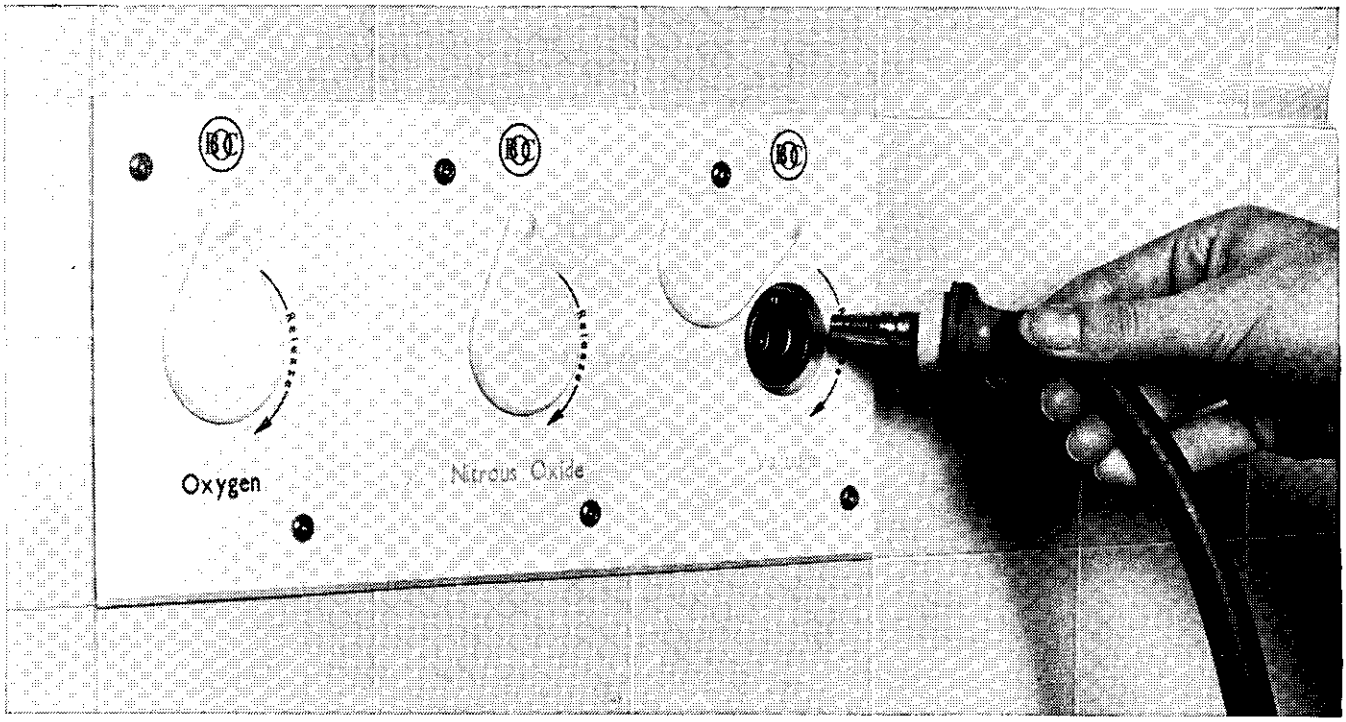
THE
HOSPITAL ENGINEER

THE JOURNAL OF THE INSTITUTE OF HOSPITAL ENGINEERING

VOL XXIII No 8
AUGUST 1969

FIVE SHILLINGS



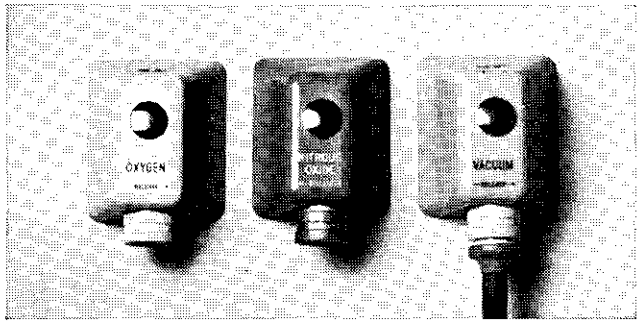
Nobody's taking any chances

When a BOC pipeline system is specified you are retaining a team which sees the job is done in all its stages—from drawing board, through installation, to testing, commissioning and maintenance. Always working to the highest professional standards, the BOC service carries with it the authority conferred by some thirty years' experience.

Here are some more facts. There are already over 50,000 BOC outlet points in some 550 UK hospitals (and more than 700 hospitals are similarly covered abroad). Outlet points can now be fitted flush to the wall but connectors for them will also fit box-type outlets where they exist. Equipment is easily transportable from ward to ward, or even to different hospitals without need for a change in connectors.

BOC service engineers are always available at short notice and gas supplies can be obtained from 20 depots throughout the country.

Get full details of these installations from your nearest BOC Medical Branch.



Connectors for flush outlets can be fitted into existing box-type outlets. The connector for each service is so designed that it is impossible to connect it into any service other than the correct one.

THE BRITISH OXYGEN COMPANY LIMITED,
Medical Department, Hammersmith House, London, W.6.
Tel : 01-748 2020

Member of the
International Hospital Federation

THE JOURNAL OF THE INSTITUTE OF HOSPITAL ENGINEERING

Published monthly at
16, SPRING STREET,
LONDON, W.2.
Telephone: 01-262 7454
(For London 262 7454)

★ ★ ★ ★

★ ★ ★ ★

The Journal is available to non-members of the Institute at the following terms:
70s. per annum post free
Single copies 5s., or 5s. 10d. post free.

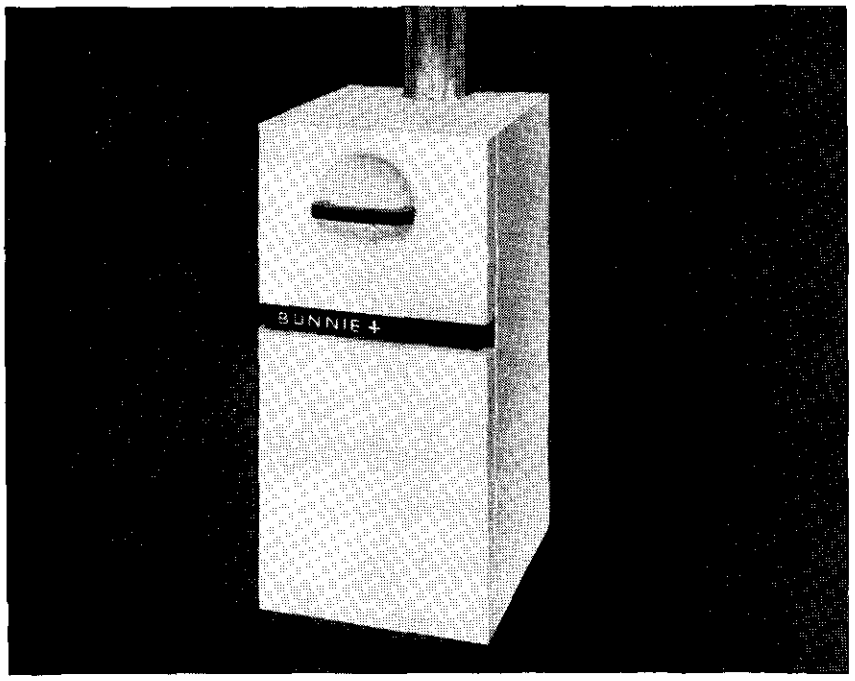
THE INSTITUTE OF
HOSPITAL ENGINEERING
20, Landport Terrace,
Southsea, Hampshire.
Tel: Portsmouth 23186

CONTENTS

THE HOSPITAL ENGINEER

VOL XXIII No 8
AUGUST 1969

We're happy to announce that the Bunnie is no longer the best...



Meet the Bunnie-Plus

When it came to Automatic Electric Incinerators, The Bunnie was a world beater.
Not any more.
We've introduced The Bunnie-Plus. And just look at its plus-points . . .
— a hot-air jet-igniter burning system.
— a secondary smoke-removing combustion chamber.
— automatic ash shaker eliminating clogged hearths.
— a process-controlled fan extractor system.
— steel-jacketed, refractory lining on the combustion chamber.
— automatic safety cut-off of heat when the door is opened.
— quick installation construction — separate wall-plate for flue and conduit connection: incinerator clips into position.
All brand-new modifications to the world-beating Bunnie. And all wrapped up in a brand-new styled steel cabinet. No wonder we call The Bunnie-Plus The Bunnie-Plus.

Wandsworth

For information, contact:
The Wandsworth Electrical Manufacturing Company Limited, Dept. HE2, 7/9 Baker St. London, W1 Tel: 01-486 3201

THE
HOSPITAL
ENGINEER

THE JOURNAL OF
THE INSTITUTE OF
HOSPITAL
ENGINEERING

VOL XXIII No 8
AUGUST 1969

Experience in Running a Metrication Course

By R. J. BIRKINSHAW

A SUCCESSFUL course on metrication was recently organized by the Electrical Engineering Department of the Stretford Technical College for the Salford Group of the Manchester Regional Hospital Board.

The college was impressed to find the group's approach to the problems of going metric 'healthily invigorating'. The group appreciated, for instance, that although certain of their own senior engineers could provide other members of their staff with instruction, many employees would more readily receive instruction from a professional lecturer who was a stranger.

After discussion about who should attend the course it was decided to run an initial course for a very wide cross-section of personnel, from group engineer to fitter's mate—in fact, all who would in the course of their work come into contact with metric units. It was realised, of course, that some of the instruction would not be necessary for craftsmen but would be very necessary for engineers and technicians; for example, instruction in SI units, preferred numbers etc. It was decided therefore to split the course, which was to occupy one day a week for eight weeks, into two parts: the first four weeks for craftsmen and engineers and the second four weeks for engineers and technicians only.

For convenience, and to avoid causing any of the employees embarrassment over the possibility of thinking they were being returned to school, the course was held in a hospital within the group rather than at the college.

The first part of the course was devoted mainly to length, area, volume and capacity in metric units, with the emphasis on "thinking metric" rather than thinking imperial and converting. Having due regard for the psychology of teaching, the first lesson had to be an absolute winner so that any tendency to apathy or antagonism towards either "schooling" or the units themselves was overcome by interest and effort. All instruction was by hand-outs and enlargement and explanation of them.

Drawings were made of everyday objects marked with their dimensions and weights in metric. A discussion was also held on some of the anomalies and differences that occur in the imperial system.

The first day ended with a description of various metric units, conversions and simple problems and a general appreciation of the simplicity of the metric system. The two subsequent weeks were spent in getting used to a wide usage of metric dimensions, such as fitting metric furniture into a metric room, designing a metric garage for a metric car (involving a metric pit and ordering metric ready-mix concrete), laying metric lengths of cable to metric fittings, using metric scale rules and so on. During this time the class worked in groups of three or four and each produced a group project result.

Individual projects

In the fourth week each person was given an individual project.

The carpenters and joiners, electricians and plumbers were each given a drawing of part of a building, a folder of manufacturers' catalogues (in metric where available), and a specific set of instructions to produce a complete all-metric specification. The fitters were given a drawing of a model, fully dimensioned in millimetres, from which they had to make the job up in the workshop.

This exercise proved much more successful than could ever have been envisaged.

The second part of the course, which was for engineers only, was able to proceed at a somewhat faster pace mainly because of the more even and more advanced attainment level of the participants and because of the smaller number in the class.

The object with this group was to go further with the units, e.g. to SI units, and to take existing schemes and problems and metricate them—heat losses in a room and a complete illumination scheme for a typical office.

The result of this part of the course was not so much a trade test but the setting out of data sheets and departmental standards to form a complete standards book.

From a teaching point of view the course was challenging and very different from anything else carried out by the college. It owed much of its success to the friendly rapport that developed between college staff and students. Naturally, courses such as this must be custom-built but there is no doubt that this kind of course could be usefully copied within industry by individual companies and organisations.

Part of a feature which appeared in *Electrical Review* and is here published by courtesy of the Editor, *B.S.I. News*. Mr. Birkinshaw is lecturer-in-charge, technical courses, Stretford Technical College.

DEVELOPMENT OF THE NORTHERN GENERAL HOSPITAL

THE NORTHERN GENERAL HOSPITAL is to be developed to an ultimate complement of approximately 1,880 beds. A proportion of the beds will be used for teaching medical students.

The hospital will be completely re-built except for the departments which have been provided during recent years i.e. x-ray, physiotherapy, operating theatres, central sterile supply department and boiler house. An extensive site survey has been undertaken and the preliminary development plan completed.

The development will be carried out in a number of building phases. Provision has been made in the Board's Building Programme and, subject to the availability of finance, it is hoped to achieve a start on site within the next three years on the first phase which will include a major accident centre, including some 105 beds; approximately half of the ultimate out-patient department; beds for psychiatric and mentally sub-normal patients; training facilities for nurses and midwives; a centre for post-graduate medical education; a medical records department; kitchen and dining facilities and residential accommodation for hospital staff.

The cost of the first phase is estimated to be just under £5 million and the total cost of the development is likely to be in the region of £17 million.

£15,000 FOOTBRIDGE AT THE NINTH STOREY

PREFABRICATING a footbridge to take account of varying angles and levels in connecting the roof of one building with the ninth floor of the adjoining block was one of the problems posed in a recent £15,000 contract awarded by Hammersmith Hospital, London.

The 75ft. bridge, erected as a memorial to surgeon Ian Aird, famous for his open-heart surgery and kidney transplant work, was being officially opened on 19th June by Sir Hedley J. B. Atkins, K.B.E., D.M., M.Ch., P.R.C.S. The entire cost of the work has been met by private subscription.

Object of the bridge is to link the top of the Cyclotron Building with the ninth floor of the ten-storey Commonwealth Building at the hospital to provide convenient communication between two departments working in similar fields. In addition to spanning the 70ft. between the buildings, South Coast Welders Limited of Lympne, near Hythe, Kent, the contractors, had to fabricate the bridge to allow for several other factors. There is a 3ft. 4in. difference in levels between the points connected and a divergence to one side of 1ft. 7½in., further complicated by the fact that the walls of the two buildings are 2½ deg. out of parallel.

