and one for women on the opposite side. At BP there is again a large central waiting hall common to both sexes ; from each side of it dressing cubicles open off into the consulting rooms, men using the left side and women the right side. At PZ, the newest polyclinic, the services for preliminary examination in the medical polyclinic are duplicated, roughly one-half of the width of the building being for women and the other half for men. This requires an unusually wide building and it is 82 ft. in width ; the waiting halls and preparatory examination rooms are centrally placed and have top lighting. On analysis it would seem that the design and smooth working of this plan is based on the permissibility in foreign countries—but not in ours—of siting w.c.'s in the middle of a building instead of on an outside wall, and in much

of the foreign planning the flexibility and compactness of design seems to centre around this rather trivial matter. It must also be realised that in the foreign hospitals the examination of the bulk of the patients is done primarily by assistants and not by the chief of the service as happens so often, especially in teaching hospitals, in this country. In the medical clinic at PZ the professor had 12 assistants appointed to him : in the E.N.T. clinic the professor had seven assistants. So in the medical clinic there were six consulting rooms on the male side and six more on the female side. These must act largely as sorting stations from which patients requiring further investigation are passed on to the professor and a whole range of special investigation rooms in the northern half of the same floor. It is not impossible that some such system of a large assistant staff will have to be developed in this country where the necessity of teaching by the chief of the service is so often in conflict with the organisation of the appointments system.

56. PAYMENT FOR TREATMENT. In SS and BP there was an office in or near the out-patient clinics at which the patient pays a fee and receives a numbered ticket ; entry to the consulting room is in numerical order of tickets. At PZ there was an almoner in the main hall with an office and secretarial assistance.

57. UNDRESSING CUBICLES. These small rooms, which are individually trivial, may in the aggregate make a considerable difference to the size of the rooms to which they are attached and so to that of the building itself. They are becoming increasingly numerous in modern hospitals, occurring particularly in casualty, in the general out-patient clinics, in maternity clinics, in the X-ray departments and elsewhere. In the hospitals we visited we met the screen type once and the more common type was built into the structure. The screen type we saw in the smaller examination rooms of PZ as a single structure ; it was formed of a screen 6 ft. high in three panels enclosing a space 38 ins. by 40 ins. fitted with a shelf and two hooks, and a stool. The built-in cubicles were in batteries and their size varied a good deal.

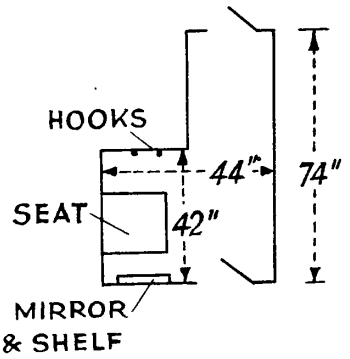
TABLE 4.

Built-in Cubicles.

Hospital.	*Department.*	*Size.*
BB	X-Ray	44 ins. × 74 ins. with two doors.
PZ	Medical O.P.	39 ins. × 60 ins. ,, ,,
BP	Surgical O.P.	30 ins. × 48 ins. ,, ,,
SS	Do.	36 ins. × 52 ins. with curtain front.

The usual fittings were a seat, a mirror and shelf under it, and two or three hooks. Those at BP seemed very cramped. The average of the figures in Table 4 is 37 ins. by 58 ins. and probably a cubicle 3 ft. by

5 ft. is not far from a reasonable standard. Those at BB were a rather curious shape.



DRESSING CUBICLE.
B. B.

Other cubicles we saw were for rest, recovery or metabolic investigation and these were considerably larger as they contained beds.

58. E.N.T. Department. This was a particular feature at PZ and we were shown round it by Professor Nager in some detail. A major problem in all E.N.T. departments is the post-operative disposal of tonsillectomy cases: at PZ 400–600 such cases were treated annually and the general rule was that dissection cases were taken into hospital for five days while ambulatory cases lay in the recovery room for some eight to ten hours before being allowed to go home. The recovery room contained about eight rest-cubicles separated by glass screens. At SS tonsil cases were kept in hospital for a week after dissection. An interesting feature in PZ was the main examination room in which there were ten examining units separated into two blocks of five by a central sterilising plant from which a continuous flow of sterile instruments was supplied to the units. The unit consisted of a very compact and highly mechanised cabinet, designed by the architects, big enough to provide some privacy for the patient and also compact enough for the surgeon to have everything he might want under his hand without having to move to fetch it. In addition to instruments, steriliser, spittoon, lights, etc., a writing slab was incorporated as the professor was insistent that the notes of each case should be written at the time the examination was made. There were also two or three closed examination rooms for difficult patients opening off the central clinic. At the south end, the clinic opened on to a long passage comparatively but not absolutely sound-proof and measured out into metres for rough audiometry.

59. There was a relatively large laboratory for histology only, the professor being firmly of the opinion that E.N.T., ophthalmology and neurology should have special histological laboratories within their own

departments. Another feature was an " inhalation room " for the inhalation of various drugs, including penicillin. There were six inhalation " cubicles " separated by opaque glass screens and furnished with a sink or basin containing the mouthpiece of the complex and expensive inhaling machine, and a time recorder. The patient was provided with a sterile nose-and-mouthpiece and by means of the time-clock controlled his dosage according to the instructions given to him. It seemed possible to us that the treatment might be given as efficiently by simpler and less costly methods.

60. CAMERA SILENTA. We saw two such rooms, one at PZ and one at SS. At PZ freedom from external sound was obtained by insulation of the room and not by suspension. The room was about 15 ft. by 18 ft. with walls and doors 21 ins. thick, cellotex ceiling and a thick felt carpet on the floor. Lighting was wholly artificial and there was a light signal to the outside. The room had its own heating and air-conditioning plant to avoid sound conduction. At SS the construction was not quite so elaborate. The room was built on a plate resting on pillars and had a double ceiling with air-space insulation. The ceiling sloped slightly and the walls were built not at right angles to each other. The ceiling was cellotex and one wall was panelled in the same material ; lighting was by daylight through double double-glass windows. The walls were about 3 ft. thick and there were double doors, one opening inwards and one outwards.

