THE HOSPITAL ENGINEER

Vol XX: No 5
August 1966

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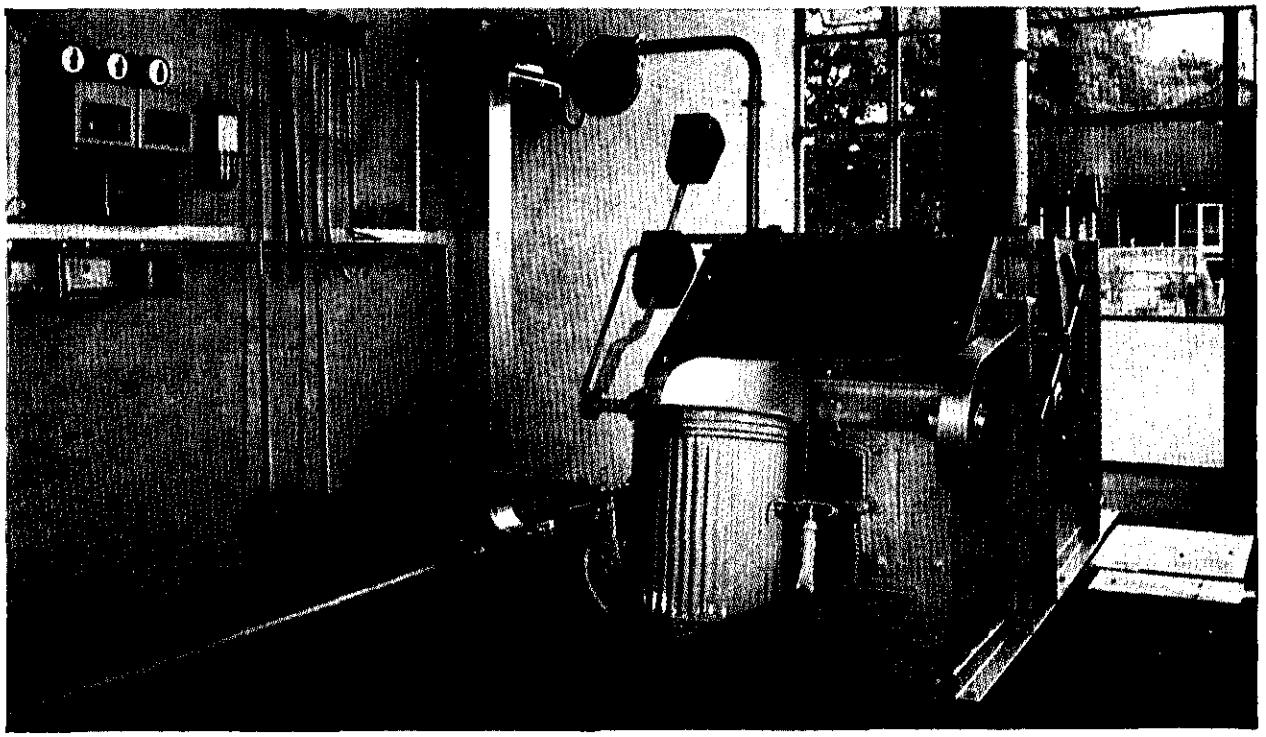

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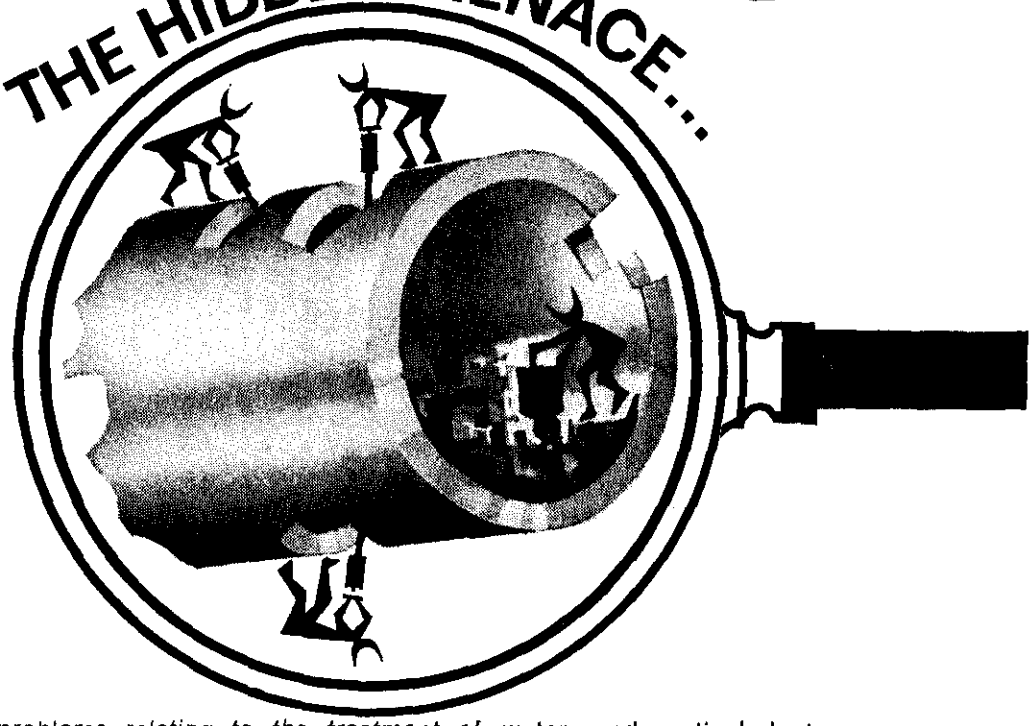

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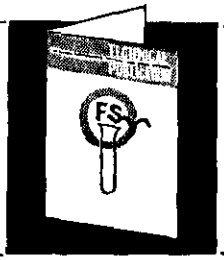