Fabricated from steel hollow sections, the nine-ton bridge is walled with toughened glass sections in aluminium channels and floored with steel coated plastic foam and flexible vinyl. The felted roof includes insulated asbestos board. At the point of entry to the Commonwealth Building, the bridge is anchored by a combination of studding and welding, while on the roof of the Cyclotron Building it is connected to a similarly-constructed 30ft. passageway giving access to the floor below. The contract included the provision of a spiral staircase and lift.

Two cranes were necessary for the subsequent erection of the bridge. One, with a 180ft. jib was used to hoist the bridge into position 135ft. above ground, while a second was required to lift one end of the bridge during transportation in order to gain entry into the hospital grounds.

Erection was carried out in one day in spite of high winds prevailing at the time. Architects were Lyons Israel & Partners, and the consulting engineers were Samuely & Partners.

The Diagnostic X-Ray Tube

Part 4

By W. TENNET, C.Eng., M.I.E.E.,
X-Ray Division, Mullard Ltd.

The Nature of the Useful Beam

The X-radiation generated at the focus consists of a mixture of wavelengths and is propagated in all directions round the group of tungsten atoms comprising the focus. The rays directed into the body of the target are, of course, quickly re-absorbed by the tungsten, leaving a solid hemisphere of radiation emerging into the vacuum of the tube. Of this hemisphere of radiation, only a narrow cone or pyramid is allowed to escape from the shield, the remainder being absorbed in the tube cathode structure, the bulb, the oil, and the protective lead of the shield. This narrow cone of radiation is the main or useful beam of the tube.

X-ray intensity distribution

Due to the anode heel effect the intensity distribution falling on a plane at right angles to the axis of the window (e.g. a film or a screen) is not uniform. Fig. 22 shows, for example, the intensity distribution which might be expected from a tube having a target angle of 16°. In practice this is not too serious, since the size of beam used corresponds to the flatter portion of the curve. Clearly, the smaller the target angle the more non-uniform the radiation intensity across the field.

Inherent filtration and half-value-layer

In order to escape from the shield the beam has to pass through the thickness of the glass bulb, the thickness of the shield window cup, and the oil in between. These, in common with every other substance traversed by the beam, attenuate the radiation differentially, in other words, 'filter' the beam. Since the long wavelengths are attenuated more severely than the short ones, the composition of the beam is modified. The beam, therefore, becomes more penetrating, or 'harder'. The glass wall, oil layer, and shield window then constitute the inherent filtration of the shield. This is expressed as the aluminium equivalent of the X-ray port, i.e. the number of millimetres of aluminium which produce the same hardness or quality, more specifically, the same half-value-layer of beam.

The value of the inherent filtration should always appear on the shield so that the user can decide whether or not additional filtration is desirable, and if so, how much.

Extra-focal radiation

We have assumed hitherto that all of the radiation emerging from the shield comes directly from the focus. Indeed, we want this to be so, because only focal radiation carries information to the film or screen. Unfortunately, the media traversed by the primary beam on its way to the film, e.g. glass, oil, plastic, air, human tissue, etc. all produce scatter, i.e. give rise to unwanted radiation.

A further source of radiation which, because it is generated outside the focus, can only degrade the diagnostic image, is the extra-focal radiation arising from the target of the tube. This is due to electrons 'rebounding' from the focus and falling back on to the target outside the focal area (see Fig. 23). Wherever they land they produce X-rays, and since these rays are almost as penetrating as those from the focus, the deliberate addition of filtration will not significantly improve matters. The presence of target extra-focal radiation can easily be demonstrated by using the same arrangement as for the taking of focus pictures, namely, a pinhole camera and dental film. If a light exposure is used, only the image of the focus appears

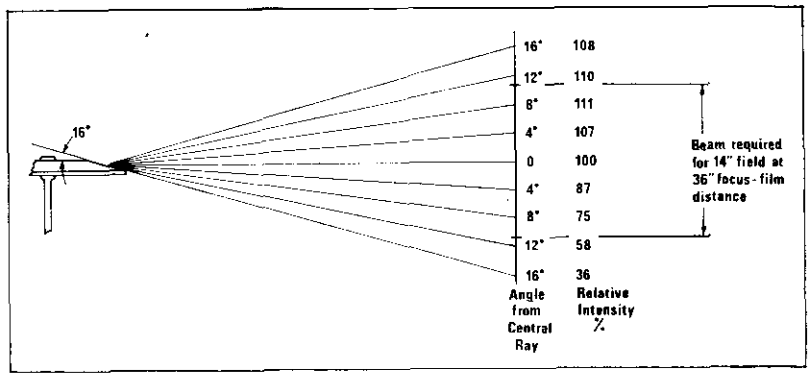


Fig. 22. Radiation intensity distribution for a 16° target angle.

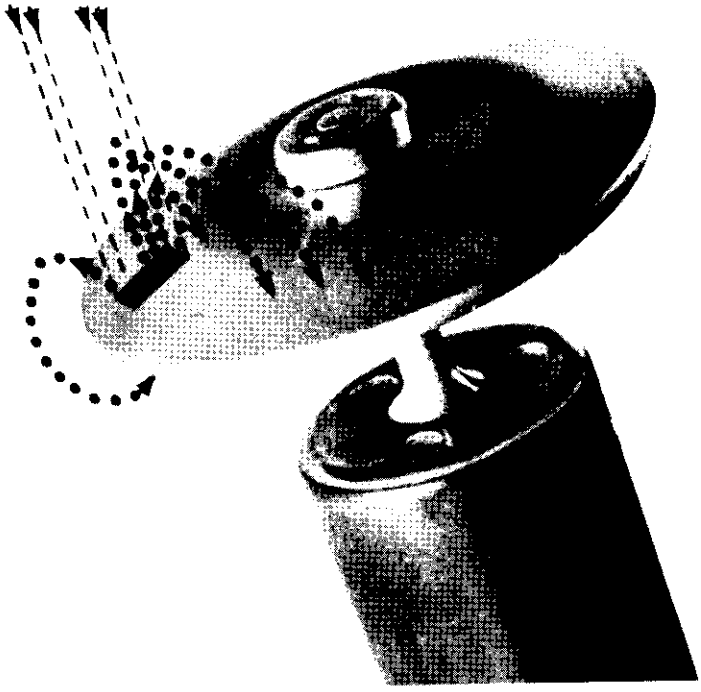


Fig. 23. The cause of extra-focal radiation.

on the film, whereas, if a very much heavier exposure is given, the focus image is grossly over exposed and an image of the entire lateral aspect of the target is seen (see Fig. 24).

This effect is much more pronounced in rotating anode tubes than stationary anode tubes because of the greater area of tungsten involved. In the stationary anode tube, much of the rebounding electron shower falls on copper and, therefore, due to the lower atomic number of this metal (Cu 29, W 74), a lower level of extra focal radiation is produced.

The effects of target extra-focal radiation are as follows:

(*a*) To render the beam composite, one component (focal) being image forming, the other (extra-focal) image degrading.

(*b*) To make it impossible to achieve a sharp field cut-off at the film or screen, particularly in the direction at right angles to the tube axis.

(*c*) To increase the patient dose.

Fig. 25 serves to explain the effect. In this diagram W 1 and W 2 are meant to represent various possible positions of the exit aperture of the beam control device (applicator or leaf diaphragm). It can readily be seen that the spread of extra-focal 'wings' of the image outside the desired

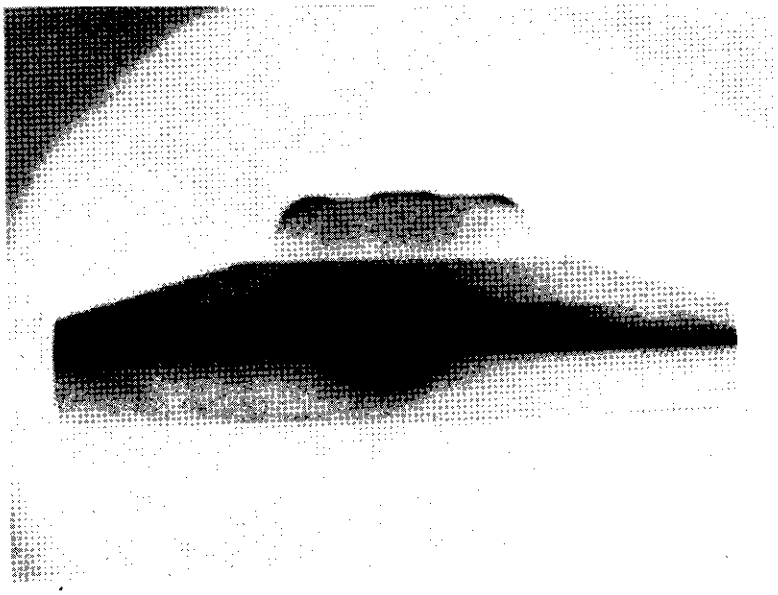


Fig. 24. Extra-focal radiation (as "seen" by a pinhole camera).

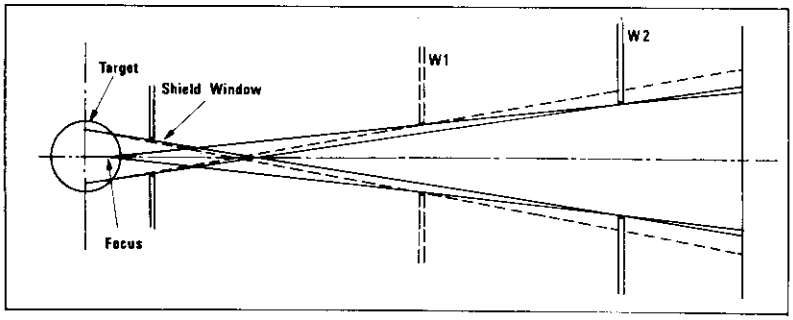


Fig. 25. The effect of distal beam control.

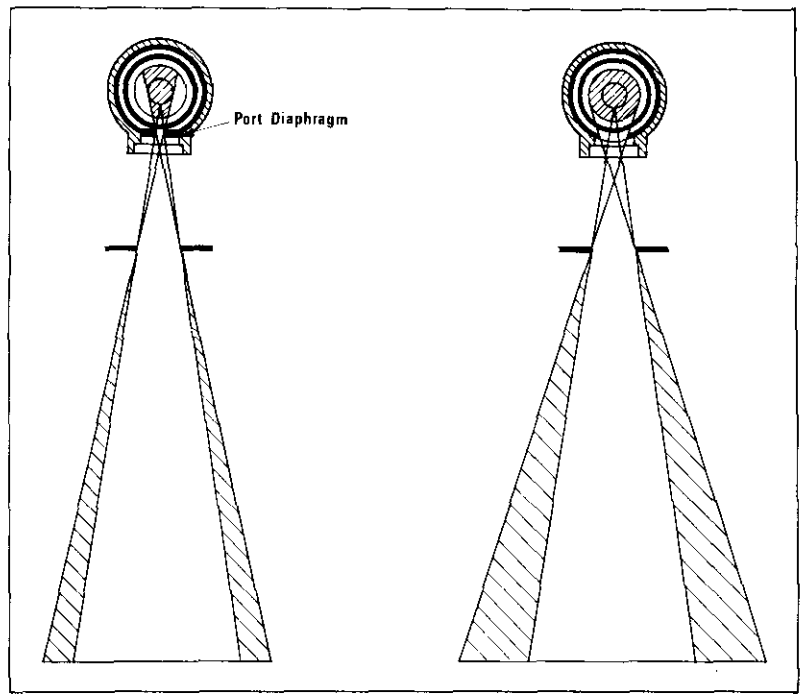


Fig. 26. The effect of proximal beam control.

field is dependent upon the position of this final aperture. If the beam control system could extend right to the film or screen, no extra-focal '*wings*' would occur. However, this, whilst in many ways desirable, would not reduce the area of the target 'seen' by any point on the image field and, therefore, would not reduce the amount of extra-focal radiation received at that point. It is the *first* aperture of the beam control system, i.e. the shield window, that governs this.

The only way of screening the whole of the target, except the focus, from the film would be to place the first aperture at the focus itself, and this is quite impossible. Extra-focal radiation from a rotating anode tube cannot, therefore, be eliminated. It can, however, be reduced to a minimum by fitting a first aperture (port diaphragm), as small as the maximum field-coverage required will allow, as close to the focus as possible, i.e. in the bottom of the window cavity of the shield (see Fig. 26).

In stationary anode tubes it is possible to place a hood round the target face, thus minimizing the spread of re-bounding electrons and at the same time building the first aperture inside the tube itself. This is the one advantage of the stationary anode tube over the rotating anode tube for medical diagnostic work. It is, of course, more than offset by the gross disparity in short-time power rating.

Care of the X-ray Tube

The tube as a 'wearing' object

In the following it is assumed that:

(*a*) The tube is powerful enough for the type of work involved.

(*b*) It has been installed and adjusted correctly.

It is important to remember that, in the X-ray tube, as in some other forms of energy convertor (e.g. a motor car engine), rate of 'wear' depends upon the driving pattern. No matter how powerful the engine, sustained high speeds and frequent demands for peak performance will shorten its life. For this reason no prudent motorist would consistently drive his car at maximum engine power.

Bearing wear

'Wear' in the case of the X-ray tube takes several forms. The most obvious form is mechanical wear in the bearings of the rotating anode. These bearings can only be lubricated once, i.e. during manufacture; every care should, therefore, be taken to conserve their life. This can be done by keeping their running time at top speed to a minimum, i.e. by keeping preparation time per exposure short. If the apparatus should be of the type in which the anode rotates as soon as the mains supply is switched on, this supply should be switched off whenever the set is not required for immediate use.

Glass wall bombardment

There is, however, another form of tube 'wear' which is much less obvious and yet accounts for many tube failures. This is tungsten deposition on the internal surface of the glass envelope of the tube.