61. METABOLISM ROOMS. At BP in the Central Laboratory there was a room containing three beds for basal metabolism, test meal and blood sugar investigations. Under the name of " the department for fasting patients " in the medical clinic at PZ there was a suite of rooms for similar investigations containing :—

(i) A room for B.M.R. with six couches separated by movable glass screens.
(ii) Eight small rooms for collecting test meals and leading to
(iii) A chemical laboratory.
(iv) A room for the direct estimation of blood p_H.
(v) A room for the gasometric analysis of blood.
(vi) A room for spirometry.

62. RADIOLOGY. The tendency to decentralise some parts of radiological investigations seems to be growing with the improvement in design and control of the apparatus, and in most of the hospitals visited the screening machine is becoming a standard equipment for clinical diagnosis. Photographic diagnostic radiology is largely, but not entirely, limited to the main department, but screening machines are found both on the wards and in the polyclinics. At PZ, for instance, every medical out-patient is screened as a routine and there are at least three screening machines in the clinic. In addition there are portable

machines used in the theatres and elsewhere. As the radiological department is usually the largest of the special departments as far as space is concerned, it is a common practice to site it on a floor of the out-patient block, the in-patients being brought to it from the ward block. At SS we were told that the size and capacity of the X-ray department is the main factor which decides the size of the hospital, and in this institution the department was duplicated functionally, each half serving one half of the hospital, about 600 beds. One felt that this was perhaps rather an artificial conception.

63. Radiological Technicians. A practice common to almost all the hospitals we visited is that the X-ray technicians operate the machines from a control-cabin more or less completely enclosed and provided with windows. At BB before this method was used it was found that the technicians persistently showed abnormalities in their blood pictures. At BP the technicians have a hæmatological examination every three months and the qualified staff of the department every six months.

64. The growth of diagnostic radiology may be instanced by the difference in size of the departments of BP (1935) and SS (1944). At BP on the diagnostic side there were five rooms each containing a w.c. for passing back enemata whereas at SS there were 16 rooms for diagnostic photography more or less specialised for separate areas of the body, but not entirely so. There were the usual developing, finishing and drying rooms and a considerable range of viewing rooms with batteries of built-in viewing boxes on a rather lavish scale. This department provided a service for outside practitioners as well as for the hospital.

IV. SPECIAL SERVICES

65. Laboratories. The arrangement of the laboratory services in the hospitals visited was on a rather different plan from that which is usual in this country. "Pathology" implies morbid anatomy and histology and one rather gathered that these were regarded as the basic subjects whereas all the rest was primarily clinical pathology necessary for diagnosis and treatment but essentially ancillary to clinical medicine. In teaching hospitals a large building was dedicated to the service of morbid anatomy and histology whereas bacteriology and pathological chemistry might be housed in separate and quite different parts of the hospital or the work might be sent to some outside institution. The laboratory work was divided up among the following stations :—

1. The main laboratories.
2. The laboratories of the polyclinics.

3. The ward laboratories.
4. Special laboratories of the clinics for research.

66. Main Laboratories. The grouping of morbid histology and anatomy, bacteriology and pathological chemistry in one block or building to form an inter-related pathological service was generally not followed. The primary unit of the main laboratories seemed to be formed of morbid histology with the autopsy and mortuary service sited reasonably near the in-patient building. At PZ a large building of several storeys was in the course of construction to house this service, for it was planned to do bacteriology and serology in an Institute of Hygiene and pathological chemistry either in a university department or in a special laboratory in the new building. At KZ in the acute infectious block the bacteriology was sent out to the Institute of Hygiene. At BP the main laboratories were in the polyclinic block and here histology, bacteriology and serology were grouped together but pathological chemistry was attached to the pharmacy in the basement of the in-patient building and was under the charge of the chief pharmacist. At SS the morbid anatomy and histology laboratories were in the out-patient building in the basement while in quite another part of the same building on the fourth floor was the central clinical laboratory which dealt with all other pathological investigations under a single director. While one may be prejudiced by traditional arrangements, it does seem possible that this dissociation of the branches of the pathological service might make the complete investigation of a case more difficult.

67. Laboratories of the Polyclinics. While the greater part of morbid anatomy and histology is related to the exact determination of the nature of a definite lesion, much of clinical pathology in its widest sense is concerned with finding out if any lesion is present or not and is therefore essentially exploratory. This implies that many of its results will be within normal limits and that there will be a large element of routine, giving a massive load of rather uninteresting work which is most suitably broken up in subsidiary laboratories. In the hospitals we visited the function of the polyclinic laboratories was to perform immediate and fairly simple investigations on the patient and to collect specimens from difficult cases for more complex investigations. Most of the work done in these laboratories is therefore urinanalysis, blood sedimentation, general blood counts and minor bacteriology. They were staffed by women technicians and were under the charge of the chief of the clinic. At the PZ medical clinic urinanalysis, sedimentation rate and the Wassermann reaction were performed on all patients as a routine so that essential structural features of the clinic were lavatories for passing urine and rooms for venipuncture, the blood specimens being taken by nurses and not by the laboratory staff. At

BP each out-patient clinic had its own laboratory but at SS there was a single laboratory for the whole polyclinic, a room about 27 ft. by 16 ft. with service lifts to the central laboratories on the floor above. No patients came to this laboratory but the specimens were brought to it from the clinics where the nurses had been trained to do venipuncture. At BB there were two sets of laboratories, one for the surgical side and one for the medical which we understood to be for research rather than for routine. There is no doubt that these subsidiary laboratories of the polyclinics serve a useful purpose ; they save time for both patient and clinician and by breaking down into smaller fractions a large total bulk of routine work, much of which is of no great interest, they save the central laboratories much time and space which can be more properly used for the more difficult investigations, for teaching and for research. The possibility of decentralising pathological services in some such way may well be worth consideration in any new building in this country.