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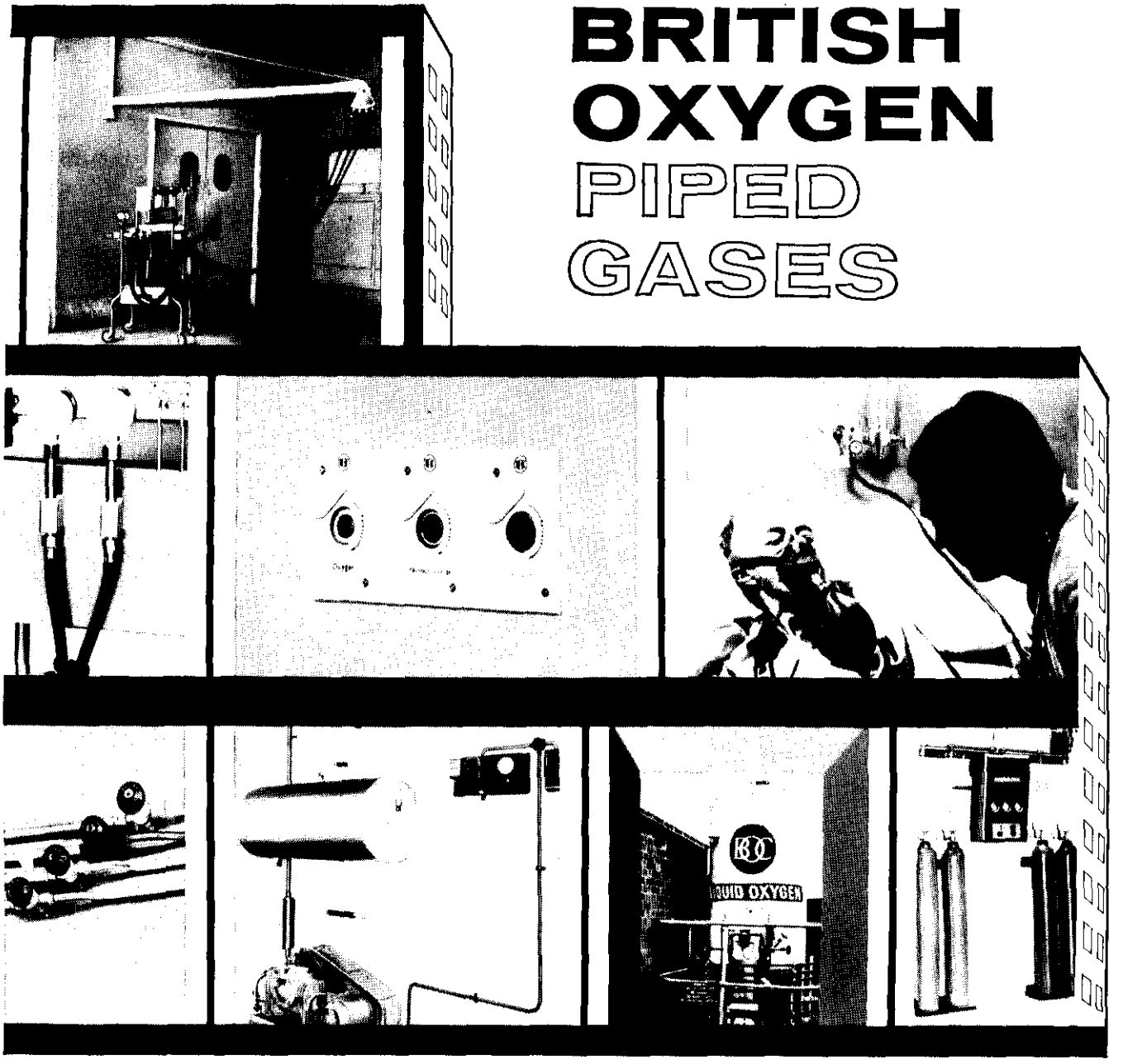

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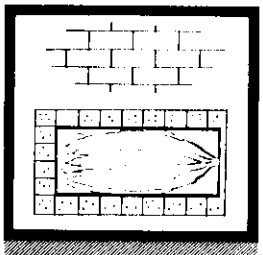

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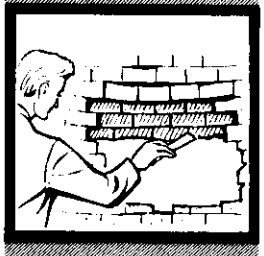

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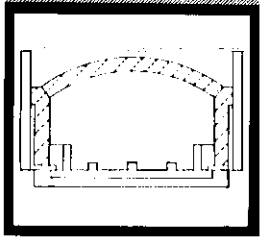

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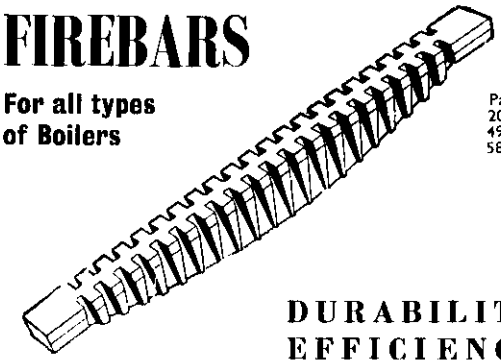

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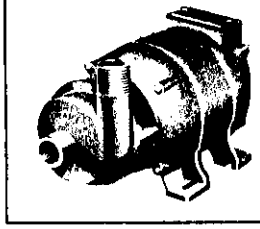

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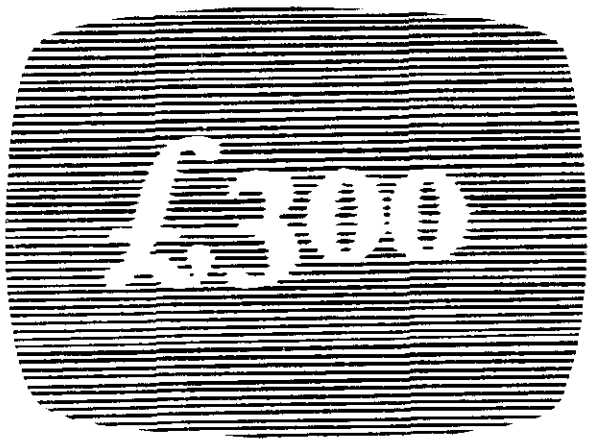

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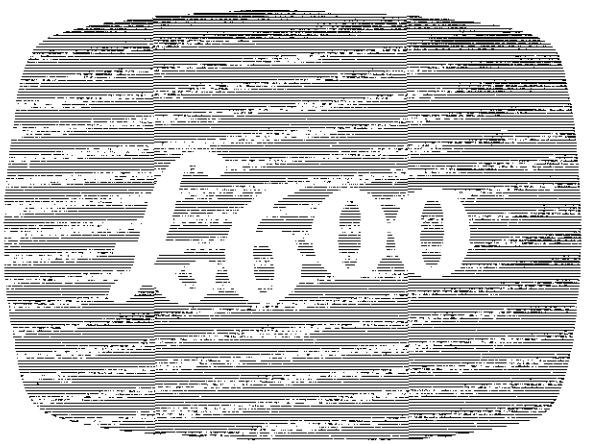