As we saw when studying extra-focal radiation, electrons arriving at high velocity from the cathode do not all enter the focus and continue round the circuit. Some of them rebound, or more accurately, re-emerge from the focal spot, and fall in a fountain-like shower on

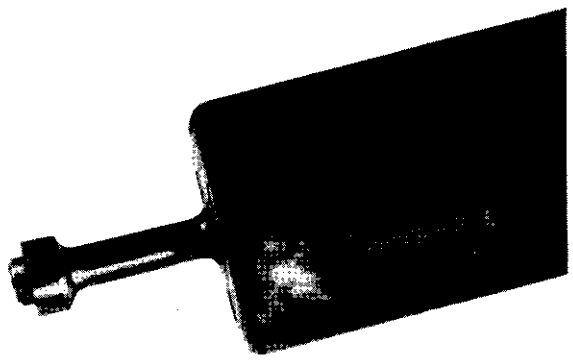


Fig. 27. Discharge marks on shoulder of rotor.

other parts of the target. They still have considerable energy as is seen from the fact that they generate X-rays on their return to the target. The glass wall, being at its nearest point only a few millimetres away from the focus, is well within range of these rebounding electrons. If they are allowed to land in any great number, very serious damage to the glass is caused. This is accompanied by evolution of gas from the glass and the vacuum of the tube rapidly deteriorates. The task of life conservancy is

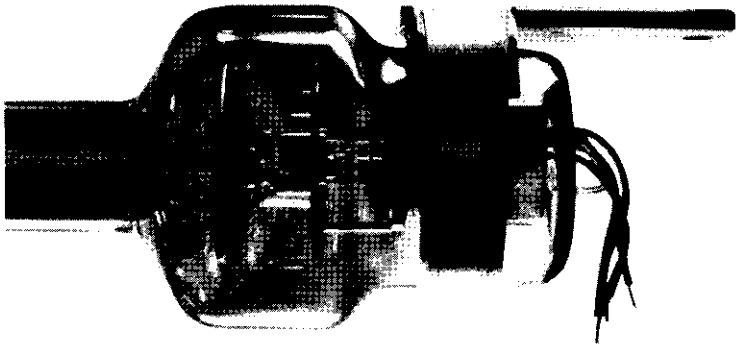


Fig. 28. Glass wall bombardment (early stage).

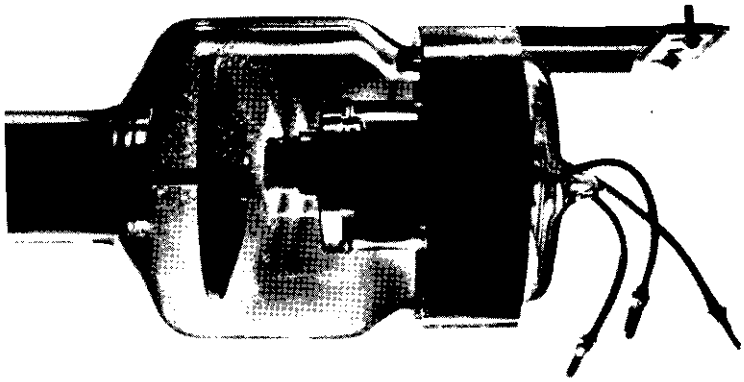


Fig. 29. Glass wall bombardment (terminal phase).

that of delaying, for as long as possible, the onset of heavy electronic attack on the glass.

The secret of preventing electronic attack on the glass is to maintain a high negative charge on the surface (the so-called 'wall charge').

Whenever high voltage is applied to a tube rebounding electrons from the focus initially land on the glass wall and build up a negative charge. The charge rapidly increases and is very soon strong enough to prevent, by mutual repulsion, any further landings. Because the charging current is of short duration no damage to the glass takes place. The charge can only build up sufficiently rapidly to prevent glass damage if the glass is very highly insulating, i.e. in the absence of any significant surface film of conducting material.

Tungsten deposition

A film of tungsten on the surface of the glass has two adverse effects, namely to increase the electrical capacitance of the glass wall and to reduce its insulating properties. Both of these serve to increase the charging current required to establish and maintain the essential negative wall charge. As more and more tungsten is deposited the situation deteriorates until finally the point is reached where the glass is under constant heavy electronic bombardment throughout every exposure. When the rate of gas evolution thus produced exceeds a certain level, gas in the narrow space between the shoulder of the rotor and the bulb becomes ionized and the tungsten film becomes, in effect, an extension of the anode (see Fig. 27). This, of course, leads to a huge increase in electronic bombardment of the glass (see Fig. 28), copious evolution of gas, and the tube breaks down.

All of the signs of this, a frequent type of failure, are to be seen when the tube is subsequently examined. A very accurate report on the cause of failure (see Fig. 29) can in this case be given. This is the most common type of failure simply because every tube which escapes destruction by mechanical shock, electrical overload (see Fig. 30), exposure on a stationary target (see Fig. 31), etc., *must* fail in this manner. Tungsten evaporation from the target (Fig. 32) and filaments (Fig. 33) and, therefore, tungsten condensation on the bulb, is inevitable. Our purpose here is to see how the rate of build up of this lethal metal film can be minimized.

Taking the target first, we cannot avoid the very high temperature reached in a single exposure. We can, however, frequently avoid the very dangerous escalation of target temperature due to the too rapid application of successive exposures. The aim should, therefore, be to have the tube as cool as possible at the commencement of any exposure, which is just another way of saying that intervals between exposures or between serial groups should be as long as possible, particularly when the exposures are known to be heavy, e.g. angiography, lateral pelvis and sacrum, etc.

(*Continued on page 176*)

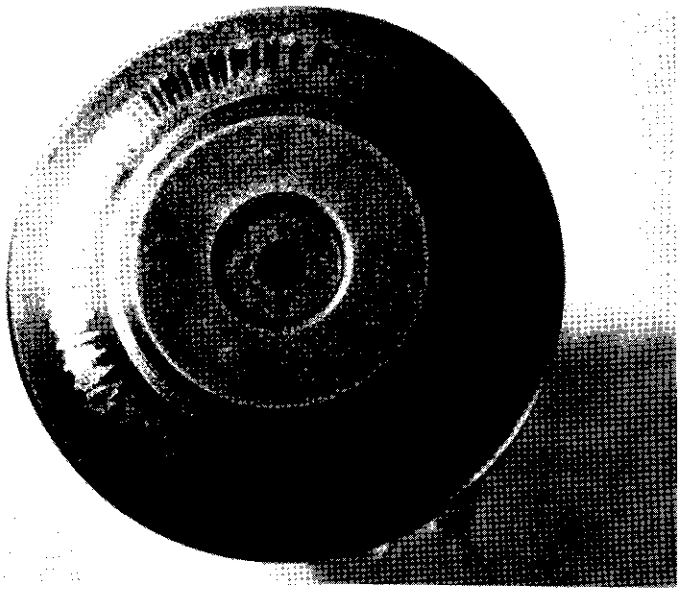


Fig. 30. Focal-track overload.

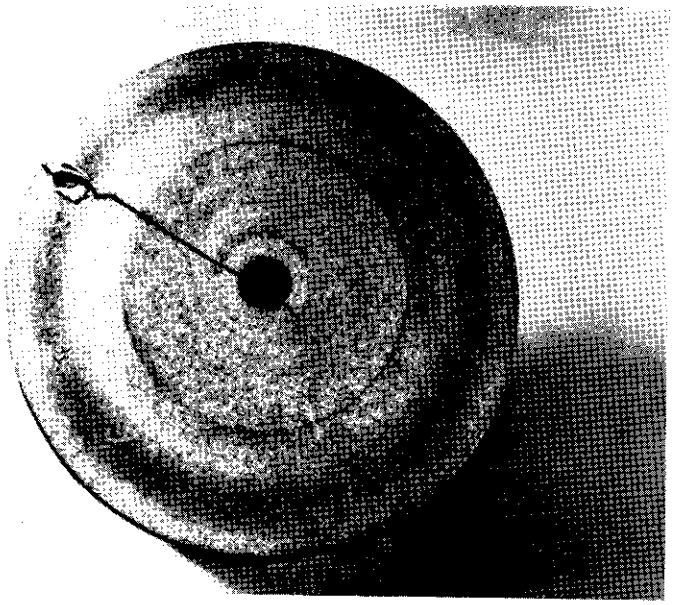


Fig. 31. Exposure on a stationary target.

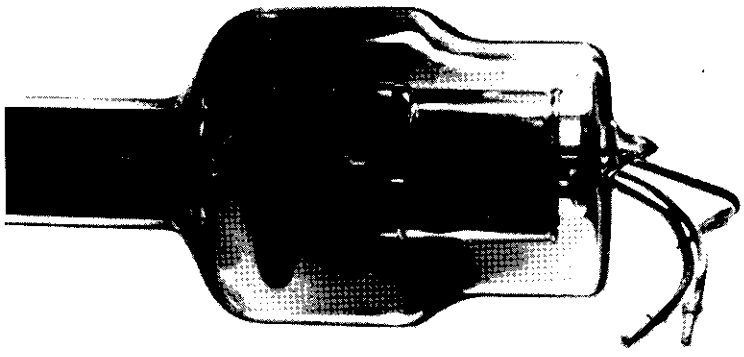


Fig. 32. Tungsten from target deposited on bulb.

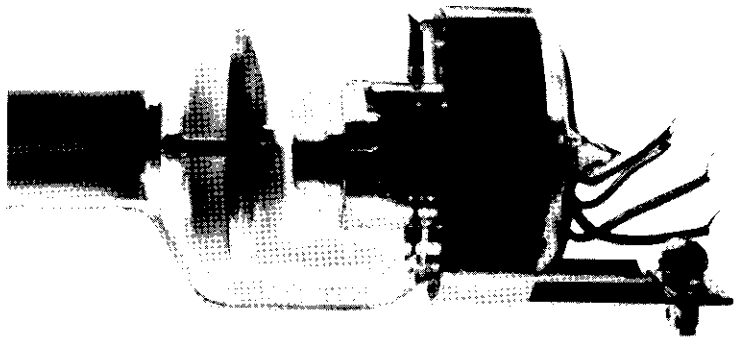


Fig. 33. Tungsten from filament deposited on bulb.

The other source of tungsten vapour is, of course, the filament of the tube. In order to achieve the high electronic emission required and at the same time to produce a small concentrated electron beam, the filament of a rotating anode tube is operated at extremely high temperatures (up to about 2,500°C). The rate of evaporation of tungsten is proportional to temperature to the power 34 and, therefore, at such high temperatures, it is very high indeed. For this reason the filament 'stands by' at a very low temperature and is boosted to radiographic temperature only immediately prior to the exposure taking place, i.e. when the set is switched to the 'preparation' condition.

Significant improvement in tube life can, therefore, be achieved by switching to 'prep' as late as possible and releasing the set from 'prep' as soon as the exposure is finished.

(Concluded)

Reflections on the 1st One-Year Inter-Regional Training Scheme for Potential Group Engineers

By M. S. THOMPSON, C.Eng., A.M.I.Mar.E.,
Group Engineer, Bedford Group H.M.C.

Introduction

NOW that this first one-year course has terminated, an opportunity is taken here to reflect upon its successes, highlights and failings. Undoubtedly the course has been a success, if only by virtue of the immediate promotion which some of the twelve course-members have achieved. The short term viewpoint is, however, overshadowed by the overriding sense of achieving a far greater awareness of the complete problems facing Hospital Management rather than viewing these strictly from an engineering context. The end-product of the course is a more complete make-up to an individual's character, thereby more readily equipping him to accept membership of a senior officer's team pertaining to a hospital group. By removing the routine, repetitive and time-consuming tasks encountered by an engineer in post and in their place, both the time and opportunity being given to developing correct techniques and confidence, both in a management and technical sense, all trainees have been able to acquire a thorough knowledge of many subjects.

Secondments

One of the highlights of the scheme was the opportunity afforded to study in detail the relative techniques and methods employed by different Group Engineers in achieving the same objective, namely the efficient operation of the Engineering Department. This unique opportunity enabled trainees both to learn by direct imitation and also to develop ideas of their own from experiences gained at several hospitals.

Personal Appraisals

Another worthwhile aspect of the scheme was the regular appraisal meetings held with trainers at weekly intervals; these being further strengthened by frequent review courses held with the course organisers. Both these types of meeting enabled trainees to evaluate their progress, attitudes and weaknesses in the light of past events and enabled new courses of action to be drawn up, wherever the need was found.

Technical Training

Without doubt, the level of technical training was high and was adequately designed to cover the extremely wide spectrum of engineering activities met in the Department. The time and effort which technical experts from various Regional Hospital Boards, Hospital Management Committees and other external sources put into the research and presentation of technical lectures was truly appreciated by all trainees. Not only were the lectures of value but, also, the vast amount of technical literature received will be of long-standing benefit for future reference.

"Cardington" Courses

As well as the internally organised courses, all trainees attended four technical courses organised by the Ministry

of Public Building and Works at their Cardington Training School. The eight weeks so spent were unanimously acclaimed as being well worthwhile and were strongly commended for their comprehensive syllabus and method of presentation.

Practical Attachment

The first practical attachment to a particular Hospital Management Committee enabled trainees either to practically participate in technical aspects of work, or to continue further studies mutually agreed with the trainer as being beneficial.

Management

Throughout the course, emphasis was placed, and quite rightly so, on the important implications of efficient management of the Engineering Department. Management training took two forms and consisted of, firstly, theoretical study of various techniques and skills, together with the opportunity to consolidate and articulate individual practical experiences of management. Lectures and discussions were also given by successfully practising hospital managers, ranging through the senior engineering and administrative fields. The second aspect of management training was more practically organised and was designed to cover several months during the second attachment at a Hospital Management Committee. Increased scope was given to take the direct management responsibility of the Group Engineer. The end product was that, not only could the trainee in fact do such work, but that he acquired both the desire and the confidence to do so. The opportunity was also given to study other important management functions whilst on this attachment. Communications and relationships were studied with Regional Board staff, Hospital Committees and with other senior hospital officers. Other important aspects such as personnel management, office management techniques, engineering costing, purchasing and planning were studied within the practical confines of a particular hospital group.

Timetables

The only real weakness of the course was the timetable of events, which in some cases did not follow a smooth natural progression. At times, it also meant very short attachments at various areas with the result that some worthwhile subjects could not be adequately studied, due mainly to time restrictions. The explanation lay in the unavoidable fixed timings of the "Cardington" technical courses with the result that other activities had to be geared to these. However, I understand that such "teething" troubles, which one can expect from a new course, have been noted and action taken so that future courses will have a more balanced arrangement and training will follow a more realistic sequence.