68. Ward Laboratories. These were not universal. At BP there was a ward laboratory on each floor of 110 beds, probably too small a service ; at BB the ward floors were connected by a special lift to the medical or surgical laboratory units and at SS there did not appear to be any ward laboratories. In the new Kantonsspital one ward laboratory is planned for every 25 beds.

69. Special Laboratories for Research. At BB we saw a laboratory suite of this type in the surgical department, containing a full range of facilities in histology, bacteriology, hæmatology and chemistry in small but well-equipped rooms. There was a technician service and the assistants to the clinic were expected to make original investigations. There was a similar unit on the medical side. At PZ Professor Nager had a special histological laboratory for investigating lesions of the auditory apparatus. These laboratories were under the control of the chiefs of the clinics ; we did not see similar units either at BP or SS. Their inclusion in the equipment of the larger clinics is probably a wise provision.

70. Autopsy and Mortuary Service. In these foreign hospitals autopsies were performed as a routine on the great majority of deaths so that the equipment was usually generous. For 1,000–1,300 beds six or seven autopsy tables were provided except at SS where for 1,200 beds there were no less than ten tables of various kinds though the total number of autopsies was around 500 per annum. There were four tables for adults, two for infants, three in separate rooms for special cases and one table for X-ray photography ; there was also a portable screening machine. Here also the tables were teak-topped with stainless steel underfittings ; at BB the tables were marble and at BP porcelain. In all cases water was provided from below the

table by armoured hose with a rose fitting and the sink was at the foot-end. Cold storage was provided at BB for 12 bodies, at BP for 20 bodies at 4° C. and for ten more at about 2° C.; and at SS for 36, with deep freezing at —10° C. for four more bodies. The pathologist thought that half this number would have been adequate. At PZ storage for only four bodies is planned so there is evidently a very considerable variation in this costly and space-consuming provision. At BP the autopsies were performed theoretically by the head of the department to which they belonged but in practice by the house officers. At SS they were done by the morbid anatomist who was also the morbid histologist. At BB police cases were dealt with by the Professor of Forensic Medicine in the anatomy department.

71. In general the bodies came into the basement of the morbid anatomy department by an underground passage; at BP where this department was in the basement of the in-patient building, there was a special lift for bodies. Here they were weighed, measured and placed in cold storage if not dealt with immediately. On the same level the range of mortuary viewing rooms was also placed, usually three or as many as five or six, tending rather to the macabre. In some cases the autopsy room was on the floor above being lighted naturally and connected by a lift to the floor below. At BB and PZ there were fitted theatres for autopsy demonstrations and at PZ a gas incineration for the destruction of organs not buried with the bodies, a freezing store for the preservation of such organs and storage rooms for formolised material.

72. PHARMACY. At PZ there was a manufacturing pharmacy for the supply of the needs of the Health Department throughout Kanton Zürich, so it was very large and occupied a great deal of space. By contrast at SS the pharmacy looked to be too small until we learnt that it was almost solely for the in-patients and that out-patients rarely go to it. This is because the pharmacy is let out to a firm of dispensing chemists from the city and out-patients would have to pay the same price at the pharmacy as in the city. This system has the obvious advantage that it reduces the size of the pharmacy very materially as well as its maintenance costs and it avoids the crowd of waiting patients and the necessity of finding space for them to wait in. It raises again the question whether it is the proper function of out-patient clinics to be primarily consultative or essentially therapeutic. The dispatch of drugs from the pharmacy at SS to the wards was by the use of light wooden boxes with locks numbered according to the wards; the keys were held by the pharmacy and by the ward sisters. These boxes were arranged on the hatchway system being collected from the corridor side of the pharmacy by trolley and sent to the wards by service lifts. The boxes were 20 ins. deep, 15 ins. high and 13 ins. wide.

V. GENERAL SERVICES

73. COLLECTION OF DIRTY LINEN. The actual collection in the ward unit or theatre was done most simply by clipping bags open on square metal frames, the method used in post offices. The less settled problem is the means of transferring the bags to the laundry, the alternative methods being by chute or by lift. At BB chutes were not used ; one of the sisters who had worked with them at Heidelberg said that there they became fouled and gave rise to an all-pervading smell. At KZ there was a linen chute for the infectious block but not elsewhere. At SS chutes were in general use both for wards and theatres ; the doors of the chutes were clamped so as to be airtight and a control was arranged so that the doors of a chute could not be opened if any one was standing at its bottom or if any other door was open. There did not seem to us to be any unpleasant smell.

74. COLLECTION OF REFUSE. The largest amount of refuse comes from the kitchen and where this is at ground level, the disposal of waste presents no great problem. At BP where the kitchen was so sited, rubbish from the wards came down in a special lift in the east or kitchen wing of the building, and nearest to the incinerator in the power house buildings. At SS where the kitchen was on the roof chutes were used, the rubbish dropping into large metal bins at the bottom, of about 4 ft. or 5 ft. cube ; these were then handled by a small crane, tipped into the incinerator (from which steam was raised) and then inverted over a mechanical washing machine. The swill cans were kept in a " cold room " in the kitchen until removed by lift, thus avoiding flies and decomposition.