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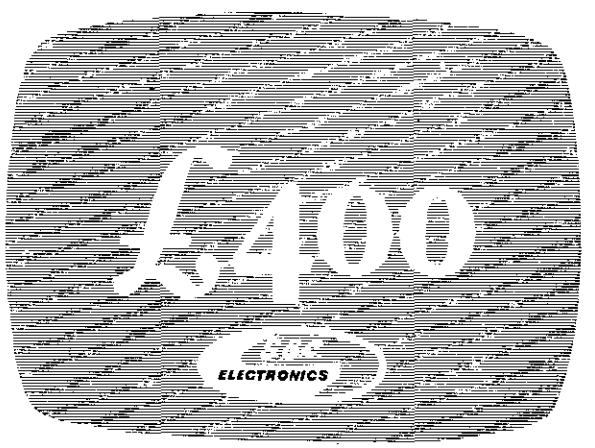

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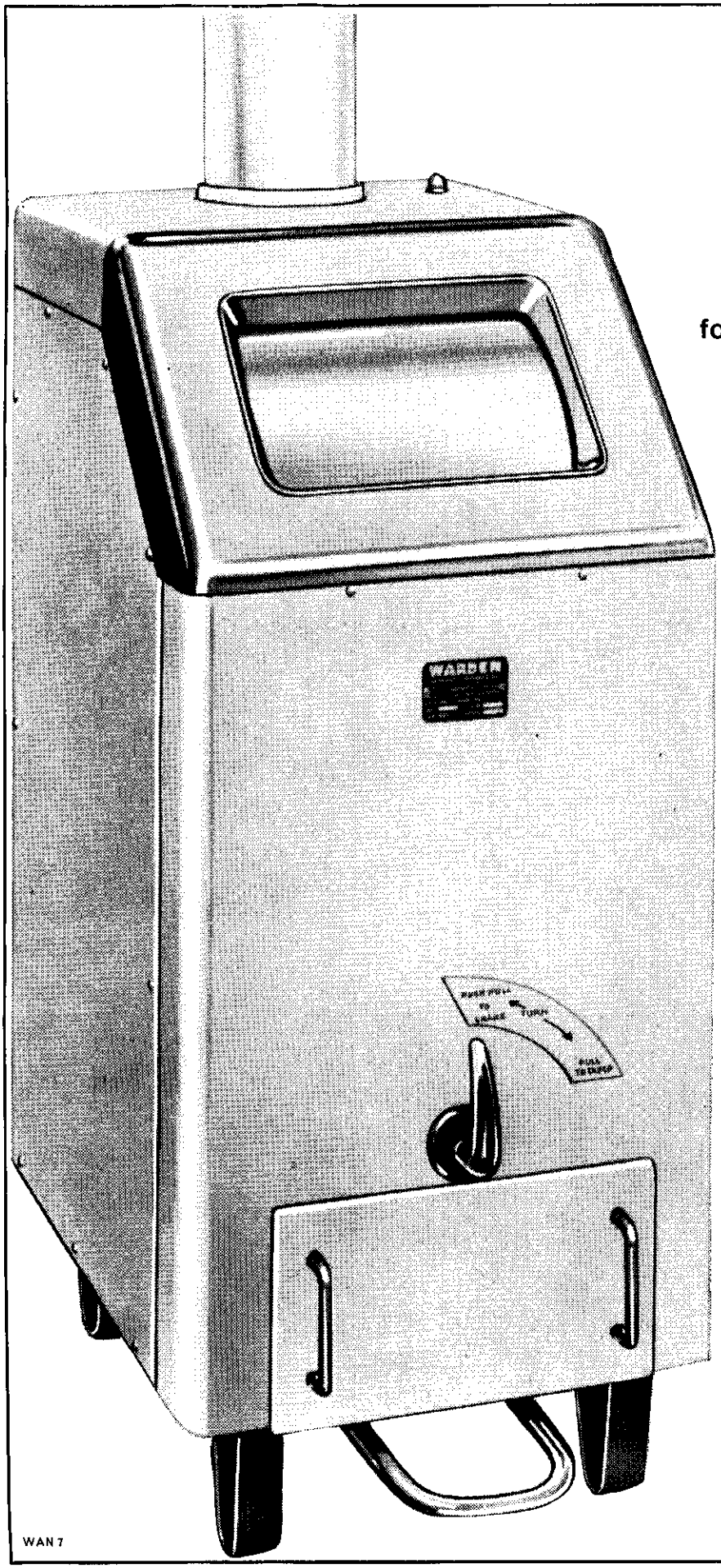

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THE JOURNAL OF THE INSTITUTION OF HOSPITAL ENGINEERS

Volume XX: Number 5 August 1966

Standby Electrical Supplies

By V. J. MARSTON, Graduate I.E.E., M.I.T.E.
Regional Engineer's Office, South West Metropolitan R.H.B.

A memorandum on standby electrical supplies covering the generation, distribution and utilisation of such supplies in hospitals within the area of the South West Metropolitan Regional Hospital Board

SURVEY OF SUPPLY FAILURES DURING 1962/63

1.1 Details of Hospitals and Failures covered by Survey

THE survey covered the failures of a half an hour or more in duration which took place at hospitals within the region during the winter of 1962/63. Table 1 expresses the shut downs by Groups, with total establishments in each Group and the number of hospitals where the shutdowns occurred. This represents in averages 1·53 hours per hospital involved in a shutdown or 0·89 hours for all hospitals.

1.2 Average Cost per Kilowatt

If for the purpose of this exercise the average estimated requirement of generating plant per hospital was taken as approximately 75 kVA, the average load expected per hospital at 30 kVA, and the cost of a 75 kVA set and the installations required as approximately £8,000.* If the 1962/63 failures were used as an average for the life of the equipment over a period of say 20 years, then the average cost of capital works per kVA used would be £13 6s. 8d. Considering that no account has been made of maintenance or fuel costs, this cost can only be described as high.

The figures used in this exercise are not intended to be precise, but serve to show that a case cannot be made for standby supplies on the grounds of economy or low cost. If however, the cost is evaluated against the comfort, risk and convenience to the patients and staff, it would be less significant, and the provision of standby facilities can be said to be reasonable whatever the cost. It is worthy of note that some licensing authorities require private hospitals to comply with the provisions of the Ministry of Health Technical Memorandum No. 11 on Emergency Electrical Services. It is

*This cost is based on the Emergency Standby installations at Croydon General Hospital in March, 1964, since this was a full standby supply installation in a medium sized hospital (200 beds).

