of the doctors in attendance, under the supervision of the medical superintendent.

Calculated on the basis of the present cost of hospital beds, it would be easy to show how, even with such a liberal allowance for maintenance as £350 a bed, a hospital of, say, 100 beds, let at weekly rates varying from 2 to 8 guineas—and with 70 out of the 100 beds reserved for 2 and 3 guinea cases—could be made to pay its way, provided the beds were kept fairly well occupied, and provided it started with a free foundation. Its success would depend upon its popularity with the public and with the medical profession, but it would rapidly commend itself to both if it were judiciously managed and wisely administered. No scheme could pay its way on anything like the terms here suggested if it had to face the capital expenditure required for site, building, and equipment; but if this were provided and the experimental institution proved successful, there would be no lack of money to extend the principle. There would be no necessity for multiplying the initial cost, so far as that would apply to laboratory investigations, major surgical operations, and expensive methods of medical treatment in special varieties of disease. The original institution in every city might be a centre around which would cluster a system of smaller homes arranged on the cottage hospital plan, to serve the requirements of a certain area of population. These could be affiliated with the parent hospital under a system of organization whereby one set of laboratories would do the work of both the main institution and its subsidiaries, and one surgical equipment would suffice for major operations, minor surgery and emergencies only being treated in the district homes.

Successful paying hospitals would ensure to pious founders the certainty of conferring an untold blessing upon a large section of their fellow-creatures. Such a humanitarian and patriotic benefaction would, moreover, materially lighten present hospital difficulties, and would provide homes for the cure of disease which would not compete unfairly with existing vested interests, but would bring within the reach of every one the easiest and cheapest means by which the disabilities and difficulties of illness might be most skillfully combated, and the health of the sufferer most speedily re-established.

If the public health, upon which our national existence depends, is to be maintained and preserved from decadence, its interests must be safeguarded by practical measures which shall embrace all classes of the community. Our charitable hospitals only partially fulfil this requirement, and are now doing so at the cost of a growing abuse of their privileges, which will demand sooner or later—and sooner rather than later—active measures for their correction. To burden the rates with their upkeep would be a national calamity, but it is one not unlikely to happen if relief is not afforded to the demands now made upon them by the establishment of some system or other whereby the impecunious but not poverty-stricken can, when sick, be treated adequately, and on terms that come within the scope of their financial resources.

NOTES ON THE CONSTRUCTION OF COTTAGE HOSPITALS.

By H. PERCY ADAMS, F.R.I.B.A., F.R.SAN.I.

NEARLY fifty years ago the first cottage hospital was established in this country at Cranleigh, by the late Dr. Albert Napper. A Surrey cottage of ordinary type, belonging to the then Vicar of Cranleigh, Archdeacon Sapt, was assigned by him and converted into a hospital at the very moderate expense of £50. The new departure excited a good deal of interest, various books and pamphlets were published on the matter, and public attention was directed to the subject by articles in the *Builder*, a leading architectural newspaper, which foretold the extension and success of the movement in rural districts. The benefits which a country district derives from a well-managed cottage hospital are indisputable. It provides the medical practitioners in the locality with a place to which they can send cases for operation, or serious medical cases requiring special treatment and supervision not to be obtained in the homes of the poorer classes.

This is the main benefit, but two others may be mentioned: First, the fact that the existence of cottage hospitals gives the country practitioner an opportunity of

Cranleigh Hospital.

operating in cases that would otherwise often be sent long distances to the county or town hospital, which has the result of raising his professional status and increasing his

Cranleigh Hospital.

knowledge and experience, thus benefiting not only the poorer patients, but the wealthier as well. Another advantage is that good nursing is established in the district for the benefit of all.

The first cottage hospitals were nearly all converted cottages, such as Cranleigh, of which we give a plan in its original state, but the modern cottage hospital is generally a building erected for the purpose and fitted much on the lines of a larger hospital. Roughly, they are of two types: (a) In the one the wards and the administrative offices are contained in one block; (b) in the other they are in two separate blocks. The first plan seems most suitable for quite small hospitals, say, up to six beds, and the second for anything up to, say, fifteen beds; beyond this we are approaching the size of a general hospital.