75. LIFTS. In vertical hospitals the lifts are the main methods of vertical communication and we found that staircases were largely for emergency purposes ; it is essential that the lifts should be sufficient in number and reliable in performance. In the hospitals we visited there were three types of lift in common use : the large bed-lift taking a bed or stretcher with attendants or not less than 12 persons alternatively ; the personnel lift taking 6-8 persons or a patient in a wheeled chair ; and the service lift for food, medicines, specimens and supplies generally. At BB there were six bed-lifts for 730 beds or one per 120 ; there was complaint that this was too few especially on the surgical side where the bulk of the patients were not on the same level as the main operating theatres. There were two personnel lifts and these were also insufficient. There were eight special lifts for the food wagons measuring 72 ins. high by 39 ins. wide by 54 ins. deep taking one wagon each. In all there were 21 lifts of various kinds. At SS there are no less than 50 lifts of various kinds for the service of the 1,200 beds : from the floor plans it seems that there are 18 bed-lifts and at least 11 personnel lifts. The bed-lifts carried 15 persons and the personnel

lifts five. The 11 subsidiary kitchens account for 11 service lifts and the roof kitchen was supplied by two large lifts used only for carrying food supplies. At BP the lateral design of departments making each floor reasonably self-sufficient, lessened the vertical movement of patients; there were eight large lifts used mostly for visitors, 15 service lifts and nine other lifts of various kinds, a total of 32. In all cases the lifts other than service lifts were automatic. Excluding purely service lifts, the ratios of bed + personnel lifts to hospital beds are: at BP 1 : 140, at BB 1 : 73 and at SS 1 : 42, a rather remarkable variation. In BB, SS and KZ the rather unsightly skeleton of the lift shafts was enclosed by opaque glass with a fine wire mesh and the effect was quite pleasant.

76. STERILISATION. Local sterilisation plants in ward units, theatres, etc., have been already mentioned (p. 27) and here notes are made on the central plant. At SS there was a sterilising plant in the basement consisting of a large room for making up dressings, a sterilising room fitted with two pressure-steam autoclaves going through the wall to the drum room. All dressings were meant to be dealt with here but owing to disagreements, the surgical and maternity departments now sterilise their own dressings and linen elsewhere, so that this plant supplies chiefly the needs of the polyclinic and wards. Steam is supplied to the sterilisers at 1·5 atmospheres and 130° C. At BP chemical sterilisation by formol vapour was used in addition. Clothing was sterilised by pressure steam and books by formol vapour while mattresses and bedding were first treated with pressure steam and then with formol vapour, though no particular steps seemed to be taken to remove the latter finally. Regular tests of the efficient working of the sterilising plants seemed to be rather vague. In no hospital did the sterilisation seem to be in charge of personnel trained specifically for that work. The centralisation of a service of dry sterile syringes was also absent and at BP syringes were usually boiled on the wards, the practice too common in this country.

77. VENTILATION. The desirability of air-conditioning or forced ventilation in hospitals is still unsettled and is primarily governed by its initial cost. At BB there was forced ventilation only to a very limited degree, as in the X-ray and physical therapy departments, in the clinical lecture theatres, in the kitchens and catering rooms and occasionally in one of the two-bedded rooms of the ward units. At PZ on the other hand the whole polyclinic was air-conditioned, the air flow being so arranged that it came slowly into the larger rooms, passed more rapidly into the corridors and smaller rooms and finally still more quickly through the toilets. At SS air conditioning was always used in rooms where patients were in bed or were treated, in the kitchens and in the basements; the theatres had special ventilating arrangements. At BP there was forced ventilation for the kitchens but it was not generalised in other parts of the hospital.

78. HEATING. While space-heating was uniformly by hot water, both surface radiators and embedded pipes seemed to be equally used, some of the radiators being of remarkable size and extent, chiefly horizontal but occasionally vertical. At BB winter heating was from ceiling panels, through which cooling mixtures were run during the heat of the summer. At PZ heating was partly by means of radiators and partly ceiling pipes, and at BP it was by radiators only. At SS the hospital as a whole was heated by radiators ; the theatres had pipes embedded in the floors and walls, while the solaria were similarly heated from the floors and ceilings. In connection with heating an interesting and unusual type of hot bottle for patients was seen at PZ and KZ. This was a metal cylinder with rounded ends containing a patented heat-retaining compound whose nature we could not find out. These cylinders were heated up in an oven-like thermostatically-controlled cupboard made of a solid matrix rather like firebrick with rows of holes into which the cylinders fitted fairly closely. The " bottles " were thus always at a fixed temperature, neither too hot nor too cold, a fresh one at the right heat is always ready, and there is no emptying and refilling to be done. At SS curiously enough the bottles seemed to be of the old " stone " type.

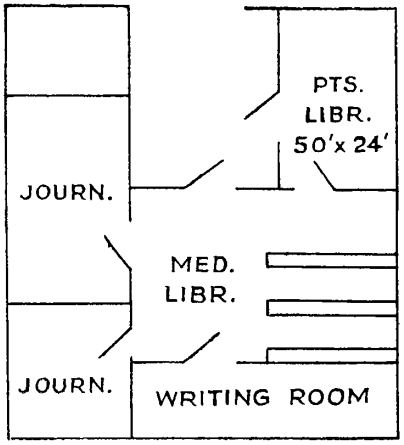
79. LIGHT AND POWER. We did not see any special features of lighting and were a little surprised at the slight use made of strip lighting. There were one or two curious points about power supplies. At PZ this was supplied by the town at three different cycles while water was supplied at three different pressures. At BP the current came in at 1,200 volts and was broken down to 250 volts for power and 110 volts for lighting. At SS we were surprised to find the hospital making its own power with steam turbo-generators at a capacity of 6,000 kw. We were told that this was done to use the steam of the reserve boiler, kept going in case the other should fail. It is perhaps worth investigating whether, in the long view, it may not be cheaper for a large hospital to make its own electricity and to use the resulting hot water for space heating, than to pay a company for cooling the water, to have no use of it and to bear the cost of a separate plant for producing hot water.