Conclusion

I am sure that the true value of this intensive training scheme will show itself more in the long term viewpoint than that in its immediate impact. I believe that all trainees will now lay more emphasis on the necessary and urgent needs of correct training of staff. In addition to having a sound engineering knowledge, I am convinced that, by having an appreciation of the need for developing correct relationships and attitudes to one's colleagues and subordinates, and exercising to the best of one's ability the requisites of good management, such trainees will be better equipped to meet the increasing and rapidly changing problems facing the hospital engineering department.

In conclusion, and speaking on behalf of all trainees, I wish to express the trainees' sincere appreciation to all concerned with the organisation and operation of this progressive course.

LEEDS, BIRMINGHAM AND SHEFFIELD REGIONAL HOSPITAL BOARDS INTER-REGIONAL TRAINING SCHEMES FOR ENGINEERS

Introduction

IN AUGUST, 1967, the Leeds, Birmingham and Sheffield Regional Hospital Boards agreed to co-operate on an inter-regional basis to implement an experimental one-year scheme of training for suitably qualified and experienced Engineers, for posts as Group or Hospital Engineers in the three Regions, on satisfactory completion of training. It was intended that the scheme would be an interim measure designed to produce results quickly and would not, therefore, interfere with the normal career structure for existing Hospital Engineers. Nor would it prejudice any future proposals for the long-term training of Hospital Engineers being considered by the Advisory Committee set up by the Minister of Health and the Scottish Home and Health Department.

The main purpose of the scheme was to attract suitable candidates from inside and outside the hospital service who were appropriately qualified and who, though basically experienced, required additional technical and management training in the hospital field. It was anticipated that any external candidates recruited would be offered supernumery posts as Technicians II with the appropriate Regional Hospital Boards during training, whilst internal candidates would remain on the staff of their own employing authorities and would be seconded for the one-year training period. It was agreed that the actual training should take the form of a sandwich course, consisting of intensive theoretical and management training, supplemented by periods of practical training at selected hospitals within the three Regions, under the supervision of experienced Group Engineers who would act as Trainers.

Steering Committee

In September, 1967, a Steering Committee was set up under the chairmanship of Mr. W. Bowring, Secretary of the Leeds Regional Hospital Board, the membership consisting of representatives of the three Boards concerned. In the first instance, it was hoped to attract about four candidates from within the areas of each of the three Regional Boards, each Board to meet the costs of its own candidates.

Executive Committee

Responsibility for preparing a suitable training scheme was delegated to a small Executive Committee consisting of the Deputy Regional Engineer to the Birmingham Regional Hospital Board, the Regional Training Officer of the Sheffield Regional Hospital Board and the Principal Assistant Secretary in charge of Establishment/Training at the Leeds Regional Hospital Board, who were also authorised to publicise the scheme, to prepare a brochure and to set up a Joint Selection Panel to interview and select suitable candidates.

Candidates

Although, at the outset, it was intended to confine the scheme only to candidates recruited and sponsored by the Leeds, Birmingham and Sheffield Regional Boards, it was subsequently decided to extend recruitment to include candidates sponsored by other Regional Hospital Boards.

Out of a total of 77 applications received, 50 were from internal candidates and 27 from external candidates. 21 candidates were interviewed by the Joint Selection Panel and 12 candidates were finally selected for the training scheme, as follows:—

Leeds Region ...	...	4 candidates
Sheffield Region	...	2 candidates
Birmingham Region	...	4 candidates
Manchester Region	...	1 candidate
Liverpool Region	...	1 candidate
		12

Training

In preparing the scheme, the Executive Committee defined its main objective as providing the optimum conditions in which the trainees could carry out active studies of all the constituents of hospital engineering management. The method of achieving this objective was considered to be a programme which would include planned experience, with opportunities for direct study of appropriate technical engineering and management work, for understudy of exemplary practitioners and for periodical review of personal knowledge, skills, attitudes and overall development.

Training commenced on 10th June, 1968, on the basis of the following programme prepared by the Executive Committee:—

1 Week	Introductory Course
7 Weeks	Technical Training at Sheffield
3 Weeks	Management Training at Sheffield
29 Weeks	Practical Training at selected Training Hospitals
8 Weeks	Specialised Technical Training at Cardington
1 Week	Short Review Course
3 Weeks	Annual Leave

The experimental one-year training scheme ended on 30th May, 1969, with the presentation of Certificates by the Chief Engineer to the Department of Health to the 12 candidates who had successfully completed the course. The Certificates awarded have now been approved by the P.T.B. Whitley Council and the Secretary of State for Health and Social Security as an "equivalent qualification" for the purpose of the Whitley Council Regulations, as an alternative to the qualifications laid down in P.T.B. Circular No. 179 for the grades of Group Engineer, Deputy Group Engineer and Hospital Engineer.

The following table indicates the original posts occupied by some of the trainees, their sponsoring Regional Hospital Boards and the posts taken up since the training scheme ended.

Previous Post	*Sponsoring Region*	*New Post*
1. Hospital Engineer	Leeds	Deputy Group Engineer, Leeds Region
2. Hospital Engineer	Leeds	Group Engineer, N.W. Metropolitan Region
3. Hospital Engineer	Leeds	Deputy Group Engineer, Leeds Region
4. Hospital Engineer	Leeds	Group Engineer, N.W. Metropolitan Region
5. Assistant Engineer	Birmingham	Deputy Group Engineer, N.W. Metropolitan Region
6. Coal Board Engineer	Sheffield	Deputy Group Engineer, Sheffield Region
7. Hospital Engineer	Manchester	Group Engineer, East Anglian Region

The Future

At a meeting of the Steering Committee held on 5th September, 1968, discussion took place on whether or not a similar scheme should be organised to commence in 1969, on completion of the pilot experimental scheme. An approach was made to the Department of Health asking if they would take the lead in sponsoring the similar scheme on a national basis. The Department replied that, although they did not propose to organise a national scheme themselves, they would be grateful if the Leeds, Birmingham and Sheffield Boards would continue their scheme for a further year, in conjunction with the Advisory Committee on Hospital Engineering Training, on the same lines as the first experimental course, the scheme to be open to candidates sponsored by all Regional Hospital Boards and the Scottish Home and Health Department. Details of the second course were subsequently publicised by the Department in a staff Training Memorandum and it was agreed that the arrangements for the recruitment and selection of candidates for training on the 1969 course would be exactly the same as for the 1968 course.

Candidates for the 1969/1970 Course

In response to the publicity for the 1969/70 course, 100 applications were received, of whom 40 were interviewed by the Joint Selection Panel. Seventeen candidates were considered suitable for training, all being internal candidates,

from the following Regions:

Leeds Region	3 candidates
Sheffield Region	7 candidates
Birmingham Region	1 candidate
South West Metropolitan Region ...	1 candidate
South East Metropolitan Region ...	1 candidate
Manchester Region	1 candidate
Scotland	3 candidates

In addition, the Ministry of Overseas Development had submitted a candidate from Barbados and this was agreed, making a total of 18 candidates available.

Sponsors

Certain difficulties have, however, arisen with regard to the costs of the 1969/70 scheme in that, so far, the Steering Committee has found great difficulty in obtaining sponsors for some of the candidates and only four Regional Hospital Boards, the Scottish Home and Health Department and the Department of Overseas Development, have accepted financial responsibility for candidates, as follows:

Leeds	4 candidates
Sheffield	3 candidates
Birmingham	1 candidate
Manchester	1 candidate
Scottish Home and Health Department	2 candidates
Department of Overseas Development	1 candidate

This means that, out of the total of 18 suitable candidates available, only 12 can be accepted, although approaches have been and are still being made to other Boards and the Department, so far without success, to sponsor the other candidates.

The Birmingham Board have reluctantly had to reduce their sponsorship this year because the mergers, which took place in April 1969, have solved the short-term shortage of Group Engineers in that Region. The Board have, however, embarked upon a long-term training programme for school leavers. Nevertheless, arrangements are being made to commence the 1969/70 Course on 6th October, 1969.

1969/70 Course

Arising out of the experience gained on the first Course, it is considered that several important improvements in the 1969/70 scheme will be possible. These include the undertaking of all technical training during the early stages of the Course, thereby permitting the application of the knowledge gained during the practical attachments later on. It has also been possible, by agreement with the Ministry of Public Building and Works, to arrange all the specialised technical courses at Cardington simultaneously, instead of in a piece-meal manner, as vacancies permitted, during the first Course.

As a result, the programme for the 1969/70 Course will be amended to provide for the incorporation of the following improvements:

(*a*) The Introductory Course and the Technical Courses to be combined in a seven-week course at the beginning of the programme.

(*b*) The first practical attachments for the trainees, following the Introductory Course and the Technical Course, to be arranged and supervised by the Regional Engineer (or his representative) of each sponsoring Board, who would be responsible for assessing the practical training needs of each individual trainee under his control and for selecting training hospitals for this purpose, so that the practical attachments could be tailor-made for each individual trainee and would include the appropriate practical experience required.

(*c*) A briefing course to be held for the R.H.B. Scheme Representatives during the Introductory Course so as to enable the Scheme Representatives to hold assessment interviews with the trainees and define their technical and practical training needs at the outset.

(*d*) Since the first Course, there have been changes made in the method of admitting Health Service staff to the Cardington Courses and agreement has been reached to admit future trainees from this scheme in blocks covering two periods of four weeks.

(*e*) The Management Courses to be combined into one comprehensive course of three weeks duration.

(*f*) The second part practical attachments at selected hospitals will continue to be regarded as managerial attachments during which the trainees will undertake projects and the full range of duties of a Group Engineer, under the supervision of the Group Engineer Trainer.

In view of these proposed changes, the broad outline of the 1969/70 programme will, therefore, be as follows:

6th October—21st November 1969	Introductory and Technical Course
24th November—19th December 1969	Cardington Courses
22nd December 1969—2nd January 1970	First part practical attachments at selected hospitals arranged by the R.H.B. Controllers
5th—30th January 1970	Cardington Courses
2nd February—3rd April 1970	Continuation of first part practical attachments and including intermediate Review Course
6th—24th April 1970	Management Course at Sheffield Regional Training Centre
27th April—28th September 1970	Managerial attachments at selected hospitals
28th September—2nd October 1970	Final Review Course

Conclusions

It will be some time before benefits of the training scheme can be totally assessed. The immediate advantages, however, have been that most of the trainees have obtained more senior posts. Certainly, all of them are now capable of accepting more responsibility for technical and managerial tasks. The trainers, all experienced Group Engineers, have affirmed that they, too, have gained from the refresher aspects of training others. Furthermore, Junior Engineers promoted temporarily during the absence of the trainees have also benefited from their greater responsibility.

Duchess of Kent opens new Maternity Unit at Rush Green

HER ROYAL HIGHNESS The Duchess of Kent opened the new Maternity Unit at Rush Green Hospital, Romford, on Thursday, 29th May. The Unit, built for the North East Metropolitan Regional Hospital Board by Wates Construction Ltd., replaces an older, but out-dated, maternity unit at Oldchurch Hospital which the Board decided to replace in 1963.

The Ministry of Health informed the Board early in 1964 that they were proposing to undertake and experiment in system building applied to the Hospital Building Programme, and they proposed that the Board co-operate in this experiment by building the new unit based on a design by the Birmingham Regional Hospital Board.

Wates were assigned to undertake the system building of the Rush Green Unit. The purpose of the experiment was to evaluate the speed of construction, economy in materials and manpower and the extent to which the planning period could be shortened by using modern methods of system building. It was also to evaluate the advantages of involving the contractor with the project team at an early stage of planning.

Work started at Rush Green on 4th July, 1966, with a construction period of 21 months.

The result of the use of the system method of building the Unit has been that expectant mothers served by the Romford Group have the advantage of the new Maternity Unit some two or three years earlier than would have been possible if conventional methods of planning, etc. had been adopted.

It became obviously apparent in the early stages that there would be a substantial diminution in the pre-contract work required up to the receipt of tenders.

When the building was finally completed in March, 1968, the old unit at Oldchurch Hospital was transferred to the new building at Rush Green.

Siting

The Maternity Unit is sited on open ground in the south-west part of the hospital, occupying an area of approximately 1½ acres. Its entrance forecourt is directly linked by the widened east-west road to the new hospital entrance in Dagenham Road.

Accommodation—General Layout

The single storey podium block houses the reception area, central milk kitchen, ante-natal clinic, admission and labour suite, and a special care unit for premature babies.

The ground floor of the high rise block accommodates offices and a teaching department for midwives. The upper floors contain the four ward units.

The front entrance (facing Dagenham Road) is used by staff, visitors and patients arriving by car or on foot. Ambulances, however, are directed to the south entrance opposite Ward 14. The latter entrance is also used for supplies.

Reception and Entrance Area

Ante-natal patients enter directly off the open entrance hall leading to the large waiting hall adjacent to the west reception counter while visitors, ambulant patients and staff use the approach through the entrance and reception halls. The reception counters are so positioned as to serve both sections.

The reception area includes the main lift hall where refreshments and small gifts are available at a tea bar, the central milk kitchen divided into "clean" and "dirty" rooms which serve the whole of the Maternity Unit, a sterile supply store and staff changing and rest room facilities.

Ante-Natal Clinic

This is based on two consulting rooms and a suite of eight examination rooms each served by the changing cubicles. The clinic includes a treatment suite, accommodation for the sister-in-charge, health visitor and medical social worker, dictating and interview room, medical typist's office and rooms for special investigation.

A large "relaxation and instruction" room has been set aside where patients receive guidance in mothercraft and take part in relaxation exercises.

Admission and Labour Suite

This is a compact unit to take patients from admission through all stages of labour. The facilities include six progress rooms, each having a private toilet suite, six delivery rooms and an operating theatre suite equipped to the most up-to-date standards.

Doctors' and midwives' changing rooms, including toilets and showers, are planned as "barriers" between sterile and non-sterile areas.

Ancillary accommodation includes utility and sluicing rooms, doctors' and midwives' duty rooms, and a

patients' sitting room for use during the early progress phase.

Special Care Baby Unit

This unit is arranged adjacent to the replacement and auxiliary operating theatre and consists of three 4-cot and six single cot nurseries in which premature babies receive special care in incubators before being allowed home with their mothers.