Group	*Hospitals in Group*	*Hospitals involved*	*Total hours per Group*
1.	5	2	2
2.	5	2	5
3.	4	1	2
4.	6	1	1
5.	7	7	10
6.	8	5	5
7.	9	1	1
8.	8	–	–
9.	9	9	23
10.	10	9	10
11.	14	10	15
12.	12	3	4
13.	7	3	6
14.	7	4	4
15.	2	2	2
16.	1	1	1
17.	3	1	4
18.	1	1	6
19.	1	1	1
20.	1	1	2
21.	1	1	1
22.	1	1	1
23.	1	–	–
24.	1	1	1
25.	5	1	1
26.	4	3	4
27.	3	1	1
28.	1	1	3
29.	1	1	3
30.	2	1	1
31.	1	1	1
32.	7	4	9
TOTALS	149	81	132

Table 1.

thereforereasonable to accept that if the provision of standby supplies is a requirement for licensed private bodies, then governmental authorities should also comply with this requirement.

AN ASSESSMENT OF THE TYPE OF PLANT AND INSTALLATIONS REQUIRED

2.1 Emergency Lighting in Theatres

Emergency plant comprising battery operated lighting in the event of mains failure has been in use in all hospitals within the region having major operating theatres, for a number of years. This equipment in general is designed to provide adequate lighting to enable a surgeon either to complete an operation or to ensure the safety of the patient should mains failure occur.

The equipment does not, however, provide energy to drive electrical equipment, to run the theatre ventilation, or to maintain the supply of steam for sterilisation or hot water.

2.2 Emergency Standby Lighting

The difference between emergency and emergency standby lighting can be defined as follows. On the operating table the emergency lighting should be such that the pause between the failure of mains and the switching to batteries is scarcely discernible. However, with standby lighting a pause of up to ten seconds will occur while the generator set runs up to load speed. The best form of emergency lighting is as mentioned in part 2.1 above, but the size of battery can be reduced by using this supply only for covering the ten seconds gap between mains failure and the connection of standby supplies. To do this would mean that there could not be any allowance for a mishap to the standby set or its automatic starting devices. A compromise would be to provide a one hour battery storage instead of the usual 4 hours, which would give the Engineer time to rectify any fault.

The Ministry of Health Technical Memorandum No. 11 gives a list of areas where standby lighting should be provided and also states the grade of lighting. There have, however, been appeals from hospitals for a modicum of standby lighting for general wards, which is not included in the above mentioned lists. The need to provide lighting in the wards would depend largely on the circumstances and arrangement of wards and of course, the type of patient catered for.

2.3 Emergency Standby Power Supplies

This paragraph is generally in line with the provisions given in the Technical Memorandum No. 11, but an attempt is made here to list the order of priorities and some additional items are suggested as essential. The first and usually the largest power load requiring standby facilities is in the boiler house and associated plant rooms. Since mains failures usually occur during the coldest time of the year, the maintenance of general heating is essential for the comfort and possibly the lives of patients, and steam is essential for the operation of sterilisers and autoclaves. Many of the boiler houses in hospitals within the region are oil fired and are therefore dependent on electrical supplies for the operation of firing and control equipment. Supplies are also required for circulating pumps, tracing and the preheating of the fuel oil.

Other equipment which has prior claim for emergency standby supplies includes the blood bank, theatre ventilation, theatre socket outlets, water supplies and sewage disposal. The load of the blood bank and theatre socket outlets is very small and the loads of the other items listed are not usually very large.

Other equipment which should be provided with standby supplies comprises:

1. One deep freeze or food storage refrigerator.

2. One refrigerator in babies' milk room.
3. Ventilation plant to areas having no other possible form of ventilation.
4. One bed lift per building with facilities to bring other lifts to a floor level where possible
5. General purpose socket outlets in theatres, resuscitation rooms, delivery rooms, recovery rooms, special wards using machines such as respirators etc., and special baby care units all require to be on standby supply. Pathological laboratories and general wards should be provided with one or two socket outlets but wards with more than four beds may require a larger number of the socket outlets to be on standby supply. It should be noted that socket outlets for x-ray machines should not be connected to the standby supplies. Pathological laboratories may need also certain incubators to be on standby supplies.
6. Telephone exchange, nurse call equipment and staff call equipment. These items consume very little energy and can be connected to the standby supply if the cost involved is not very great.

2.4 **Diversity of Load**

When estimating the size of alternator required for standby duty, it will be necessary to know the full connected load, and the diversity which can be applied. It can be undesirable to run a diesel engine at a load very much below its normal rating (see paragraph 3.1).

The diversities which can be applied to circuits connected to the standby supplies are as follows:—

(i) *Lighting*—nil.

(ii) *Socket outlets*—for general purpose sockets, the overall load is likely to be so small that an allowance of 100 watts per outlet should be sufficient. Where a socket is required for a special item, the full rating of the item should be used.

(iii) *Boiler house, plant rooms, ventilation system*—the full load should be taken of each motor which it is possible to run at one time on the standby supply. Where pre-heating of oil, tracing and the feed pump are electrical only these must be taken at full load. When these items are normally run by steam but with electrical standby provisions then no diversity can be allowed unless use of these can be confined to a period before the other items, such as lifts, are switched over to emergency supply. The idea is that once a head of steam is raised, the pre-heating and tracing of fuel oil and the boiler feed pump can be steam operated and the standby generator capacity thus freed made available for other loads.

2.5 **Type and Size of Sets**

The type of set required to do the duty of providing a standby supply will comprise a diesel engine directly coupled to an alternator and started by a reliable battery and with certain automatic controls and protective devices. The size of the set will depend on the connected load taken together with the estimated diversities as discussed above but consideration must also be given to future development on any given site. The set must be capable of dealing with any load such as a limited number of directly supplied lighting points which will be applied during the starting up of the set. The set must also be capable of dealing with any sudden bulk loads which would occur on the operation of a manual or automatic change-over device. It may be found in some instances that it would be cheaper to install a set sufficient to carry the whole connected load. The implications of this are discussed further under part 5, Distribution.

2.6 **Noise Considerations**

Much thought is being given today to reducing the volume of noise which occurs in and around our hospitals, for the obvious reason that excessive noise can retard or even worsen the progress of seriously ill patients. Since diesel engines are noisy machines, thought should be given to suppressing, containing or absorbing this noise.

The first obvious point at which to reduce noise is from the exhaust of the diesel engine. This can be effected by the provision of the right type of exhaust silencer.

The noise of moving parts and the noise coming through the engine case will be considerable but this is often amplified more than it need be by large sheet metal sections such as alternator and control cubicle housings. This noise can be reduced by specifying that all such casings should be provided with some form of anti-drumming. Attenuators can be fitted in the ventilation duct between the radiator of the set and the ventilation grill of the housing but it will be necessary to increase the output from the radiator fan in order to overcome the resistance of the attenuator.