80. WATER. It has already been noted that at Zürich water was supplied by the town at three pressures. At BB there was also a supply of hot water at 150°–180° C. from the town incinerator and electricity works ; the return flow from the hospital was about 80° C. and the heat was taken out in a calorifier system. The supply of distilled water varied at different hospitals. At PZ it was made in an automatic plant in the roof and was piped to the clinics as a service. At BB there was a similar type of still but limited to the supply of the main operating theatres. At BP each theatre had a separate plant in the theatre unit for producing sterile distilled water.

81. Suction and Pressure. At PZ compressed air was laid on as a service from a central compressor but suction was produced locally wherever it was needed. At BB and SS neither service was laid on. One of the surgeons at SS thought that both these services should be laid on to all theatres and to at least some of the surgical wards ; in none of the hospitals was suction supplied to the wards.

82. Other Services. Transmission of messages, reports, small specimens, etc., by pneumatic tubes had been installed at BP and was to have been put in at SS but was turned down on the question of cost. The estimated cost was about £140,000 and it is now felt that it would have been an economy as it would have saved the nurses a lot of unnecessary running about. Fire services seemed not to have been a very urgent consideration. The internal stairways were looked upon as fire escapes and there were no external ones. At BP (and other hospitals) there was no hospital fire brigade but there were hydrants and hoses at intervals which would serve until the official fire brigade arrived ; there was also a method of flooding sections of the floors from the lift shafts.

83. Libraries. At SS there was a scientific library for the use of the doctors and nurses and a library for the patients. The last was housed in a room about 24 ft. by 50 ft. and was in charge of a woman librarian, an employee of the City Library spending half her time at the hospital and half in the city library.



LIBRARY S.S.

In the patients' library it is hoped to have 4,000–5,000 books eventually ; at the present time there are about 600 books out on the

wards at any time. The books are taken round the wards on a trolley and the patients can ask the librarian to get any particular book they want. This library is not open to the nurses who will have their own library when their new school is built. The scientific part of the library was considerably larger and consisted of a large book room, two journal rooms and a solarium writing room. At KZ the library was about 16 ft. by 60 ft. containing specialist books and journals on the various aspects of pædiatrics; it was essentially a departmental library and was also used as a conference room. At PZ there was a comfortable library in the medical clinic fitted with standard unit-cupboards with glass fronts.

VI. STRUCTURAL FEATURES

84. BUILDINGS. The basic structure of BB, BP, PZ and SS was reinforced concrete faced with a veneer of some other material. At BB the facing was polished whitish yellow stone slabs in the lower storeys; at BP an unfortunate kind of yellowish-red brick which showed no signs of mellowing; at PZ the lower storey was concrete and the three upper ones brick and plaster relieved by bands of granite; and at SS the surface was an unrelieved and monotonous grey plaster. There was a notable absence of the defacement of the exteriors by drain pipes; even down pipes from the roofs were absent from some buildings for the flat roofs were slightly tilted to drain to a central gulley from which the down pipes went through the building to the main drainage system. The roofs of the in-patient blocks at BB and of the polyclinic at Zürich were used as roof terraces for staff and patients or at KZ for wards. The internal decor was generally a rough plaster in the corridors and halls painted white or a light shade of blue or green. A pleasing feature, especially in Switzerland, was the free use of plants in pots, even quite large shrubs in the bigger halls.

85. UNIT BUILDING. At PZ there was an interesting example of building in standardised units of construction; the unit was called the "Achse" or axis and consisted of the width of a standardised window and half the width of the supporting pillar on either side, a width of 1·62 metres. In each of these pillars between windows run the standard services of gas, electricity, power and telephone whether they are required for the present function of the room or not. The wall opposite the window side is the bearing wall, the partitioning walls being fairly easily removable. This standardisation was designed to give flexibility in regard to future possible needs and a complete alteration in the present lay-out of the building, for however the rooms might be laid out at some future date, the essential services would

always be at hand and would need no more than very simple connections. For the same reason built-in furniture was avoided, all furniture being easily dismantled in a very short time. The standard height of the room was three metres in the clear with floors 40 cm. thick ; the corridors were 2.45 metres high in the clear, the difference of 55 cm. being occupied by the ducts for service pipes which ran in the corridor ceilings. These pipes were accessible at any point by the removal of a panel of the cellotex ceiling, used to deaden noise in the passages. The size of the rooms is expressed as the number of contained axes—one for w.c.'s, two for examination rooms, four for laboratories, etc.

86. Unit Furniture. While the details of these forms of unit construction are described in much greater detail in " Werk," the build up, for instance, of laboratory benches was most instructive. The standard bench was 29 ins. high and 23 ins. wide, a standard stack of drawers of this height formed its major support from which metal tube supports ran laterally from either side to the wall or to the next unit. These supports were clamped by fly-nut screws and could be dismantled in a matter of minutes. The bench tops were oak blackened by a chemical impregnation. These work benches running under the windows do not carry sinks, which are provided as fixtures at the ends of the room. Another good standard laboratory unit was the fume-cupboard, measuring 72 ins. long and 33 ins. deep. The hood had no side supports off the front of the bench : when closed the hood rested on the bench top and when raised the whole hood ascended leaving the bench space unobstructed. The controls for gas, water, electricity, pressure, etc., were led to a sloping panel like a dash board at the front just below the bench top and outside the enclosed space ; the sink was of acid-resisting pottery and under the bench were drawers, cupboards and a small built-in refrigerator. At this polyclinic the unit furniture and some of the technical equipment, e.g., the examination cabinet in the E.N.T. department, were designed by the architects.