Four "mother and child" rooms are provided to enable ambulant mothers to tend their babies under special supervision while staying at the hospital. As in the labour suite, male and female changing rooms with shower facilities are planned as "barriers" between the sterile and non-sterile sections. The accommodation includes a midwives' station, sister's office, kitchen and dayroom for mothers.

Administration and Teaching Department

This is on the north side of the large entrance hall and consists of offices for the midwifery superintendent and the deputy, and the medical record officer. The teaching section includes a lecture room, a library and study room, and office accommodation for tutors.

Wards

The three ward units on the 1st, 2nd and 3rd floors are identical, each with 27 beds, arranged in 5 four-bed wards and 7 single wards for patients requiring isolation and segregation on medical grounds. Four of the single rooms have private bathroom and toilet facilities and form a separate compound with its own secondary midwives' station. There is also an up-to-date treatment suite.

The top floor has only 23 beds, arranged again in 5 four-bed wards, but only 3 single rooms. A separate labour suite is incorporated at the northern end, consisting of two delivery rooms and two progress rooms supported by ancillary rooms. This suite initially augments the central labour suite facilities on the ground floor, but it is expected that the top floor ward will eventually function as a General Practitioners' Unit in which patients remain under the care of their own G.P.s.

Apart from the normal patients' toilet and bathroom/shower accommodation and usual ancillary rooms, all four wards have a ward kitchen the function of which is the distribution of meals and the preparation of beverages, a comfortable dayroom for up-patients and a visitors' room with en suite toilet facilities where relatives can, in emergencies, stay overnight.

Each of the four-bed wards has, for privacy, a curtained-off recess containing patients' lavatory basin and a fitted unit of four personal lockable wardrobes.

Construction and Finishes

The Maternity Unit has been constructed in reinforced concrete on a largely industrialised-prefabricated-basis with exposed aggregate external cladding. Internally, partitions are in 4" blockwork, plastered and finished in eggshell or emulsion paint. Floor finishes are in vinyl sheet or tile throughout.

In the ward areas a felt-backed vinyl sheet finish has been laid to reduce impact sound transmission between floors and afford greater comfort to patients and staff.

Suspended ceilings are either in Frenger heated panels or pre-finished plastic-faced panels set in plastic sheathed aluminium tees. The void above houses the extensive engineering services. A large number of sapele-mahogany and plastic faced storage fitments have been incorporated. These were designed by the Ministry of Health in conjunction with the Inter-Board Study Groups as standard components for new hospitals.

Internal doors are also mahogany faced and generally conform to standard Ministry of Health sizes. All doors are 6' 10" high. Steel windows in standard "module 4" sizes have been used.

Associated Works

Various services in the existing hospital had to be strengthened to support the new Maternity Unit. These include a new Pathology Department, extensive upgrading and improvements to the main kitchen, including new central wash-up facilities and central stores, additional residential accommodation for doctors and nurses, and, close to the new entrance in Dagenham Road, a new enquiry and porter's lodge with telephone switchboard.

A number of new roads were constructed, and some existing roads widened and upgraded to take into account the increased and changed flow of traffic.

New car parks have been provided in several areas, the largest being sited to the north of the Maternity Unit, having a capacity of 85 car spaces.

ENGINEERING SERVICES

Boiler House

The existing boiler house accommodated three coal-fired steam boilers each rated at 5,000 lbs. per hour with mechanical stokers which served the existing hospital. An additional coal-fired boiler, with automatic stoker, rated at 6,500 lbs. per hour, was installed in the existing boiler house to meet the demands of the new Maternity Unit and to give adequate standby capacity. This work, together with the steam distribution mains, was carried out as a separate contract to the Maternity Block contract. Steam distribution to a central basement calorifier room in the Maternity Unit provides heating and hot water services.

Heating

Space heating is generally by hot water heated ceilings and, in certain circumstances, combined with hot

water radiators. Room temperatures are automatically controlled by thermostats situated in various positions to proved separate control in rooms having differing orientations. Time switches are installed in areas used only during the day to reduce the room temperatures at night and so save on fuel consumption. Standby calorifiers and pumps are provided in the plant room.

Hot Water Supply

Hot water is distributed throughout the building from calorifiers in the plant room in the basement. Standby calorifiers and pumps are provided in the plant room.

Cold Water Supply

Softened water is supplied from a central softening plant which serves the whole of the hospital. This supply is pumped to two main storage tanks in the tank room on the roof of the new Maternity Block, providing 9,000 gallons storage. A separate 3,000 gallon storage tank provides for a service to sluice sinks and bed-pan disposal units etc. An autopneumatic booster set is used to serve drinking water and hosereel points in the various parts of the building. Water supply to the hot water service system is fed from the softened water storage tanks.

Ventilation

Mechanical ventilation installations supply filtered, warmed and humidified fresh air to Operating Theatres and Delivery Suites. These systems keep the clear areas at a positive pressure to prevent the ingress of dust and germs from the less clean surrounding areas. Cooling has not been included, but provision has been made for the installation of a cooler battery and the associated refrigeration plant in the future, if it is found to be necessary.

Warmed and filtered fresh air is supplied to the Ante-Natal Clinic, Treatment Rooms and internal rooms throughout the building. Mechanical extract is provided from all internal rooms, bathrooms, toilets, showers, milk kitchens, etc.

Waste Disposal

Two "Sluicemaster" disposal units are provided on each floor to dispose of papier mâché bed pans and discharge the waste as sludge direct into the drainage system, thus avoiding the need for bed pan washers, sterilizers, and warming cupboards.

All other waste is collected in disposable bags and delivered to a central incinerator adjacent to the Boiler House. No local incinerators are provided.

Medical Gases

Oxygen and nitrous oxide are stored in high pressure cylinders in the main basement plant room, together with a central medical suction unit from where the respective services are piped to the outlet points in the Operating Theatres, Treatment Rooms and Wards, etc.

Electrical Services

(i) *Mains Supply*

A 440 volt 3-phase mains supply is taken to the main switch room situated adjacent to the main plant room and sub-divided to provide power, lighting, etc. for the unit.

(ii) *Emergency Supplies*

A diesel generator with a full load output of 250 kVA. is installed adjacent to the Boiler House to provide power during a mains failure. This set was installed under a separate contract and serves sections of the existing hospital and Boiler House in addition to the Maternity Unit.

It is designed to supply power to maintain all main piped services in operation, together with a Lift, Operating Theatres, Delivery Rooms, medical gas warning systems, pumps, a proportion of lighting and a limited number of socket outlets.

The supply from the diesel alternator, which starts automatically on mains failure, will be distributed by cables separate from those carrying the mains supply. During the short time lapse in which the alternator is running up to full load, the electrical supplies to the Operating Theatres are supplied instantaneously on mains failure from a bank of batteries.

(iii) *Staff Location*

A V.H.F. staff location system enables staff within the hospital precincts, who are equipped with miniature personal receivers, to be contacted by the telephone operator. This system also provides one-way speech.

(iv) *Bedhead Units*

Specially designed bedhead units are installed in all delivery rooms and they incorporate nurse call system, socket outlets and switch for bedhead lights. Bedhead units are installed in all Wards and incorporate the call system, radio outlet for hand set and switch for bedhead lights.

The nurse call system consists of buzzers and lights with a mimic diagram at the nurse's station to indicate the origin of the call. There is a central aerial for radio and television wired to socket outlets; television is only provided in dayrooms.

(v) *Telephones*

The existing G.P.O. and internal telephone systems have been extended to serve the new Maternity Unit.

(vi) *Fire Alarms*

The method of raising a fire alarm within the hospital is by dialling a standard number combination on the internal telephone which is received on an extension at the main telephone switchboard. The same method has been adopted in the Maternity Unit.

Hose reels are installed in the building for local fire fighting and fire hydrants are situated around the site for the Fire Brigade's use.

(vii) *Clocks*

Generally, clocks are of the impulse slave type operated by a battery master clock giving the advantage of reduced maintenance and central time-keeping.

In addition, synchronous clocks with centre sweep second hands have been installed in most of the Clinical Rooms.

Lifts

Two 23 persons bed/passenger lifts were installed and are provided with collective control so that the caller receives the first lift available. An overriding key operated control is provided in each lift car to facilitate the movement of bed patients, and separate special control switches situated in the entrance lobby are respectively for medical emergencies and fire incidents. The lifts have a speed of 150 feet per minute. A service hoist is provided for the transport of sterile supplies.

Distribution of Services

Care was taken in the design of the main services to route these services through the false ceilings of the main corridors in order to minimise the disturbance of occupied rooms by maintenance staff.

Sub-Contractors

Mechanical services installed by Andrews Weatherfoil Ltd., Electrical services installed by Bective Electrical Co. Ltd., both of whom were responsible for the design of the requirements of the Regional Engineer. Lifts were installed by Express Lifts Ltd.

General

Estimated Cost

Contract sum	£715,400
Professional Fees	49,000
Furniture and Equipment	64,600
	£829,000

Medical Planning

Dr. T. A. Ramsay, F.R.C.S.(Glas.), B.Sc., M.B., Ch.B., Senior Administrative Medical Officer.
Miss S. P. White, S.R.N., S.C.M., Nursing Officer.

Architects

Mr. W. G. Plant, Dip.Arch.(Liverpool), F.R.I.B.A.
Mr. J. Nicholls, A.R.I.B.A.

Engineers

Mr. H. T. Scott, A.M.I.H.V.E., A.R.S.H.
Mr. E. P. Garland, A.M.I.H.V.E.

Quantity Surveyor

Mr. W. F. Halls, A.R.I.C.S.

Project Team

Dr. W. B. Obank, M.A., M.B., B.Chir.(Cantab), M.R.C.S., L.C.R.P., Barrister-at-Law, Medical Officer.
Miss P. J. Mardell, S.R.N., R.F.N., S.C.M., R.N.T. Nursing Officer.
Mr. E. K. Heyman, Dipl.Arch., Dipl.T.P., A.R.I.B.A., Architect.
Mr. J. H. Leverton, B.Sc.(Eng.), C.Eng., F.I.E.E., Engineer.
Mr. W. G. Fuell, C.Eng., A.M.I.Mech.E., Engineer.
Mr. A. J. G. Cawsey, F.R.I.C.S., Quantity Surveyor.
Mr. D. F. Jones, Project Secretary.
Mr. E. S. Smith, Project Secretary.
Mr. F. E. Stone, Clerk of Works.
Mr. P. Marshall, Site Engineer.

General Contractor

Wates Construction Ltd.

Consultant Structural Engineers

Ove Arrup & Partners.

Abstract of Reports

BURNLEY AND DISTRICT H.M.C.

THE TWENTIETH Annual Report on the activities of the hospitals in the Burnley and District Group during the year ended 31st March, 1969, highlights the completion of Phase I of the Major Building Programme and the official opening of the new Edith Watson Maternity Unit on the 29th November, 1968, by Mr. Julian Snow, M.P., Joint Parliamentary Under Secretary of State to the Department of Health and Social Security.

Having completed Phase I of the Major Building Programme, the Committee look forward to the commencement of Phase II (new Out-patient, Physiotherapy and X-ray Departments at the Burnley General Hospital) and already discussions on the detailed planning of the scheme have taken place with officers of the Regional Hospital Board and particularly on the possibility of including a new Accident and Emergency Department in the scheme.

Shortly after the closure of the Bank Hall Hospital as a maternity unit, work commenced on the conversion of the premises into a 42-bedded geriatric unit scheduled to be opened in April, 1969. At the same time, work has proceeded on the building of a new Day Room for the patients in the geriatric wards 14, 15 and 16. When this work is completed, in August, 1969, it will provide good Day Room facilities for the patients in these wards.

A special meeting of the Hospital Management Committee was held to discuss, in detail, the Green Paper published by the Ministry of Health on the subject of 'The Administrative Structure of the Medical and Related Services in England and Wales', which set out proposals for the re-organisation of the administration of the health services and included the establishment of Area Health Boards to incorporate the functions of Hospital Management Committees, Executive Councils, and the Local Authority Health Services.

In the course of discussion on the Green Paper many points of view were expressed by members but it was agreed to advise the Regional Board that in the opinion of the Management Committee, a gradual integration of

the Health Services would be valuable and that consideration should be given to achieving such integration by building on the present administrative structure of the Regional Hospital Boards and Hospital Management Committees.

Another interesting and important memorandum issued by the Ministry during the year under review entitled 'Administration of Hospital Authorities' strongly commended the observations of the Farquharson-Lang Committee on the functions of the members and officers of hospital authorities. Generally speaking, the memorandum recommended that the future pattern of hospital administration should be that Commmittees should devote their efforts towards formulation of policy and that there should be a more liberal delegation of authority to officers to undertake executive functions within the framework of the Committee's policy. The recommendations also proposed the establishment of minimal numbers of Committees with interest in particular aspects of Hospital Service rather than in individual Hospital Units.

Capital Works Programme

The depression felt last year because of the delay in completion of Phase I, quickly turned to great anticipation as the new Maternity Unit reached completion and as soon as various sections of the Unit were handed over, the hospital teams concerned with the cleaning, furnishing, equipping and administration moved in quickly.

Apart from early 'teething' problems, the Unit has worked smoothly and extremely well.

Although the future of the Fern Lea and Christiana Hartley Maternity Homes has not yet been decided, it is pleasing to report that work has proceeded quickly on the conversion of Bank Hall Hospital into a 42-bedded Geriatric Unit. The availability of these beds will enable a better spacing of beds and other improvements in the Geriatric Wards at the Burnley General Hospital.

Discussions have continued with the Board on Phase II of the Major Development Programme at the Burnley General Hospital and in particular on the possible inclusion of a new Accident and Emergency Department. The extension of the scheme would mean that the earliest date for commencement would be February, 1972, but the Committee feel that the more comprehensive scheme will justify delay.

X-ray Service

The general workload of the Department continues to increase and this emphasises the inadequacy of the facilities available at the Burnley General Hospital. It is, however, pleasing to report that investigations are now being made into the possibility of providing a second X-ray room at the Burnley General Hospital as a temporary measure, which should provide some relief pending the provision of a complete new X-ray unit as part of Phase II of the Major Development Programme which is scheduled to commence in 1971/72.