The running speed of a set will have some bearing on the noise problem, but this is discussed in paragraph 3.1. The housing will provide some form of noise abatement and this is more fully discussed under Part 4 The Diesel Alternator Chamber.

2.7 **Distribution**

No general formulae can be given because of the many variables which will occur on various sites. Factors that will govern the method of distribution are as follows:—

(i) The type and method of existing distribution systems

(ii) The number of mains supply intake points

(iii) The dispersal or layout of buildings on the site

(iv) The arrangement, construction and number of floors of the building or buildings.

THE DIESEL/ALTERNATOR SET

3.1 The Diesel Engine

The ideal driving unit for a standby supply set would be cheap to install, economic to run, noiseless, of constant speed, able to start quickly and requiring little or no maintenance, able to run without harm at anything from no load to 25% overload and able to take sudden changes in load.

The diesel engine possesses many of these advantages but is very noisy, requires a modicum of maintenance and will, if run for long periods at less than half load, require expensive attention to the injection jets. The noise from a diesel engine is proportional to two things, cylinder capacity and speed, but these items are in turn governed by the economics involved. The number of cylinders will affect the noise generated, the larger the number the less the noise but the greater the cost. A slower speed engine is quieter but also more expensive. The best compromise is found by using a multi-cylinder engine (with 4-8 cylinders depending on the desired output) running at a speed of 1500 r.p.m.

When sizing a standby set it must be noted that the applied load should not be less than 80% of the unit's normal working capacity since a set run continuously at low load conditions will be subject to break-down without warning. The reason for this is that the fuel injection pumps and jets become carbonised and it will then be necessary to provide for the regular inspection and cleaning of these items, which adds considerably to the maintenance costs.

Other driving units were considered, such as the reciprocating steam engine, the steam turbine, the petrol engine and the gas turbine, but these proved less satisfactory than the diesel engine for various reasons. The steam engines were found to be very much more costly to install, required much larger housings, were expensive to maintain and had problems associated with dealing with the exhaust steam. The petrol engine was found to be more difficult to control and less reliable than the diesel engine and had problems associated with the handling and storage of sufficient quantities of the highly inflammable fuel. The gas turbine was found to cost more than double that of the diesel engine so that any other advantages were not worth considering.

3.2 The Alternator

The alternator for standby duty should be relatively inexpensive and capable of establishing full stable voltage and full load output in less than ten seconds from stationary. The alternator should also be self exciting, self regulating and require little or no maintenance. It is essential that the machine should have regulation within $\pm 2\frac{1}{2}\%$ of the required voltage over the full range of temperature from hot to cold and to operate under these conditions with balanced and unbalanced loads between 0·8 and unity power factor.

The type of alternator fulfilling these requirements is the brushless, self-exciting, self regulating machine which for sizes above 30 kVA is economical in capital cost. This machine has a small exciter mounted at one end of the rotor shaft. The stator for this exciter is provided with permanent magnets within the field cores to ensure sufficient residual magnetism for a quick build up of current and magnetic field. The exciter rotor is wound to provide a three phase supply which is rectified and fed to the rotating fields of the alternator. The alternator stator is wound to provide a three phase output and connections from this output are taken to a regulator which rectifies and modulates the current which is fed into the field windings of the stator of the exciter. The regulator can be designed to give whatever voltage/load characteristics are desired so that it is possible to have an alternator which has a rising terminal voltage with a rising load. This can be borne in mind when specifying a machine which is required to provide heavy loads over long distribution lines. By increasing the voltage with load it is possible to compensate for voltage drop in transmission and thus save the cost of providing over-rated cables.

From this description, it can be seen that the only parts of the machine that will be subject to wear or deterioration will be the bearings of the rotor so that maintenance other than bearing lubrication will be generally nil for the life of the set.

3.3 The Diesel/Alternator Set

Having selected the right kind of motivator and alternator it is necessary that they be put together as a co-ordinated unit with all connections, supplies (fuel and battery), couplings and controls.

A model form of specification detailing the items and methods considered desirable is included at the end of this paper (see appendix A). This section will deal with the reason for preferences and these are as follows:—

Mountings. There are two methods of providing resilience in the mounting of the sets to damp the transmission of sound to the fabric of the building. Some manufacturers build the resilience into the framework of the sets by making two frames that fit one onto the other with a resilient material provided between these two frames. Another method is to bolt resilient feet to the underside of the main frame of the set. Both of these forms of mounting have been found to be satisfactory on sets purchased by the Board but it was found that the sets that were allowed to "rest" on the slab or plinth without fixings were more satisfactory than when the frame or feet were anchored or grouted in. The free standing sets will not "walk" or move because the great weight of the sets is too much to be influenced by vibration.

Couplings. Some manufacturers provide resilient couplings between the engine and the alternator. The