Perhaps one of the most complete cottage hospitals in England at the present day is that erected five years ago by the Duke of Bedford at Woburn. It is magnificently situated on an elevated site outside the village of Woburn, the beautiful wooded country sloping away from it towards the south and west. From the village of Woburn, Husbome-Crawley, Ridgmount, Eversholt, Milton Bryant, Potsgrove and Battlesden, Little Brickhill, Hockliffe, Tebworth, Wavendon, Salford, Toddington, Tingrith, Steppingley, and Liddington, the local practitioners can recommend patients for admission to the hospital, and can continue to attend them there, preference being given to those patients least able to afford good

light. The room is lofty, the upper part projecting into the upper story.

Aërially disconnected by a cross-ventilated lobby, having an arrangement of doors that can be shut across the corridor in fine weather, are the kitchen and offices, all one floor high, the floors of red tiles, the walls white distemper, and all the woodwork and fittings painted apple-green; the larder is lined throughout with white tiles, and has white marble shelves.

In the basement under the kitchen block, and with access for the engineer from outside, are the rooms for the oil engine and electric plant, accumulators, the heating apparatus, and coal cellars; the electricity for lighting purposes and for pumping water from a spring over a mile away is made on the spot, the pump being set in motion by pressing a button at the hospital. The heating of the whole building is by low-pressure hot-water radiators, supplemented by open fireplaces. On the upper floor of the central part of the building are the bedrooms and bathroom for matron, nurses, and servants; these rooms are daintily furnished with rose-pattern chintz curtains, chair covers, and quilts, white walls, and green fittings.

The wards are all floored with teak, and the walls have a tiled dado of pale green, with a deeper-coloured band

Woburn Cottage Hospital: Elevation.

nursing in their own homes. A matron and two staff nurses are always in residence.

The building is of two stories, but the accommodation for patients is all on the ground floor. It was designed by the architect from sketches prepared by Her Grace the Duchess of Bedford on a symmetrical plan; the male ward for five beds, and a single-bed ward are to the right of the entrance, and similar accommodation for females to the left; between the wards are the matron's room, the staff dining-room, a dispensary, a day-room, all having a beautiful outlook over Woburn Park. The sanitary arrangements for each sex are on the north side of the building; they are well disconnected from the wards, and consist of bathroom, watercloset, and sink for emptying and cleansing bedpans, and cupboards for patients' clothes, etc. The nurses' duty room is central for all the wards, and is fitted with a sink, plate-rack, a dresser, and a small range.

The operating room is also on the north side, and is fitted on the most approved antiseptic lines, with pedal action lavatory and sink, glass shelves for the glass jars of antiseptics, glass instrument cupboards, electric sterilizer, and adjustable electric light over the table; the entire room is white, so that it can at once be seen that everything is spotlessly clean; the floor is of white terrazzo and the walls and ceiling of white tiles; the room is perfectly lighted, with a top and due north side

above, the upper part of the walls and the ceiling, as well as the woodwork and fittings, being finished with white enamel; the chimney-pieces are of tiles and perfectly flush with the walls, any effect being obtained by colour rather than by raised surfaces; there are practically no corners, everything being rounded and all mouldings omitted. Attached to each of the wards is a small sun-room, filled with plants and palms.

There is an entirely separate isolation hospital for one patient, with nurses' sitting-room and bedroom, and also a servants' bedroom; this block forms, in fact, a cottage hospital in miniature, and on the ground floor of this building is the ambulance shed.

Completely hidden away by shrubberies is the mortuary, decorated so that it may be used as a view room by the friends of deceased patients.

There is an ample kitchen garden for the use of the hospital, and a fine tennis lawn for the staff.

As *Country Life* said some years ago, model farms are features of most large estates, but it would be well if model hospitals were established up and down the land by those who are able to build and support such institutions.

In such hospitals as that at Woburn, where efficiency has been the keynote, almost regardless of cost, the designing and carrying out of the work is a comparatively simple matter, but it may be of interest to state

a few leading principles which should be followed where economy is important.

The site should be carefully selected, with sunny cheerful aspect, sheltered from prevailing winds, and have a sandy or gravelly soil; a clay subsoil should if possible

designed building of good proportions and refined detail costs no more in materials and labour than the veriest eyesore that will be an everlasting blot on the landscape.