At the commencement of the year, work was completed on the scheme for the upgrading of the third X-ray room at the Victoria Hospital to comply with radiation protection standards. New equipment provided under the Regional Hospital Board's special programme included an automatic processing unit for the Reedyford Memorial Hospital and a special X-ray tube head for operating theatre use and small items of equipment to complete the installation in the third X-ray room at the Victoria Hospital. A miniature camera X-ray unit, already available in the Group, is to be installed in a Staff Health Centre to be established at the Burnley General Hospital where routine staff medical examinations will be undertaken.

Works Maintenance and Engineering Services

Although the major capital works tend to attract the greatest attention, a considerable amount of work has been done in connection with extensions to the Pharmacy Department at the Burnley General Hospital, the conversion of the former Pathological Laboratory building at the Victoria Hospital into a Central Medical Records Department, the provision of a third day room at the Hartley Hospital and the conversion of the Bank Hall Hospital into a geriatric unit. The many schemes of improvement or alteration of existing accommodation have also included—

Up-grading of services in the central kitchen area at the Marsden Hospital.

Installation of additional equipment in the Group Laundry.

Up-grading of heating services in the Nurses' Home at the Reedyford Memorial Hospital.

Installation of heating and electrical services in the new day rooms for the Medical Wards at the Victoria Hospital.

Conversion of Ivy Cottage at the Burnley General Hospital to provide improved facilities for the Dermatological and E.N.T. Out-patient Clinic and Staff Health Centre.

The scheme of planned maintenance for the electrical and mechanical services has been introduced at the Burnley General Hospital and is working satisfactorily. The scheme has already revealed items requiring attention but not requisitioned and to this extent is relieving the maintenance staff at the Burnley General Hospital of additional work. The Marsden Hospital is also to be included in the scheme and the necessary schedules are being prepared. As the success of the scheme necessitated joint working arrangements for Plumbers and Fitters, it was agreed that both sections of tradesmen should be directed by the Group Engineer (the officer responsible for planned preventative maintenance) without alternation in their conditions of service or rate of pay.

Central Laundry

The output of the Group Laundry continues to increase particularly since the opening of the new Maternity Unit in November.

Following the installation of additional equipment in the Group Laundry, arrangements were made for the evening shift to be discontinued. Machinery replacements in the Laundry during the year have included two Amazon 100 lb. washers and a Poly-Feed Master for fitting to the Quadroll Ironer which should be an aid to increased production. In addition, a Huebsch Dress Finishing Machine has been installed which should bring about a marked improvement in the finishing of dresses and shirts, etc.

On the Market

A review of new equipment and materials and their development

INSPECTION AND LABELLING OF INFUSION FLUIDS

Newman Labelling Machines Ltd., Queens Road, Barnet, Hertfordshire, are now able to offer an integrated unit for the inspection, label coding and labelling of infusion bottles. The unit has been designed with the medium to large hospital group pharmacy, or the regional infusion fluid centre in mind.

After leaving the autoclave, the bottles are placed on the rotary table which feeds them on to the conveyor and along to the first station, where they are picked up and inspected by an operator using an inspection lamp on the opposite side of the 4in. wide conveyor which can be adjusted to handle either $\frac{1}{2}$ litre or 1 litre bottles.

They are then replaced on to the conveyor which carries them to the labelling station where they are placed on the bottle rest of the Newman Model 24A Labelling Machine.

Before applying the labels to the bottles, the machine can also date stamp or batch code the labels.

The whole line is suitable for speeds of approximately 8-10 per minute where one inspection operator is being used, but when a higher output is required, this can be accomplished by using the variable speed on the conveyor and labelling machine. The conveyor can be supplied in varying lengths to suit space available.

UNDER PRESSURE TAPPING SADDLE

Chemidus announce the introduction of a new corrosion resistant saddle which substantially reduces the price of making service connections to u.P.V.C. mains.

Chemstraps consist of two semi-circular malleable cast iron straps, P.V.C. coated. Each saddle is supplied with rubber "O" ring and aluminium bronze, high tensile, non-corrosive nuts and bolts. Each bolt is complete with two flat washers to protect the P.V.C. coating when tightening.

Chemstraps are available for u.P.V.C. mains of 3in., 4in., 6in., 8in., 9in., 10in. and 12in. diameters.

Full particulars are available from **Chemidus Plastics Limited,** Dept P/R. Cobbs Wood, Ashford, Kent.

CANTILEVER BATHS FOR EASIER BATHING

A new application of the Vogue 1700 Cantilever bath for use in hospitals has been developed by **Allied Ironfounders Ltd.,** 4 Stratford Place, London, W.1. The bath has a unique free cantilevered end, so that most patient lifting systems can be run up to and under the bath from either the back or the sides of the tub. Initial installations have utilised the Vogue 1700 Cantilever with the Mecanaids Ambulift, which incorporates a seat on which the patient can be retained during bathing. The bath's design eases the strain of bathing by allowing the nurse greater manouvreability, and by making the patient more comfortable and accessible. For less incapacitated patients, the bath can be installed with a long bench at the head end. The nurse has only to assist the patient on to the bench, which can then be used as a seat and support for the patient manoeuvring into a bathing position. The contoured back of the bath is also of great assistance in sliding patients into a bathing position when using the sling type of lifting system.

In addition to the cantilevered construction, the Vogue 1700 Cantilever bath has a number of practical safety features. The single water inlet can be used as an anti-slip safety handle, matched, if required, by a second handle on the opposite side of the bath.

Tapheads positioned on the outside of the bath are easily manipulated by both patient and nurse, but may be removed temporarily. The bath is fitted with a chainless semi-captive plug and there is a soft textured headrest which gives extra support in the reclining position or which can be opened out to form a seat.

LIFTS FOR HOSPITAL INSTALLATION

A complete range of passenger and service lifts are now being produced by **True Bros. Conveyors Ltd.,** Queniborough, Leicester. The emphasis is on ease and speed of installation and they have a carrying capacity of from 1 cwt. to 4 tons. The wide range of specifications and applications makes them suitable for installation in either new or existing buildings.

The lift car can have straight through doors of standard dimensions, or entrances on two or three adjacent sides with power operated doors if required. When three doors are used an increase in shaft size is necessary.

The usual speed for passenger lifts is approximately 100 ft./min. but, in the case of service lifts, the speed is usually as low as 30 ft./min. In special cases where traffic and travel conditions warrant higher speeds, these can be increased to 300 ft./min.

With service lifts, the installation allows for a self-supporting structure to be supplied in sheet steel, coated in P.V.C. which is available in almost any colour. The installation is also readily erected in a brick shaft. The motor room itself is usually sited at the head of the shaft, but if headroom is critical it can be placed in a room at the side or in a pit beneath the shaft. Electrical control gear can be provided to give automatic travel to any floor.

NEW DRYING OVEN FROM DAWSON-MMP

Dawson Bros-MMP Ltd., Gomersal, near Leeds, well known as suppliers of advanced washing equipment for Hospitals and Laboratories, have now added to their range the ovens manufactured by their Danish agents Ingeniorfirmaet Lytzen of Herlev, Denmark. These ovens for drying and dry-sterilising holloware and laboratory glassware in hospitals, Central Sterile Supply Depart-

ments and laboratories, will be marketed in the U.K. by Dawson-MMP under the name Dawson Lytzen Ovens.

The Lytzen Standard Oven is electrically heated, with a temperature range from 30 to 225 degrees centigrade (86°-469°F). It works on the principle of positive recirculation designed to obtain an overall distribution of the heated air in the oven chamber, which is effectively insulated. The oven has a thermostat fitted to ensure corrective temperature control, while the electric automatic controller ensures long oven life. Clean modern lines give a compact, attractive appearance, while all controls and dials are easily accessible.

The door normally is hung on the right, but opposite-hand opening with the control panel on the other side can be arranged.

The KCB Lytzen Oven is provided with 10 sets of adjustable angle-runners to support grids or baskets with runners. These baskets or grids can be supplied at extra cost.

The electric motor for air recirculation is 1 h.p., the heating element is 10·7kW, and the electric supply, 3 phase 415 volts 50 cycles.

NEW FLOAT SWITCH

Dewrance Controls of Grimrod Place, Skelmersdale, Lancs. latest addition to their product range is a Float Switch designed to be operated by a change of liquid level in a vessel.

The switch, with a ¾" screwed B.S.T.P. brass body, and nitrile rubber float, is available for make, break or changeover action when either a rise or fall in the fluid level occurs.

The unit consists of a float and arm assembly connected at right angles to a free moving spindle in a low resistance bearing. The spindle passes into the switch body and the torque produced by the float movement actuates a microswitch by magnetic flux interaction across a solid bulkhead. This actuation is brought about by a fluid level change of 0·75". In cases where greater fluid level variations are involved, the unit can be easily adapted to meet particular requirements.

A special feature of the unit is the integral bulkhead which eliminates any possibility of fluid leakage.

The microswitch is rated at 5 amps on 125 or 250 volts 50 cycles, A.C., 5 amps D.C. resistive, 3 amps D.C. inductive and will withstand a maximum inrush current of 24 amps.

Fluid temperature limitations for the unit at 0°C to 100°C and ambient temperature should not exceed 40°C when fluid temperature is at maximum.

SMOKE DENSITY INDICATOR AND ALARM

Two important advantages are embodied, it is said, in the new Model SD4 Smoke Density Indicator and Alarm equipment announced by **Londex Ltd.** First, the control circuit includes a stabilising network rendering the usual constant voltage and projector transformers unnecessary. Second, the need for special and expensive screened cable between control unit and projector has been eliminated and by connecting the receiver direct to the projector, no other return to the control unit is necessary. Conventional 3-core and 2-core 3/0·029 in. wiring is all that is needed.

The operating principle of this type of equipment is basically a photoelectric system. It conforms to BSS 2811-57 requirements enabling users to comply with the Clean Air Act regulations.

Projector-to-receiver beam length extends from 12 inches to 25 feet. If necessary, beam length can be increased to 35 feet.

Regular maintenance is limited to keeping the projector and receiver windows clean. If necessary, the entire component assembly can be removed without disturbing permanent wiring.

The equipment is intended for operation on 200/250V 50Hz supplies and an alarm relay is included with contacts rated at 6A at 250V a.c. resistive. Two indicator lamps are fitted to show 'normal' and 'alarm' conditions as well as a meter calibrated in percentage obscuration.

Full details are contained in publication 210D obtainable from Londex Ltd., P.O. Box 79, 207 Anerley Road, London S.E.20.

LAMSONS EXPAND RANGE OF JUNIOR AIRTUBE SYSTEMS

Lamson Engineering Co. Ltd., Hythe Road, London, N.W.10, announce that their range of Junior Airtube Systems has been extended to include a system using 4 in. diameter tubing.

The new 4 in. (100 mm.) system will handle light document traffic up to 6 oz. (170 g.) in weight, using a transparent carrier. Its maximum circuit is 100 ft. (30·48 m.) and carrier speeds of 18 ft. (5·5 m.) per second are attained. Tubing can be in steel or plastic. Standard sending and receiving terminals are used and the fractional h.p. motor operates on single phase electrical supply. The plant operates only during the time a carrier is in transit, which results in the economical use of electrical current.

A typical 4 in. Junior Airtube installation using the maximum 100 ft. (30·48 m.) circuit would cost under £400.

NEW TWO-STAGE AIR FILTER FROM SERCK VISCO

The new Serck Visco Two-Stage Air Filter is the only disposable filter containing two separate graded stages of filtering medium. When designing the filter it was found necessary to separate the primary and secondary filter mediums completely, for it is within the gap created by the use of an egg-crate type spacer unit, that the air containing the finest dust particles which have passed through the primary stage, change direction and re-impinge on the denser second stage of the filter cell. Graded media, however thick, does not give this result, because complete air tunnels can be set up throughout the thickness of the filter where unimpeded passages of unfiltered air are allowed to pass through, resulting in lower efficiency.

The most important feature of this filter is that the primary and secondary mediums are stuck to the inside of the filter casing, thereby ensuring that there can be no by-pass of unfiltered air. The filter medium is of two grades of random-

bonded Acrylic fibre, which makes its use particularly suitable for hospitals where glass fibre is not normally considered suitable. There is no danger whatsoever of fibre migration from the filter cell, but a fine sheet of muslin is fitted on the air exit side of the filter as a safety measure against possible damage to the filter medium.

The filter is completely disposable, having no metal parts and is the most robust of its type on the market.

Further information available on equest from: **Serck Visco,** Stafford Road, Croydon, CR9 4DT, Surrey.

ALUMINIUM FLAT RUNGED LADDER

A range of aluminium ladders featuring non-slip flat-topped rungs has been introduced by the Challenger Division of **W. C. Youngman Ltd.,** Manor Royal, Crawley, Sussex.

Known as the Youngman Silver Dee, the new range comprises light duty two-section push-up ladders with extended lengths of 14 ft. to 22 ft., and medium duty two-section rope-operated from 22 ft. to 30 ft. Single sections are also supplied from 8 ft. to 16 ft., all models being available in increments of 2 ft.

In the design, the $1\frac{1}{2}$ in. wide "D" shaped ribbed rung has been arranged to fit into the stiles so that the flat top is at parallel with the ground when in use. In addition to providing an improved foot hold, this feature offers considerably increased area for the distribution of weight when compared with round rungs, and is of particular advantage when long periods of standing on the rungs are involved. In the case of two-section ladders, these are constructed so that both rungs are parallel when overlapped, offering a wider platform area.

The Silver Dee is finished with moulded rubber bumpers fitted to both ends of the stiles. The clutch fitted to the rope-operated two-section type is counterbalanced for positive locking over two rungs for maximum safety. The red anodised rung which indicates maximum limit of extension is again featured in the Silver Dee.

A NEW TULLIS MONSOON TUMBLER

A new drying tumbler, the HD245, is offered by **D. & J. Tullis Ltd.,** Clydebank, Dunbartonshire, Scotland, which is an addition to their Monsoon range. The machine can be used for drying, loosening and conditioning laundry work as it passes from the washer, washer extractor or hydro extractor to the finishing department of the laundry. It can also be used for setting and conditioning of textiles during manufacture.

The HD245 is loaded and unloaded through twin front sliding doors. It will handle loads up to 110 lb. in small space, for its overall dimensions are only 84 in. high × 54 in. wide × 60 in. deep. The inner cage, which has countersunk perforations, is 50 in. in diameter and 39 in. in depth, is made from stainless steel and has large robust bearing surfaces and a silent friction roller drive. A 4 kW. motor drives the inner cage and fan, and the heat consumption is 6,000 BTU's per minute, giving rapid and efficient drying.