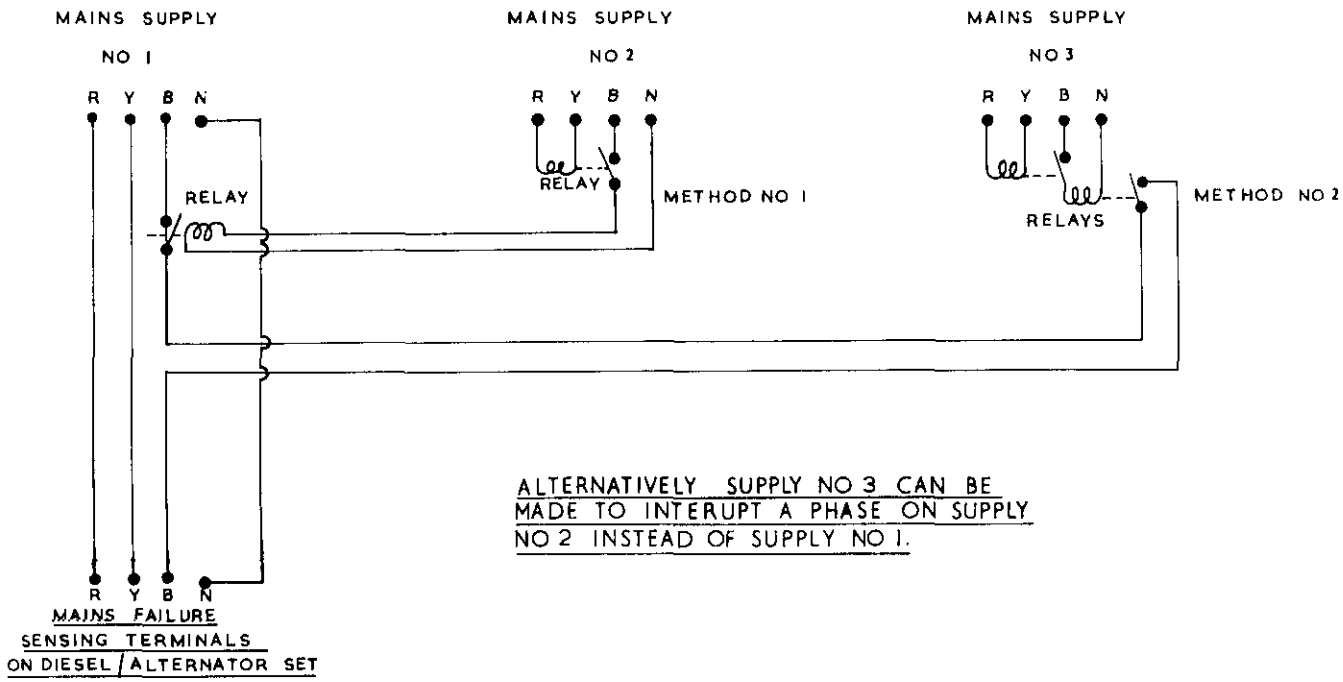


Figure 1. Diagram of connections for mains failure sensing.

object of this is to smooth out sudden torques on the main shaft to eliminate the possibility of shear at the coupling and also to facilitate the removal of the engine or alternator for maintenance. Other manufacturers claim that there is no virtue in this and bolt the two shafts together solidly. In doing this, one bearing of the alternator can be dispensed with providing the engine bearing is designed to take the extra duty and also providing the alternator has an end thrust type bearing. The only advantages gained in the latter design are the saving of a few pounds in the cost of the machine and about five inches in the overall length of the set, so that in general it is better to specify resilient couplings.

Fuel Tank. This should contain sufficient fuel to cover the duration of any breakdown in supply and is best provided mounted on the set as this simplifies installation and is more economical on space. A means of filling the tank is required and a semi-rotary hand pump with a plastic hose is sufficient for this purpose since it is not anticipated that fuel will have to be replenished often. An electric pump would add unnecessarily to the cost and the manual effort required is not over strenuous provided it is not repeated too often. The type of fuel indicator best suited for this application is an internal float carrying a magnet which operates a compass-like needle contained in a dial fixed to the wall of the tank. The glass tube type of indicator is not advisable since this is liable to damage which would spill the contents of the tank.

Batteries. The size and voltage of the battery will depend on the size and type of engine it has to start. This can be safely left to the manufacturer providing the duty is specified, i.e., able to make three successive starts from cold. The choice of batteries lies between the lead acid type and the nickel alkaline type. The nickel alkaline type is more expensive but the additional reliability afforded by this type of cell is well worth the extra cost.

Control Panel. This will house the mains failure sensing equipment, the various meters, safety devices and indicators, battery charging controls, main outgoing circuit breaker, the output terminals or bus-bars and various other controls.

The mains failure sensing device needs no further explanation except to say that the method of sensing the failure of more than one supply point is easily achieved by providing an arrangement of relays which will interrupt the supply of one of the phase lines from the first three phase supply when any phase or the neutral of the second three phase supply is interrupted.

This system is shown in figure 1. The use of relays to sense the supply failure is recommended because they are positive in action, inexpensive and simple for an electrician to understand and maintain. The more expensive " bridge " type of control is not recommended since it has been found it is possible for the bridge to remain " in balance " if the condition should arise where two of the phases are interrupted simultaneously whilst the third phase and neutral are not interrupted.

The essential meters are:

(a) An ammeter for each outgoing phase so that the output and balance of the load can be checked and action taken by the Engineer if the load is too out of balance or outside of the limits of the set;

(b) A voltmeter with a selector switch to give readings between phases and phase and neutral;

(c) A frequency meter which will obviate the need for a revolution counter.

A kW hour meter is not recommended as it can have little use functionally and is therefore an unnecessary expense.

Safety devices, to shut down the set if dangerous conditions occur, should be limited to overspeeding, overheating and lack of lubricant oil. A multiplicity of devices is not recommended as it is desirable that a set should start up quickly and automatically without the need of manual attention when a failure occurs. Too many devices can provide means of breakdown to a set and lead to confusion rather than assistance to an operative.

The overspeed device should not have to operate since the set will have automatic speed control but it will save the set further damage should the automatic speed control fail due to a defect or indifferent maintenance providing of course that the device is arranged to cut off the fuel injection immediately overspeeding occurs. Some manufacturers consider such a device to be an unnecessary item of expense since the number of engines damaged by overspeeding is so small that they can be ignored.

The overheating device may become necessary should the filling or topping up of the radiator with water have been overlooked and would protect the set until this had been attended to. The 'low oil pressure' device would serve the same function for the oil lubricating system. Each of these devices will need an indicator lamp to show which device has shut down the set and in addition, a 'fail to start' lamp or indicator is desirable should failure be for some other reason.

An important item required on the panel is a *maintenance switch* with a withdrawable key that can leave the set in the 'On' or 'Off' position. The purpose of this switch is to prevent accidental starting when maintenance is taking place on the set. This switch can also serve to reset the controls after a shut down by the above safety devices. Switches or selectors other than this switch should not be provided as this may result in a set being left in a state other than for automatic starting on mains failure. The maintenance switch must be clearly marked with its function and the 'On' and 'Off' positions without any possibility of confusion.

A stop button will be needed to shut down and re-set the set after the restoration of mains at the end of a failure. It should be noted that the set must not shut down automatically on the resumption of mains as this might not be convenient to staff who may have to operate change over switches or restart motors with no-voltage release controls. Although it is essential that the standby supplies become available within seconds of a mains failure there is no real need to shut down the set until the Engineer has satisfied himself that mains resumption is stable and any manually operated switches are set back to *mains supply*. A start button or *mains failure simulation* button will be required for testing and maintenance running of the set.

Controls, and indicators other than those mentioned above are not recommended as too many switches, buttons, dials and lamps are apt to lead to confusion. Even '*Mains On*' and '*Standby On*' are hardly necessary as both of these can be readily observed at the set without the help of an indicator. It should be noted however that a '*Mains On*' indicator of some kind will be required at some strategic point to advise the Engineer when the mains have returned to normal.

3.4 Earthing and Bonding

The set should be provided with connections from the star point or neutral line to the framework of the set. A removable link should also be provided in this connection with a means for the connection of a tape for the purpose of bonding to the sheaths of the outgoing cables, and to an earth electrode.