87. Corridors. In all the hospitals the width of the corridors seemed to be slightly different ; at BB the standard width was 10 ft. ; at BP 9 ft. 2 ins. ; at PZ 8 ft. 6 ins. ; and at SS 7 ft. 8 ins., the range of difference being as much as 2 ft. 4 ins. which is considerable. Wider corridors tend to minimise the claustrophobic feelings which big buildings may produce, they are lighter and more airy and though they are rather more expensive to build, to heat and to clean, their psychological gains are probably worth the expense. An 8-ft. corridor is perhaps the minimum and 8 ft. 6 ins. or 9 ft. a proportionate advantage. At PZ and SS the service ducts ran in the corridor ceilings and advantage was taken of this to use a panelling system of noise deadening material. At PZ this was cellotex in flat removable panels ; at SS the panels were of white corrugated asbestos-cement, the ridges set across the length

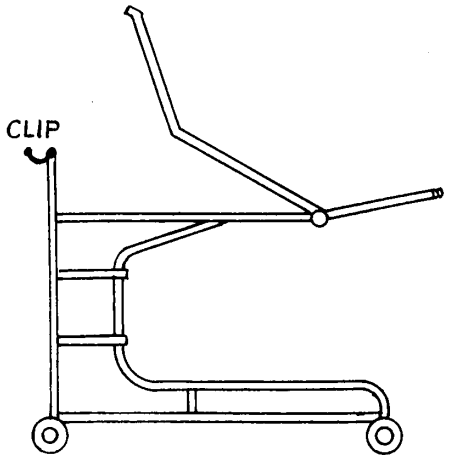
of the corridor giving a rippled ceiling. These panels were not sealed at the join with the corridor wall but there was a visible crack so that any leakage from the service pipes could be immediately located. The effect was a little unfinished but on the whole pleasing.

88. Doors. At BP ordinary double swing doors with metal kick plates were used a good deal: to nurses with their hands full these seemed to us obstructive and even dangerous and should have no place where there is much traffic inside the building. Many of the room doors had metal flanges meeting metal door jambs with inadequate felting and nominally controlled by " dictator " stops which are mostly broken; the metal handles were mostly loose and the noise generally was considerable. At BB, SS and PZ there were no swing doors in use but the principle of a wide door for normal use plus an additional flap usually kept shut was the general type. At BB these two measurements were 48 ins. + 13 ins.; at SS 46 ins. for ordinary bedroom doors which were single and 44 ins. + 12 ins. for theatre doors. At KZ there were 41 in. doors for the wards and 49 in. doors for special rooms like the X-ray department. At SS efficient dictator stops were used and the doors had no latches; the " push " side of the door was fitted with a metal knob projecting on a short rod and the " pull " side was fitted with a hand-grip. This was also a common practice in the larger shops and stores in the town.

89. Signals. Signalling systems for finding members of the staff in the hospital varied. At BB and BP there was no system other than telephoning round the wards and departments: at BB this was stated to be quite unsatisfactory and also slow. At PZ there was a system of lights in three colours giving 14 combinations and a rather intricate telephone system. At KZ there was a similar light system in 3 colours built into the surround of the corridor clocks. At SS the doctor on entering the hospital put down a switch corresponding to his official number which signalled his presence to the telephone exchange. Thereafter he was " found " by the exchange through loudspeakers placed at intervals throughout the buildings, including the corridors of the ward units: no light signals were used. The system was apt to break down owing to congestion at the exchange. Light signals were used locally on the wards; patients summon the nurses by a red light over the ward door and in the duty room where there is also a buzzer; a white light over the ward door shows where the doctor is and a green light for the sister. At SS a public telephone box was provided on each floor for the use of the patients.

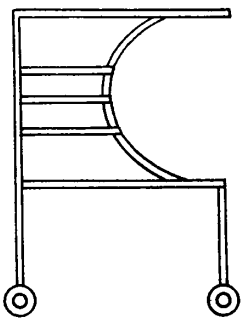
90. Stretchers. At SS there was an interesting type of tilting stretcher with a recessed undercarriage so that the top would come well over the bed, minimising the manual lifting of the patient. The whole top tilted laterally when actuated by a rack and pinion hand winch.

In the ordinary position this movable top locks on to the undercarriage by two simple clips.



TILTING STRETCHER. S.S.

91. TROLLEYS. At SS instrument and dressing trolleys are made with a similar type of recessed undercarriage so that they can be drawn over operating tables or beds if necessary. The trolleys for food service at this hospital were 35 ins. long and 24 ins. wide with an electric hot-plate at one end and flex for plugging into the wall. At either end were extension flaps of 10 ins. giving an overall length of 55 ins. The top surface was in stainless steel and underneath was a drawer to carry cutlery and another shelf below.



INSTRUMENT TROLLEY. S.S.

92. MATERIALS. The use of glass was a prominent feature. There were glass doors across corridors to shut off ward units, glass lift surrounds, fixed or movable glass screens and so on. Main entrances

were generally a range of large glass swing doors with a surround either in clear glass sheets or in glass bricks. These were about 4 ins. thick and were also used for long lights in stairway stacks or for overhead lighting as in the BP kitchen. Stainless steel was the material of choice for ward and theatre sterilising units, sinks other than laboratory sinks (these were of acid resisting pottery), large kitchen equipment and many other metal fittings. Wood was much used in the Swiss hospitals with beautiful effects; special features were the wood block floors, wooden ventilating grilles, wooden grille gates to lifts which were less noisy than metal ones, and wooden stair rails. Seats of all types were in wood rather than metal but despite the free use of wood, fire precautions did not seem to be a matter of anxiety. Cellotex was widely used in the Swiss hospitals for deadening noise in corridors, halls, and operating theatres; it was used both as ceiling and wall panelling. Flooring materials varied considerably: the visitors' hall at BB was floored in stone slab, landing halls in wood block and corridors and wards with a rubber composition sheeting; there was no general coving of floors or rounding off of corners. At BP the floors were tiled throughout and tiling was also used in the infectious block of KZ. At SS there was a wide variety of floorings: in the visitors' hall and main passages leading from it, polished slabs of black limestone were used; some of the corridors were covered with lino, in some there was terrazzo which was badly cracked, in others again there was a mixture of cement and cellulose which gave a too slippery surface. Paint was widely used internally despite its disadvantage of putting rooms out of action for renovation and of its inflammability.