The model can be supplied with a variety of optional extras

B.S.I. News

HOSPITAL CUPBOARDS FOR DRUGS AND POISONS

The British Standard relating to hospital drug cupboards, BS 2881 *Hospital cupboards (wall fixing) for poisons and dangerous drugs*, has now been revised. The standard specifies safety requirements, dimensions, construction and finish for wooden and metal cupboards, and in this second revision further details concerning locks have been specified to increase security.

The principal external dimensions of the cupboards have been revised and, in the case of cupboards with flat tops, dimensions have also been included to meet the new building programme (12 in module) of the Department of Health and Social Security. The outer doors may now be racked to take jars or bottles in a single rank.

Provision is made for electric lights, which are automatically switched on when the doors are unlocked, to provide adequate illumination of the interior of the cupboard and also to provide a red warning light whenever the cupboard is open or the inner compartment for poisons, etc., is unlocked. This red warning light can only be extinguished by correctly closing and locking all doors, and the arrangements of the doors are such that the outer door cannot be closed and locked until the door of the inner compartment is closed and locked and the key removed.

METRIC CONVERTER FOR HOME AND OFFICE

The British Standards Institution is marketing a new simple metric converter for general domestic or office use. It is sturdily made in blue and black plastics with silver lettering, measures only 160 mm. × 100 mm. ($6\frac{1}{4}$ × 4 in.) and is sold in a neat transparent case.

Metric and imperial equivalents are presented on a white slide, viewed through adjacent windows in the coloured plastics envelope—an arrangement which gives conversions at a glance with little chance of confusion. Units in constant use —length, weight, volume and area—are covered.

For two years BSI has marketed a more elaborate slide for industrial use, giving precise conversions for a much wider range of units, but the new converter is particularly designed for general use to meet the growing need for a simple pocket or handbag converter as metrication gets under way.

The BSI Readimetric Converter may be obtained from the BSI Sales Branch at 101/113 Pentonville Road, London, N.1. Price 12s. 6d. (plus 2s. postage to non-subscribers). Later this year the converter will be on sale through stationers under an exclusive retailing agreement with the manufacturers, Blundell Harling Ltd.

SPRING WASHERS—METRIC SERIES

Following the publication of metric specifications for plain washers (BS 4320) and crinkle washers (BS 4463), the British Standards Institution has published BS 4464—*Specification for spring washers for general engineering and automobile purposes —Metric series.*

Notes for Members

MIDLANDS BRANCH

Successful extra event

Members of the Midlands Branch and their families combined business with pleasure on Saturday afternoon, 7th June, when about thirty visited the grounds and the Hall at Blithfield.

The party met at the Hall, then the majority proceeded to the Reservoir, about a mile away, where they were taken on a conducted tour by staff of the South Staffordshire Waterworks Company. They returned to Blithfield Hall for tea and the day was completed with a conducted tour of the Hall.

Branch Meeting, 5th July

The fine weather and holidays reduced the number attending this meeting which was held at the Guest Hospital, Dudley. Almost twenty members left their gardens to listen to a paper on "Water Distribution and Bye-Laws" by Mr. P. C. Deebank and Mr. K. Webb of the South Staffordshire Waterworks Company. Mr. Deebank outlined the growth of the Company and the networks of mains since they began in 1835. Some of the original cast iron mains are still in use.

Members also saw a film, produced by Messrs. Permutit Ltd., called "An Introduction to ION Exchange" in which the action of the various resins was explained.

Forthcoming Events

The next Branch meeting will be held at Stratford-on-Avon Hospital on 6th September, 1969. The paper will be "Smut Emission and Corrosion of Chimneys" by M. Beaumont, Director, F. E. Beaumont Ltd.

A visit to Ansells Brewery has been arranged for 3rd September. Details will be circulated.

SOUTHERN BRANCH

A meeting was held in Coldeast Hospital, Sarisbury Green, on 17th May, 1969.

The Chairman opened the meeting by introducing Divisional Officer T. E. Robinson, Senior Fire Prevention Officer to the Hampshire Fire Authority, to discuss Fire Hazards in Hospitals and precautions necessary from the engineering viewpoint.

Mr. Robinson commenced by mentioning Hospital Memorandum No. 16 and all its suggestions and implications. Hospital Design Note No. 2 (Fire Escapes) was also talked about. The various suggestions as recommended to keep the fire to manageable proportions were put forward, such as fire doors to keep the fire compartmented and split it into cells. Sub-compartmentation and walls should have a fire resistance of 1 hour, including roof spaces which tend to be ignored but which should also be compartmented by building division walls.

An essential part of any organisation is staff training so that everyone knows their part in an emergency. This will include the use of hose reels and fire extinguishers of all types and which is most essential if one is to know which is the best to use on different types of fire. This type of staff training could include the method of reporting a fire and the routine to be followed thereon.

One essential point put forward by Div. Officer Robinson was the necessity of the Fire Brigade Authorities to familiarise themselves with the site, etc. This would allow them to know hydrant positions which should be clearly marked and identified, and to waste as little time as possible in getting appliances to work. Easy entrance to site and availability to within 60 feet of affected building for appliances was also essential due to the fact that many outbreaks were dealt with by the water carried. The usual warning regarding 'No Smoking' notices in highly dangerous areas and also the precautions necessary was stressed.

A highly interesting talk was concluded by Div. Officer Robinson answering the various questions put to him.

IEETE TOPICAL MEETINGS

The Report of the Haslegrave Committee, set up by the Government to review courses and examinations in the engineering and commercial 'technician areas', and the Report of the Engineering Industry Training Board on the training of technician engineers are to be published shortly. It is believed that both will contain recommendations which, if implemented, would bring about radical changes in the entire pattern of engineering education and training.

A Seminar, comprising two evening meetings on these closely inter-related matters, is being arranged by the IEETE in the Autumn. The meetings, to take place in the IEE Lecture Theatre, London, will be as follows:

Monday, 29th September:

"Education and Qualifications for Technician Engineers and Technicians". Speaker: Dr. H. L. Haslegrave, Chairman of the Haslegrave Committee.

Monday, 6th October:

"The Training of Technician Engineers". Speaker: F. Metcalfe, Chief Education and Training Officer, Engineering Industry Training Board.

A limited number of tickets, free of charge, will be available. Early application for these is advisable, and should be made to the Secretary, IEETE, 2 Savoy Place, London, W.1. (01-836 3357).

JUST WHAT ENGINEERS DOES INDUSTRY NEED?

Few subjects have aroused as much discussion in recent years as the need for expanding the number of qualified scientists and engineers in our economy, and how children can be encouraged to study appropriate subjects to remedy the drift away from technological studies.

Report has followed report but one vital question remains unanswered. Namely, just what type of engineer *does* industry need today, and further, what prospects can and does it really offer them?

This provocative subject is the theme for a one-day conference "The Engineers that Industry wants" being sponsored by C.E.I. at the Institution of Electrical Engineers, London, on Tuesday, 16th September.

It will be opened by Dr. Jeremy Bray, M.P., Joint Parliamentary Secretary, Ministry of Technology, and speakers will be:

Dr. W. J. Arrol (Joseph Lucas)

Mr. G. Bird (Machine Tools Trade Association)

Dr. W. H. Darlington (Stothert & Pitt)

Mr. H. H. Gardner (B.A.C.)

Mr. M. Hall (L.S.E.)

Dr. R. Edgeworth Johnstone (formerly Professor of Chemical Engineering, University of Nottingham)

Professor G. D. Sims (Chairman, Manpower Study Group under Electronics Economic Development Committee)

and a speaker from Westinghouse Electric International.

Whilst no preprints are being issued, a brief summary of the speakers' talks will be available before the conference and a copy of each of these will be sent to all delegates.

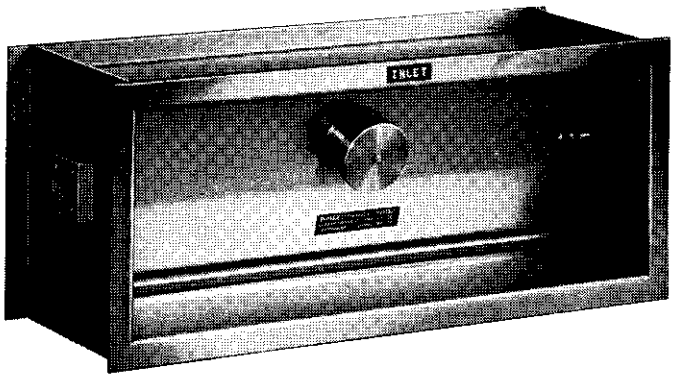
Registration Forms will be available after 1st July from The Secretary, I.E.E., Savoy Place, London, W.C.2, who is organising the Conference on behalf of C.E.I.

PERSONAL

B. A. Hermon (Member) has been appointed Regional Engineer to the Oxford Regional Board, and takes up this post on 18th. August

He is at present Deputy Regional Engineer to the Birmingham R.H.B.

THIS IS THE NEW EVACUATION VALVE BY POWER UTILITIES LTD*

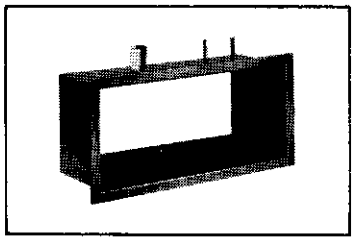


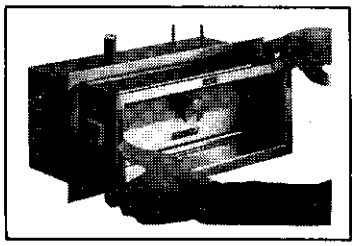
This type W Valve has been specially designed to:-

1 Control the air pressure in clean air areas, such as operating theatres, served by plenum systems.

2 Give extreme accuracy of pressure control down to 1/200th inch W.G.

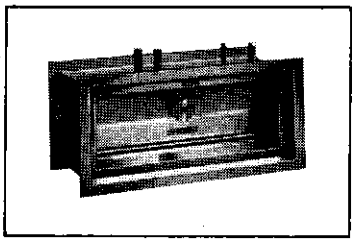
3 Enable each valve to be easily adjusted on site to meet the requirements of cascade air spillage systems.





Easily cleaned. All parts in contact with the air flow are manufactured in stainless steel.

* Manufacturers of the well known range of Type M, S and X Aercon Evacuation Valves.



For further information please write or phone:

POWER UTILITIES

PU

Power Utilities Ltd., Lombard House, Great Charles Street. Birmingham, 3. Tel: 021-236-3446. 7-8-9.

GREAT BRITAIN'S ONLY HOSPITAL SHOPPING CENTRE MOVES TO EARLS COURT

International Hospital Equipment Medical Engineering & Services Exhibition 1970

Sponsored by the Institute of Hospital Administrators and 'The Hospital'

YOU SHOULD KNOW MORE ABOUT OUR PLANS!

TO: CONTEMPORARY EXHIBITIONS LIMITED 14 NEW BURLINGTON STREET LONDON W1

Please send me details of space available together with information regarding the exhibition.

NAME _____ Status _____

COMPANY _____

ADDRESS _____

SITUATIONS VACANT

HOSPITAL ENGINEER
ROYAL BERKSHIRE HOSPITAL, READING

Applications invited for post of HOSPITAL ENGINEER at ROYAL BERKSHIRE HOSPITAL, READING, vacant 30th November, 1969, on retirement of current holder.

Hospital is main district hospital of Group and Hospital Engineer is also responsible for Wokingham Hospital. Both hospitals currently undergoing major redevelopment.

Applicants must possess H.N.C. in either Mechanical or Electrical Engineering with appropriate endorsements and have completed apprenticeship in mechanical or electrical engineering or have otherwise acquired thorough practical training.

Salary £1,370 to £1,605, plus £100 responsibility allowance. Accommodation available.

Good experience will be gained of modern engineering plant and encouragement given to further studies and career.

Application forms from Group Engineer, Reading & District Hospital Management Committee, 3 Craven Road, Reading, Berks.

ASSISTANT ENGINEER required at ST. JOHN'S HOSPITAL, St. John's Hill, London, S.W.11. Salary scale £975-£1,270 plus £90 London Weighting. Luncheon facilities. Application forms and further details obtainable from and returnable to Group Secretary, Battersea, Putney and Tooting Group H.M.C., Tooting Bec Hospital, Tooting Bec Road, S.W.11.

Owing to acceptance of the Incumbent for a Regional Training Course a vacancy will arise on 1st October, 1969, for an ASSISTANT HOSPITAL ENGINEER at the new Subnormality Hospital, Balderton, Newark-on-Trent, Notts.

Salary scale: £975—£1,270 per annum, plus Fire Precautions responsibility allowance of £25 per annum.

Modern plant, planned maintenance and an Area Laundry are important features of the engineering installations, giving an ideal training ground for future Hospital and Group Engineers.

House available on Hospital Estate at reasonable rental.

The Group Engineer, Mr. T. S. Elstub, will be glad to answer any enquiries.

Applications, giving age, qualifications experience and names and addresses of two referees, to Group Secretary, Saxondale Hospital, Radcliffe-on-Trent, Nottingham, by 15th August, 1969.

U.K. Consultant requires Engineer well experienced in hospital mechanical engineering services, and air conditioning, for pleasant location in the Middle East, to act in liaison between U.K. designers and overseas clients. Preferably bachelor or married no children. Must be qualified and have good appearance and presence. Excellent prospects. Please apply to Box No. 1/A, c/o "The Hospital Engineer", 16 Spring Street, London, W.2.

NOTTINGHAM No. 3 HOSPITAL MANAGEMENT COMMITTEE MAPPERLEY HOSPITAL, NOTTINGHAM

HOSPITAL ENGINEER

Applications are invited for the above post at this psychiatric hospital.

Applicants must have had a thorough practical training and hold one of the following qualifications or approved equivalent:

1. Higher National Certificate or Higher National Diploma in Mechanical Engineering with endorsements in Industrial Organisation and Management and Principles of Electricity or Electro-Technology, if this was not taken as a subject of the course; or
2. Higher National Certificate or Higher National Diploma in Electrical Engineering with endorsements in Industrial Organisation and Management and including (at S.III or O2 level, or with endorsement in) Applied Heat and Applied Mechanics, provided he has suitable practical experience in mechanical engineering; or
3. City and Guilds Mechanical Engineering Technicians Full Technological Certificate (Part III) which must include Plant Maintenance and Works Service.