As a general rule the shorter the length of corridors and passages the more economical the plan. The wards

Woburn Cottage Hospital.

be avoided. It would be advantageous to consult the architect before a site is definitely decided, as the cost and success of the building depend largely upon it. With regard to the plan and construction, all buildings, if properly designed, must vary enormously according to the nature of the site; there can be no fixed rules for any particular sized building, and what would be appropriate for one site may be quite out of place on another; the buildings should be specially designed to fit the site and its various levels, and not the site levelled up to fit the building. An interesting example of a twelve-bed cottage hospital being designed to suit an irregular site is now about to be erected at Southport; all the levels have been taken into consideration in the planning, and thus necessarily cheapening the cost by very considerable saving of expense in the foundations.

Local materials should be used as far as possible, and the exterior of the building designed to harmonize with its surroundings. In some districts brick, in others stone and even concrete for the walling may be found most economical; it should be remembered that to erect a well

for patients should be, as far as possible, separate from the administrative part of the building; an operating room is a necessity, and should have a good north light; in some German hospitals the large tiled bath-rooms are used as supplementary operating rooms, and it seems an idea worth imitating by utilizing the bath-

room in this manner in small cottage hospitals; it is certainly preferable to using, as is sometimes done, the committee room or matron's sitting-room for this purpose. There should be wards for each sex and a minimum cubic area of 1,000 ft. per bed and 5 ft. space between the beds; the wards should be cross-ventilated with windows on opposite sides of the room, preferably with double hung sashes having a "fall in" or hopper window above fitted with

glass slides; this arrangement prevents a direct draught on to the patient. Additional ventilation should be provided by building extract flues in the chimney stack and having only an iron plate between them and the smoke flues; the heat from the latter will induce an upward draught, the vent from the ward being at the ceiling level. For small cottage hos-

Woburn Cottage Hospital: Isolation Block.

hospitals open fireplaces are usually sufficient; slow combustion grates are best, with fresh-air inlets at the back of the stove where the air can be slightly warmed before delivery into the room. Additional inlet ventilators may be placed in the external walls, and should be constructed of glazed pipes and have hinged gratings for access to the flues for cleaning. All cupboards should, where possible, be ventilated with a small window or ventilator. A good substitute for the very expensive bedpan sinks in common use is a swivel tap fixed over a water-closet, and made, like a gas bracket, to shut against the wall; it is inexpensive, and answers the purpose for washing out bedpans. A nurses' sitting-room is an essential, and should have a good outlook. A good inexpensive floor can be made for the ground floor by sticking ordinary plain-coloured linoleum upon the concrete and then wax-polishing it; the concrete must be very dry before this is done. There should be no mouldings and as few projections as possible. For a cottage hospital nothing looks better than whitewashed walls and apple-green paint or stain, and this decoration is cheap and sanitary. It is more economical to treat the internal woodwork with stain and varnish than paint. The drainage should, if possible, be taken to a sewer; earth closets are very sanitary for small buildings, but there is the difficulty of cleaning bedpans. If there is sufficient land available a small septic tank system can be used with advantage.

As to the question of cost, it should be clearly understood that it must also vary according to the site and the neighbourhood in which it is situated, and upon the details and furnishing of the building. It is an utter fallacy to talk, as so many people do, of the cost of hospitals at so much per bed; it is far more reliable to compare the cost by the relative price per cubic foot of the building; about 7d. a foot cube is the lowest price at the present time at which a really good cottage hospital could be built, and this would probably work out at about £250 a bed for a six or eight bed hospital.

The present Cranleigh Cottage Hospital, of which we give the ground plan, is interesting, as it shows how a small cottage hospital may be extended. The former hospital is now used for administration purposes, and a new building is connected to it by a short corridor, and contains two wards, each 23 ft. by 14 ft., and holding four beds; the nurses' room is between the wards, and can be used as an operation room. The total cost of this new block was about £1,800. The staff consists of a resident nurse who acts also as housekeeper, and one servant. The lady honorary secretary exercises some sort of general supervision. The patients pay from 3s. 6d. to 10s. a week according to their means; if a serious operation is necessary, then an extra nurse is engaged from a London nursing home, and the cost defrayed from the general funds. For the loan of the plan and the above information we are indebted to Dr. Napper, medical officer to the hospital and son of the original founder.

A NOTE ON SEPARATE OPERATING ROOMS AND THEIR MANAGEMENT.

By GEORGE G. HAMILTON, F.R.C.S.,
SURGEON, LIVERPOOL ROYAL INFIRMARY.