THE DIESEL/ALTERNATOR CHAMBER

4.1 Location of Chamber

This will be dictated often by site conditions but the preferable location would be in the vicinity of the main electrical intake and the boiler house or Engineer's Office, surrounded by bushes and trees and as far away from the hospital wards and neighbouring residential property as possible. The chamber is best designed as a single storey, free standing building.

4.2 Size of Chamber

The chamber requires to be large enough to accommodate the set with enough free floor area to allow for the movement of maintenance staff, and of sufficient height to allow for air circulation round the set for cooling.

A space on each side of the set, of three feet and at the alternator end of the set of four feet is sufficient for maintenance needs when a set is of the self-contained type, i.e., one framework. The distance between the radiator and the outlet grille need not be more than eighteen inches unless an attenuator is to be provided.

The height of the chamber will be governed by the physical dimensions of the set and should allow about eighteen to twenty-four inches above the exhaust system. This will generally make the height of the chamber to be in the region of nine feet.

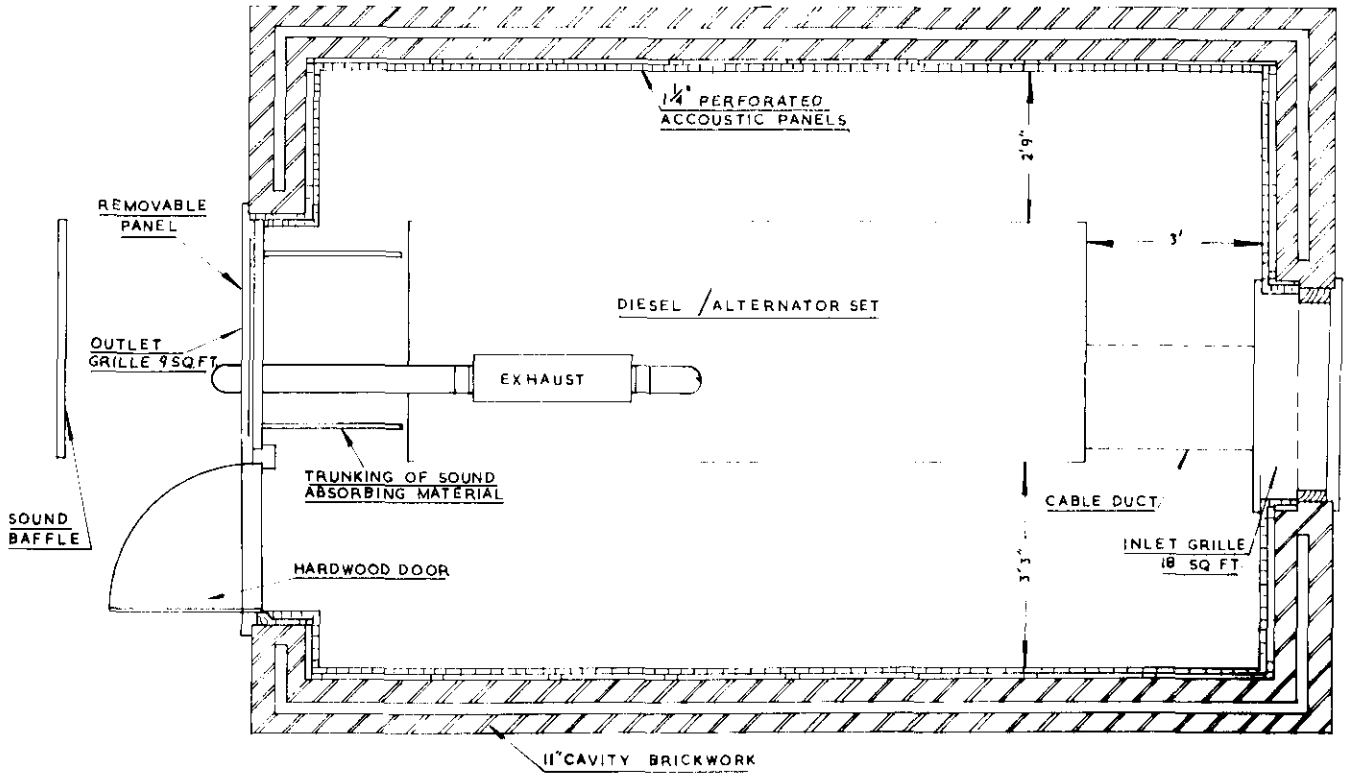


Figure 2. Typical plan of a Diesel/Alternator chamber.

4.3 General Arrangement of Chamber

Points of design to bear in mind are access for the set and for the staff, inlets and outlets for air, and sound proofing.

The access for the set should be such that it can be moved out of the housing should a major overhaul necessitate it. The building in of a set is not recommended as this could make a major overhaul much more expensive and difficult than it need be. One way of achieving this is to build either the inlet or outlet grille into a four feet wide door with an access door for staff adjoining it.

No windows are required since the chamber is not intended for use as a workshop and windows, apart from adding to costs, will reduce the sound insulation of the room. Providing reasonable artificial lighting and a socket outlet for a handlamp are installed, the lack of windows should not cause any inconvenience to the operation or maintenance of the set.

The size of the outlet grille should be the same size as the radiator front of the set and the inlet grille should be twice this size. The grilles should not present too much resistance to airflow but are required to be weather and bird proof. Improvement of the air circulation can be made by providing a trunking between the radiator and the outlet grille, but this trunking should be of sound absorbing material or it will give rise to noise through transmitted vibration.

The floor should be such that dust is not produced which could settle on the moving parts of the engine or alternator and cause possible damage to them. The walls can be untreated or covered brick but since noise will be the chief consideration, it is advisable to have the walls and ceiling covered with sound absorbing/insulating material. The type of insulation required will depend on the degree of attenuation required.

If a further reduction of the noise level emitted via the ventilator grille is required, a light screen should be installed about two to three feet from the outlet grille. The screen should be at least twice the width and height of the grille, be of a sound absorbing material, have a weather protecting capping, and if positioned at the access end of the housing be easily removable. Alternative methods of reducing air borne noise escaping from the chamber are the provision of a separately housed radiator or a cooling tower or tank.

If a separate radiator is found to be desirable this should be in a separate weatherproof housing mounted on the roof of the chamber. This housing would require identically sized inlet and outlet grilles and it would then be possible to omit the outlet grille of the chamber and to reduce its inlet grille by a half. The radiator would require an electrically driven fan which would obtain its supply direct from the output of the alternator.

The use of the cooling tank method dispenses with the need of a separate ventilated housing, a fan and an electrical supply, but will, however, require a make-up

supply of water. The system comprises a tank supported on legs on the building housing the chamber, with flow and return connections between the water system of the engine and the tank. Possible objections to the use of this method would be aesthetic, but could be overcome by the provision of suitable screens.