Salary Scale—£1,370 to £1,605 p.a. plus £25 special responsibilities allowance.

House available at reasonable rent.

Applications, giving full details, to be submitted to the Group Secretary, not later than 1st September, 1969.

POOLE GENERAL HOSPITAL, POOLE, DORSET

ASSISTANT ENGINEER required to assist the Hospital Engineer in the operation and maintenance of the extensive engineering services in a new hospital now being commissioned and to carry out other duties as directed by the Group Engineer.

Applicants should have done a practical engineering training, be qualified to the standard of Ordinary National Certificate, electrical or mechanical, and be willing to study further for higher qualification. Salary scale: £975 to £1,270. This appointment is an excellent opportunity for gaining experience with modern hospital plant and planned maintenance.

Applications with details of age, training and qualifications, together with the names and addresses of two referees, to the Group Secretary, H.M.C. Office, Royal Victoria Hospital, Shelley Road, Boscombe, Bournemouth, by not later than 17th August, 1969.

BRO MORGANNWG HOSPITAL MANAGEMENT COMMITTEE

PARC HOSPITAL, BRIDGEND. (1,132 beds)

HOSPITAL ENGINEER

This appointment entails responsibility to the Group Engineer for the mechanical and electrical maintenance services at this large Psychiatric Hospital. Applicants must have completed an indentured apprenticeship in electrical or mechanical engineering or have otherwise acquired a thorough practical background, as distinct from a purely craft training. They should be familiar with planned maintenance procedures and have a sound knowledge of boiler plant, mechanical and electrical equipment and wide experience in their maintenance, and possession of one of the following qualifications or an equivalent qualification approved by the Ministry of Health would be an advantage:—

(i) Higher National Certificate or Higher National Diploma in Mechanical Engineering with endorsements in Industrial Organisation and Management and Principles of Electricity or Electro-Technology.

(ii) Higher National Certificate or Higher National Diploma in Electrical Engineering with endorsements in Industrial Organisation and Management and including (at S.III or O2 level) Applied Heat and Applied Mechanics provided they have suitable practical experience in Mechanical Engineering.

(iii) City and Guilds Mechanical Engineering Technicians Full Technological Certificate (Part III) which must include Plant Maintenance and Works Service.

Experience in a large hospital or Group would be an advantage and consideration will also be given to applicants having a wide hospital or general experience but not possessing qualifications stipulated above.

The salary scale is based on a pointage of 24½ or more points, i.e. £1,370 to £1,605 per annum plus £75 special responsibilities allowance. A house is available, if required, at a reasonable rental.

Application forms are obtainable from the Secretary of the Committee, Garthmor, Old Road, Neath, Glamorgon, to whom they should be returned by 30th August, 1969.

HOSPITAL ENGINEER

COLINDALE HOSPITAL

COLINDALE AVENUE, N.W.9

HOSPITAL ENGINEER required to be responsible to the Group Engineer for the maintenance of the electrical and mechanical engineering service in three hospitals.

The successful candidate will be based at Colindale Hospital (246 beds) which at present is under development. A new oil-fired central boiler house is now being commissioned. Responsibility includes a new psychopathic unit and a powered limb research unit.

Experience in the running of Mechanical engineering services comparable to those of a modern hospital essential. Must hold or be studying for the Higher National Certificate or equivalent qualification.

Salary scale £1,270—£1,500 plus £90 London Weighting Allowance plus £25 R.A.

Three bedroomed house available at moderate rental.

The hospitals may be visited informally by contacting the Group Engineer (01-952 2381). Job description and application form available from Group Personnel Officer, Edgware General Hospital, Edgware, Middx.

GROVE PARK HOSPITAL

MARVELS LANE, LONDON S.E.12

ASSISTANT ENGINEER required. Ordinary National Certificate or equivalent qualification required. (Unqualified candidates may be considered but will be subject to an abated salary scale). Application forms available from Hospital Secretary.

WESTMINSTER HOSPITAL GROUP

QUEEN MARY'S HOSPITAL, ROEHAMPTON

HOSPITAL ENGINEER

This is a 450-bedded district general hospital and is part of the Westminster Hospital Teaching Group. The hospital is located at the south-western side of London in a very pleasant area and is adjacent to Richmond Park. Hospital house is available at a reasonable rental.

Responsible for all engineering and building services in the Hospital, associated Limb Fitting Centre and Research building.

Applicants must have completed an apprenticeship in Mechanical or Electrical Engineering and have acquired a thorough practical training as appropriate to the duties and responsibilities of the post. They should also have a sound knowledge of the efficient operation of steam boiler plants and a wide experience of mechanical or electrical services preferably in the Hospital Service.

Applicants must possess one of the following qualifications or an approved equivalent:—

Higher National Certificate or Diploma in Mechanical or Electrical Engineering with appropriate Endorsements

or

City and Guilds Mechanical Engineering Technician's Full Technological Certificate (Part III).

Salary scale: (up to 24½ points) £1,270—£1,500 per annum plus £90 London Weighting plus £175 Responsibility Allowance.

Applications to the Group Engineer, Westminster Hospital, St. John's Gardens, London, S.W.1, as soon as possible.

Chief Hospital Engineer

Required by the GOVERNMENT OF BAHRAIN on contract for 2 years, with prospects of renewal or admission to the permanent establishment. Salary B.D. 3,000 a year (£2,625) rising by annual increments of B.D. 60 a year (£52). There is no Income Tax at the moment. Gratuity 1 month's salary for each 12 months' service. Free furnished accommodation. Free passages.

Candidates must hold a 1st class B.O.T./M.O.T. CERTIFICATE or H.N.C. (Mechanical) and have served an apprenticeship in mechanical engineering. Experience of boiler house, plant, air conditioning and allied controls and the repair and maintenance of engineering and electrical plant is essential. Organising ability and administrative experience are also essential.

The engineer will be responsible for the general administration of the maintenance and daily repairs to 12 hospitals and clinics. The staff is almost entirely Bahraini.

Apply to CROWN AGENTS, 'M' Division, 4 Millbank, London, S.W.1, for application form and further particulars stating name, age, brief details of qualifications and experience and quoting reference number M25/690715/HR.

PORTSMOUTH GROUP H.M.C.
DEPUTY GROUP ENGINEER

to deputise for the Group Engineer over the whole range of his duties. This includes responsibility for the efficient operation, maintenance and co-ordination of all engineering services and engineering activities in the Group, including design and estimating for minor work. Responsibility for specific areas of work may also be delegated to the Deputy.

Applicants must have completed an apprenticeship in mechanical or electrical engineering and hold one of the following or equivalent qualifications:—

- **(i) H.N.C. or H.N.D. in Mechanical Engineering with endorsements in Industrial Organisation and Management and Principles of Electricity or Electro-Technology, if this was not taken as a subject of the course; or**
- **(ii) H.N.C. or H.N.D. in Electrical Engineering with endorsements in Industrial Organisation and Management and including at S.III or O2 level, or with endorsement in, Applied Heat and Applied Mechanics, provided he has suitable practical experience in mechanical engineering; or**
- **(iii) City and Guilds Mechanical Engineering Technicians Full Technological Certificate (Part III) which must include Plant Maintenance and Works Service.**

NOTE: Preference will be given to candidates with an electrical main qualification.

The Group contains seventeen hospitals with a total of 2,331 beds. Extensive development is taking place in the two District General Hospitals.

The salary scale is £1,370 to £1,605 over five increments plus a special responsibility allowance of £200 per annum.

Whitley Council Conditions of Service and National Health Service Superannuation apply.

Apply giving full details including age, qualifications and experience to the Group Secretary, Saint Mary's General Hospital, Milton Road, Portsmouth, within ten days of the appearance of this advertisement.

Further information may be obtained from the Group Engineer, Saint Mary's Hospital, Milton Road, Portsmouth.

CHICHESTER AND GRAYLINGWELL GROUP HOSPITAL MANAGEMENT COMMITTEE

Applications are invited for ENGINEER—GRAYLINGWELL HOSPITAL.

Applicants must possess a qualification recognised by the Department of Health and Social Security (preferably H.N.D.) and have thorough knowledge and experience of economic steam boilers and steam distribution, mechanical and electrical plant and equipment and Planned Maintenance. Salary of £1,370-£1,605 plus £25 special responsibility allowance. Applicants who do not hold the requisite qualifications will be considered but the salary will be reduced by £200. A hospital bungalow may be rented.

Full details of the post together with application form available from Group Secretary, St. Richard's Hospital, Chichester, to whom completed applications must be returned by 30th August.

COVENTRY HOSPITAL MANAGEMENT COMMITTEE
HOSPITAL ENGINEER

To be responsible to the Group Engineer for all engineering maintenance and co-ordinate building maintenance in Gulson and Whitley Hospitals, Coventry.

Qualifications: Applicants should possess one of the following:- City and Guilds Mechanical Engineering Technicians Certificate, Part II, which must include Plant Maintenance and Works Service; City and Guilds Certificate in Plant Engineering; Ministry of Transport First Class Certificate which includes O.N.D. or O.N.C.

However, consideration may be given to applicants not in possession of the approved qualifications at an abated salary.

Salary £1,370 a year rising to £1,600 subject to qualifications and experience.

Full details of the post and qualifications required will be sent on application to the Group Secretary, Coventry Hospital Management Committee, The Birches, Tamworth Road, Keresley, Coventry CV7 8JJ, to be received by 25th August.

ST. GEORGE'S HOSPITAL
LONDON, S.W.17.

HOSPITAL ENGINEER

A Hospital Engineer is required for this busy teaching hospital which is about to be re-built at Tooting Grove.

Applicants must have had relevant experience and possess one of the following qualifications: H.N.C. or H.N.D. in (i) Mechanical or (ii) Electrical Engineering, each with endorsements in Industrial Organisation and Principles of Electricity or Electro Technology or Applied Heat and Applied Mechanics respectively; (iii) City and Guilds Mechanical Engineering Technicians Full Technological Certificate (Part III) including Plant Maintenance and Works Service.

Salary, including London Weighting and responsibility allowance, starts at £1,560 rising to £1,795.

Exceptionally, experienced but unqualified candidates may be considered but salary would be abated by £200. Married accommodation may be available.

Apply with full details of qualifications, experience and names of two referees by 1st September, 1969, to the House Governor, St. George's Hospital, London, S.W.17.

Colindale Hospital
Colindale Avenue, N.W.9.

ASSISTANT ENGINEER

This is an excellent opportunity for a young man, preferably with an O.N.C. in Engineering. He will be responsible to the Hospital Engineer for the operation and maintenance of Engineering Services which includes a new oil-fired central steam raising boiler house. Opportunities for day release for further study will be given.

Salary scale £975 p.a. rising by seven increments to £1,270 p.a. plus £90 London Weighting.

Applications to the Group Personnel Officer, Edgware General Hospital, Edgware, Middx. Tel: 01-952 2381.

EAST BIRMINGHAM HOSPITAL MANAGEMENT COMMITTEE

HOSPITAL ENGINEER

for
Weston Hospital, Weston-under-Wetherley
Leamington Spa

Salary scale £1,270 to £1,500, plus £25 per annum responsibility allowance.

Applications are invited for the above post.

Applicants must have completed an apprenticeship in engineering or have otherwise acquired a thorough practical training appropriate to responsibilities of post. Knowledge of building maintenance work an advantage. Must hold one of the following qualifications or equivalent: City and Guilds Mechanical Engineering Technicians Certificate (Part II) which must include Plant Maintenance and Works Service; or City and Guilds Certificate Plant Engineering or M.O.T. 1st Class Certificate of Competency if it includes an O.N.D. or O.N.C. House available at reasonable rent. Application Forms are available from:

Group Engineer,
EAST BIRMINGHAM HOSPITAL MANAGEMENT COMMITTEE
Group Offices, 45 Bordesley Green East, Birmingham, 9.

BOARD OF GOVERNORS OF KING'S COLLEGE HOSPITAL
DULWICH HOSPITAL

ASSISTANT HOSPITAL ENGINEER

Ideal experience and training for young engineer seeking advancement. ONC (O2) Engineering desirable and good practical training in maintenance of mechanical and electrical services. Salary £975 rising to £1,270 plus London Weighting. Consideration will be given to the appointment on an abated scale of persons without these qualifications.

Information available from Hospital Secretary. Applications giving full details of training, qualifications and experience, naming two referees, to Hospital Secretary, Dulwich Hospital, London, S.E.22.

THE HOSPITAL FOR SICK CHILDREN,
GREAT ORMOND STREET, W.C.1.

ASSISTANT ENGINEER

required

Salary £975 x £35 (5) by £40 (3) to £1,270 per annum, plus London Weighting allowance £90 per annum.

Applicants should have served a Mechanical or Electrical Engineering Apprenticeship and possess one of the following qualifications:—

(a) Ordinary National Diploma or Certificate.
(b) City & Guilds Mechanical Engineering Technicians Certificate (Part II) which must include Plant Maintenance & Works Service.
(c) City & Guilds Certificate in Plant Engineering.
(d) Ministry of Transport First Class Certificate of Competency which includes Ordinary National Diploma or Certificate.

Applicants should be conversant with Oil-Fired Boilers, Laundry, Kitchen Equipment, H & V Plant.

The post offers valuable experience for an Engineer wishing to advance in the Health Service to the post of Hospital Engineer.

Day release facilities considered to obtain higher qualification.

Further details obtainable from Group Engineer (Tel: 01-405 9200, ext. 15). Application forms obtainable from The Hospital Secretary, The Hospital for Sick Children, Great Ormond Street, London, W.C.1, returnable by 30th August, 1969.

MISCELLANEOUS

CIRCULATING PUMPS and Steam Turbines, Complete units, electric and steam, spares and service. TURNEY TURBINES Ltd., 67, Station Road, Harrow. Tel: 01-427 1355 and 01-427 3449.

Stethoscopes, Eartips, Headphones and Pillowphones—Supplies and Service. Workshops for the Disabled, Northern Road, Cosham, Portsmouth. Tel: Cosham 76533.