93. TEACHING EQUIPMENT. The routine instruction of students was only carried out at BB, KZ and PZ, so that it was at these places where we saw the highly mechanised equipment suitable to the continental system of medical education. At the first two hospitals the lecture theatres were equipped much in the same way; they were air-conditioned and partly lined with cellotex to damp echo.

SEATING. There were tiers of tip-up seats in wood with writing ledges half of whose width hinged back; the halls held about 200 students. To the screen of the front row of seats were attached four flap tables to carry specimens, etc.; much of the metal work was in stainless steel.

LIGHTING. The theatres were sky-lit with motor-driven external black-out blinds and rising shutters for the lights below the roof, also motor-driven and actuated from an instrument panel at floor level. At PZ there was even machinery for the automatic movement of the roof blind according to whether the sun came out or went in. There were special lights for the blackboards arranged at PZ below the projection screen so that the teacher could draw on the board to analyse the projected image. Artificial lighting for the theatre was diffused.

PROJECTION. At KZ this was wholly separated from the theatre by a glass panel, shutting off the apparatus and the technician operating it: communication with the teacher was by microphone. The projection apparatus was by Zeiss and a group of machines would project a two-year old child complete, X-ray films, cinema film, diagrams and illustrations, slides and microscopical preparations. The screen was built into the wall of the theatre at a slight angle sloping inwards towards the wall from the top.

BLACKBOARDS. At BB these were arranged in sets of three, one behind the other on chain and wheel suspension and made to disappear into a slot so as to clear the projection screen; each board was 36 ins. wide. Diagrams were run up the walls beyond the blackboards on endless chains or cords in pairs with hooks at intervals. At KZ there was a range of three blackboards each in a separate panel.

DEMONSTRATIONS. At KZ, by pressing a switch, the blackboards in the two lateral panels and the sheet iron wall sections carrying them rose into a slot, leaving two glass sheets. These formed the fronts of two glass cases large enough to take a stretcher for demonstration of patients. These cases could be pushed forward about 6 ft. into the theatre, the patient remaining isolated from the class. At the back of these cases were the waiting rooms. The theatre was also fitted with a radio from which records of heart sounds, etc., could be broadcast to the class.

At BB we attended a surgery lecture and the acoustics were satisfactory; the machinery worked efficiently and at KZ we were told that there had been no trouble with it during eight years of working. At BB the floor of the amphitheatre was of a special hard mosaic as minor operations were occasionally demonstrated. There was no lecturer's table but a movable lectern. At the back and under the auditorium at PZ there was the students' entrance and cloak rooms, preparation rooms, storage of films and diagrams and a collection of demonstration specimens and wax models. At BB there were two theatres of this type, one for surgery and one for medicine and between them a hall space and snack-bar for the students. Both hospitals had well-equipped clinical photography departments including cinematography and micro-photography and at BB photostatic reproduction. Both at BB and PZ there were small lecture rooms less lavishly equipped: at the latter there was a very ingenious projector. Professor Rossier had developed a neat technique for reducing X-ray films to a small lantern-slide size for storage and demonstration. The size was such that a dozen or more slides could be loaded into an " Audax " projector, quite a small machine with a slide-changing mechanism operated electrically by the lecturer from the lecturer's dais. While all this mechanisation for teaching evokes admiration for its ingenuity, it is very expensive constructionally, and it is a question whether its

educational value would in this country be commensurate with its cost. On the whole our answer to that question would be in the negative though some of the individual features would be well worth incorporating in a new building.

GENERAL CONCLUSIONS

94. It may be helpful to end our report with a few general conclusions suggested by our visit. We give these in summary form.

1. Beauty in every aspect of hospital life is of the first importance, not only in the external aspect of the buildings and in their harmony with their surroundings, but in the size, proportions, light and decoration of the interior. Simple and beautifully designed furniture, gay and colourful frescoes and pictures, spotlessly clean uniforms, pleasant gardens have an incalculable effect on the well-being, not only of the patients, but of the staff and visiting friends.
2. If possible the main administrative rooms of the executive officers should be sited in the body of the hospital in preference to a separate administrative block.
3. To attract labour the amenities and conditions provided for the staff must meet the needs, the human desires and the social aspirations of the staff. Thus, really appealing day nurseries, designed for their purpose, should be provided for the children of female day staff ; there should be bath and changing rooms for kitchen staff. All suggestions of any social inferiority in domestic work in hospitals should be carefully and tactfully eliminated.
4. In a large hospital it is probably advisable to provide for a medical as well as a surgical casualty officer ; if they do not sleep on the casualty unit there should be special means of summoning them.
5. Day nurseries where out-patients' children can be left should be provided adjacent to the main out-patient hall.
6. For the patient one of the most important considerations is the actual bed. This should not only be of the highest degree of comfort but of mobility. The truly mobile bed is one so designed and constructed that one nurse can move it with complete ease. The really mobile bed makes it possible to introduce many features into the hospital life otherwise

impracticable. Thus it would enable a feature to be introduced which we all considered to be the greatest single improvement we witnessed on our tour—that is, the elimination of the bed-pan from use in the ward. The bed should be easily removed to an adjacent bed-pan room ; if properly designed it can be removed with such ease that nurses in the nature of things prefer to move it rather than to collect screens and carry out the other duties for this trying service in the ward.

7. There should be a high measure of flexibility in all arrangements for the nursing and other staff. There should be opportunity to live in or out for trained nurses ; suitable flats might be provided for them to rent if desired. Outside the hospital they should be free to live their own lives in their own way.

8. A further great step forward in the comfort of the patient is to admit no new patients into the ward after a certain hour in the evening. Patients admitted to hospital after such an hour should be cared for during the night in some other suitable part of the hospital. Maternity patients should be specially provided for in this way.