WHEN the Royal Infirmary, Liverpool, was erected, some fifteen years ago, our surgical authorities were still in favour of large operating theatres, a gallery to seat on-lookers being provided. Each of the three surgeons had two operation days a week.

It was at that time thought desirable to have also a small theatre where minor operations and emergencies could be dealt with, and to provide a separate theatre for the gynaecologist.

Almost immediately after this date aseptic surgery made great strides, and it was found necessary to have smooth walls and floors, no furniture that could collect dust, and so on. Then followed the time when much money was spent in elaborate operation rooms, some costing as much as £10,000.

By general consent in Liverpool the plan of having one theatre for each surgeon, assistant surgeon, and staff of dressers was admitted to be the ideal, and six years ago the large theatre was roofed over and converted into an

x-ray room, two moderate-sized operating theatres being erected on the top of this structure.

Two years later the small theatre was enlarged, and a top and side light were arranged for, so that now each surgeon has fifty beds, with a theatre close at hand, in which he, his assistant surgeon, and dressers work.

There is a nurse for each theatre. One, having the title of "Sister," is responsible for the instruments generally, but each nurse is responsible for the proper working of her theatre, and the sterilization of all dressings for the 50 beds connected with that theatre. In the case of the gynaecologist, the Sister of his ward has also charge of his adjoining operating theatre.

Each theatre has an anaesthetic room attached, and there are four anaesthetists to the hospital. The house-physician on duty gives the anaesthetic in emergency cases.

The theatre ambulance arrangements are very simple, and one porter only is on duty at a common lift, the patient being brought on a wheel ambulance the same height as the operating table by the Sister of the ward and a dresser. We have a very useful contrivance for lifting the patient, which consists of four flat hand grips fixed to a square made of webbing which is placed under the patient's hips. One assistant reaches over the table and catches two of the handles, while a second assistant holds the other two, and the patient is half lifted and half slid from the ambulance on to the table.

The walls of the two new theatres consist of a dado of alabaster and a smooth surface of ripolin paint above; but where the sterilizers are in the theatre, as ours are, there is no doubt that tiles are the best. Tiles can be fitted so closely now that practically they are one continuous surface; and, after all, a sheet of glass, if one runs one's finger over it, can be shown to hold plenty of dust. The floors are of papyolith, which has not been found to be so good as either terrazzo or "torgament"—the latter an asbestos material, its chief advantage being that it is free from glare. The terrazzo can be continued, as at the new Liverpool Infirmary for Children, without angle from the floor into the dado. The doors are of hard wood varnished, and both theatres have their light from the top as well as the side. In my theatre the floor has been continued into two raised steps, with the narrowest possible railing and a separate entrance for students, who, notwithstanding the railing, are close to the operator. The doors here are of sheet aluminium on wood, and help to give more light in the darker part of the theatre.

An important point in the electric illumination of these theatres is that the lights are on swing arms. This does away with a constant source of dust immediately over the operator during day operations. Each light is on a separate fuse and switch, so that the theatre can never be in total darkness unless the main fuse goes. An acetylene lamp is provided for such a rare contingency. A wet mat and a dry mat for cleansing the boots are placed at the entrance, and provision has recently been made to prevent the entrance of flies by means of gauze frames.

Sterilization is carried out in the theatres, and the disadvantage of heat and moisture are got over by sterilizing all dressings on the days on which there are no operations. A cold jacket at the top of the sterilizer has been suggested to prevent too much moisture entering the theatre, and condensing on the roof and walls.

Almost all our surgeons wear gloves, and septic cases are taken last. We have been unable to trace any evil results from these septic cases, which are isolated in a separate room at the end of each ward. Several of the surgeons change entirely into white ducks and a flannel shirt before operating, and the heat of the theatres is rather an advantage to the patient, especially in cases of abdominal section. Some wear masks and some do not. I understand from a friend, who has returned from a recent visit to most of the important German hospitals, that masks have been given up, and that about half of the surgeons now operate without gloves.

The university laboratories adjoin the theatres, and the pathologist and assistant pathologist, who are in telephonic communication with the theatres, make constant cultures from dressings, gowns, towels, ligatures, water, etc. They also cut rapid microscopic sections of fresh growths, and in six minutes an opinion of much value can be obtained.

Post-mortem examinations are made after operation