9. In the service of food to the patient there is commonly much room for improvement. It should be taken round in hot containers to the bedside. The service then becomes individual ; quantities can be adjusted to the desire of the patient ; much waste is consequently eliminated. A refinement is for the dietitian to be present during the distribution so that the taste of each patient may be consulted.

10. Much can be added to the comfort of patients by such small things as night lights at floor level, and the provision of private conversation rooms in which to see special visitors.

11. The pain of bereaved relatives may be alleviated by reverent mortuary arrangements. A chapel adjoining the viewing room with opportunity for a religious service with music has a deeply consoling effect and conveys sympathy in a subtle way.

12. There should be facilities in the casualty unit for major as well as for minor operations, for X-ray screening and for simple pathology.

13. It might be profitable to investigate the possibility of so arranging visiting hours in the hospital that large halls and batteries of lifts for visitors could be materially reduced.

14. In our opinion the siting of the main kitchen on the roof has more advantages than disadvantages.

15. A series of subsidiary kitchen units, each feeding a small fixed number of patients, is probably an ideal arrangement though not always practicable.

16. Where subsidiary kitchens are used, the work of washing up and sterilising food-utensils can be lifted from the ward staffs.

17. All food-utensils used by sick persons should be sterilised as a routine and " marked china " should be dispensed with.

18. In view of the man-power situation, it seems reasonable to attempt a high degree of mechanisation of food and other hospital services, even though the initial cost is high.

19. The most suitable unit of beds forming a ward under the charge of a single sister seems to be 24 or 25. Within the unit the largest bedroom should contain not more than eight and not less than six beds and there should be a number of single rooms.

20. The number of ancillary rooms serving a ward unit should be made to depend (*a*) on the comfort of the patient ; (*b*) on the convenience for the nursing staff ; and (*c*) on the local provision of adequate treatment. The danger of reducing these rooms to cut down costs should be watched.

21. Theatre suites for major operations should be as near the wards as possible. When centred about main corridors their lay-out seems to be a little awkward and preferably they should be cul-de-sacs built in stacks to have common drainage and services.

22. It is probably desirable that the out-patient department should be physically separate from the in-patient block ; the maternity department, both as regards in-patients and out-patients, should also be physically separate from the departments dealing with general sickness.

23. The upper floors of the out-patient block may well house those ancillary departments and services which are mostly used by out-patients. But the siting of units such as the main operating theatres in the out-patients block, qualifying it for the name of the " treatment block," may lead to a strained and awkward lay-out.

24. We are in agreement that the comfort of the out-patient should be carefully studied, and that in waiting halls there should be chairs and tables instead of benches and a reasonable provision of canteen facilities at certain points.

25. It would be of material assistance to the flexibility of hospital construction and to the lowering of cost, if the regulations about the siting of water closets could be relaxed, adequate ventilation of course being ensured.

26. The problem of the conflict in teaching hospitals between the appointments system and medical teaching may perhaps be solved by the employment of a larger assistant medical staff.

27. The principle of protecting radiographers by the use of control cabins seems very reasonable.

28. The breaking down of the load of routine pathological investigations by the use of one or more polyclinic laboratories is desirable. It facilitates the flow of out-patients by saving time for the patient and for the medical staff.

29. We agree with the principle that there should be research laboratory facilities in the major clinics under the direction of the heads of departments for their use and that of their assistants.

30. In regard to the space at present required by hospital pharmacies, the question should be determined whether in future general hospitals are to function, in respect of out-patients, purely as consultative and advisory centres, or will also have the obligation of providing drugs for treatment. If the latter function could be transferred to the commercial chemists, large sums of money could be saved in the construction and upkeep of hospitals while pharmaceutical research and trials of new drugs could be carried out under better conditions.

31. In vertical hospitals it is essential that lifts should be sufficient in number and reliable in performance. Pre-war standards of this service require considerable revision.

32. Main sterilising plant should be in charge of properly trained staff and the responsibility for its efficiency should rest with the bacteriologist. There should be a service to supply dry, sterile syringes, puncture needles, etc., to all departments and wards from a central room, also under the charge of the bacteriologist.

33. The question of air-conditioning is most difficult. It is essential for operating theatres and X-ray rooms but not necessarily for the whole hospital. Much depends upon the lay-out of buildings and the siting of departments, and we feel that it is not a matter upon which wide and sweeping conclusions can be made.

34. The question whether it may not be cheaper in the long view for a large hospital to generate its own power and use the hot water for space-heating is one which, because of the increasing use of power, demands an expert investigation.

35. Suction and pressure should be laid on to all theatres; to some wards both medical and surgical; to laboratories; and

perhaps to some out-patient departments. Similar supplies of distilled water might be desirable.

36. A well-supplied library for patients covering a very wide range of subjects in addition to fiction is necessary. Departmental specialist libraries for the qualified staff are also desirable, while the nurses should have their own technical and general libraries.

37. In large hospitals the inevitable mass of buildings requires most careful æsthetic treatment, though function must not be sacrificed for appearance. Internally uniformity of decor is cheap but mistaken, for variety is always interesting. Corridors should be not less than 8 ft. and preferably 9 ft. wide. Double swing doors should not be used, but wide doors of 44 ins.–48 ins. with additional opening flaps where necessary are preferable.

38. Excessively large windows in bedrooms seem to us to be undesirable unless (*a*) they are of the shutter-type, giving an open air effect, and (*b*) are well guarded with sunblinds. In vertical hospitals outside blinds give rise to mechanical difficulties.

39. The question may be raised whether the traditional " southern aspect " of all wards need be so rigidly adhered to. A relaxation of this ancient principle would give much greater flexibility of hospital design and perhaps even some additional comfort to the patient.

40. Every effort should be made, even at some expense, to reduce noise.

41. Installation of pneumatic transmission should be carefully considered as a means of saving man-power.

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Printed by
GEO. BARBER & SON LTD.,
Furnival St., London, E.C.4
(A49728*