When designing for noise reduction, the function of the hospital, local background noise, and the distance of the relevant wards should be taken into consideration. To generalise, in built-up areas the background noise criterion value is 38 to 45 db. during daylight hours and 20 to 35 db. at night, except that in the vicinity of heavy traffic these levels will be correspondingly higher. In rural or quiet residential areas the levels will be correspondingly lower. Extensive sound insulation of the chamber may not be necessary if the normal background noise level is high, or if the distance between the chamber and the critical areas are great.

DISTRIBUTION

5.1 General

As mentioned in 2.7, the distribution network or system for the standby supplies will vary from one hospital to another, and what may be right for one site is not necessarily right for another. This section discusses the methods that have been used in existing and new developments and suggests methods for further investigation.

5.2 Existing Hospitals

The distribution networks giving full coverage of standby service were provided at the South London Hospital for Women and at Croydon Hospital, were similar and were installed as follows:—

Current Limiting Devices and Distribution Panel. This comprised a main miniature circuit breaker with three outgoing miniature circuit breakers which were variously rated to suit the circuits controlled.

Miniature circuit breakers were chosen for this purpose because of their speed of operation when restoring to use after a possible overload or fault. The additional expense was not considered a disadvantage in view of the few involved and the overall cost of the work.

Cables. The type of cable used generally was P.V.C. sheathed M.I.C.S. which was considered most suitable because it had to be installed in places of varied conditions, i.e., underground, in ducts with steam pipes, through walls and floors, and surface in corridors, wards, theatres, etc.

Change-over Switches. These were all manually operated four pole switches for the boiler houses, plant rooms and the selected lifts. Each change-over switch was illuminated by a fluorescent bulkhead light via a fused spur unit connected to a phase and neutral of the ingoing standby supply to the switch. This was to enable an operative to locate and operate the switch during a mains failure.

The switches for the plant rooms and lifts were arranged to change over the supply for each item of equipment individually to limit the effect of starting loads. The switches for the boiler houses controlled the whole of the supplies to these locations so that the only limiting factor would be the common sense of the boiler house attendant and the 60 amp T.P. & N. circuit breakers protecting the standby supplies.

The normal supplies and thus the change-over switches were rated at 200 amps, but for standby supplies, 60 amp was thought and proved to be adequate. Since it would probably be the duty of the boiler house staff to change over the switches and shut down the diesel set after mains had been restored, it was found necessary to provide 'Mains On' indicator lamps connected to the ingoing mains supplies to the change-over switches in the boiler houses.

Lighting and Socket Outlets. It was decided that to break into various circuits to use existing lights and sockets would be expensive because of the cost of controls and this would also constitute a hazard due to the age of some of the existing installations which might involve the expense of rewiring circuits damaged during modifications.

It was decided to provide for each hospital, a separate distribution network protected by a 15 amp T.P. & N. circuit breaker and connected direct to the output of the alternator without any other controls or switches. The system would therefore be energised and the lamps light up as soon as the set started up.

The lighting fittings were 32 watt circular fluorescent at South London and 20 watt 2 ft. fluorescent at Croydon General. Fluorescent lamps were preferred since they are not liable to filament failure and thus do not require monitoring or constant checking. It was found in some locations, such as the eye theatres and wards, that a local switch was needed to control these lights. Each fitting was provided with a fuse to prevent a local fault affecting the whole network.

Special socket outlets labelled *Standby Supplies* were installed at strategic and essential locations throughout the hospitals and connected into the main standby networks. Each socket outlet was provided with a 2 amp rated miniature circuit breaker to protect the network from faults on apparatus. These sockets would of course only be "alive" when the standby set was running.

These networks were three phase and neutral from the generator to a central point in the premises but were single phase from this point to the various areas of utilisation. This was done to reduce the voltage drop on distribution.

5.3 New Installations

For the new boiler house and the Outpatients Dept. at St. Stephen's Hospital, Chelsea, the system of distribution used was similar except that standard fuse gear was used at the main distributing point and paper in-

sulated cables were used as the main supply cables.

The boilerhouse panel was provided with a 5 ft. fluorescent light connected direct to the standby supply and a Castell type lock on the main supply and standby supply ingoing switches. This was arranged so that only one switch could be made at a time and would thus act as a manual change-over switch. It was decided that this type of switch would be the most appropriate even on a new installation since it was not desirable to have an automatic device which would not be controllable by the boiler house staff and each breach in supply would cause all starters to "fall out," thus shutting off the boilers. The limiting consumption would again have to be at the discretion of the boiler house staff. It was found necessary to put in some emergency pilot lighting which would come on as soon as the standby set was running, to enable staff in such places as the oil tank rooms, water treatment and calorifier rooms to find their way out and up to the main switch panel in the boiler house to switch over.

The standby supply to the Outpatients Department was controlled by an automatic change-over switch which controlled the supplies to certain of the staircase and corridor lighting and to the socket outlets in the minor operation theatre. Since these points were in normal use on normal mains supply except when a mains failure occurred, no special labelling was required except inside the conduit boxes for the benefit of a maintenance electrician.

A standby supply had also to be taken to the Pathological laboratory and it was decided, after taking readings on a recording ammeter, that a 30 amp cable with 30 ampere T.P. & N. miniature circuit breaker would safely deal with likely standby demands. These were provided together with a 150 amp change-over switch installed in lieu of the existing switch controlling the bus-bars of the distribution gear in this building.

This site also had the problem of three separate mains supply points, but this was successfully provided for by using the method of mains failure sensing relays as described in 3.3.

When considering the needs for standby supply distribution in large new ward blocks, it may be necessary to allow in the design for two separate distribution systems. The main system, covering the bulk of the load, being of a non-essential nature, would be connected to mains only supplies and the second system, covering all essential circuits, would normally have automatic change-over to standby supplies in the event of a mains failure. This would necessitate duplicate distribution centres, cables and sub-circuit boards, throughout the building.

Special provisions of key operated switches would be required for the lifts so that they could be operated one at a time in conformity with the requirements of the Ministry of Health Technical Memorandum No. 11. The arrangement would have to allow for only one lift circuit to be switched into the *mains/standby* distribution system, the others being normally on the *mains only* system.

5.4 Single Distribution Methods

By single distribution it is intended to indicate that only one distribution system is to be used and not two as indicated in the preceding clause. The one system would have to carry the mains supply normally and isolate this supply and connect in the standby supply when mains failure occurred.

This in fact seems the simplest method to use but of course the size of the set would have to equal the maximum demand of the hospital which might mean a very large and expensive set. Before rejecting this as impracticable, the economics of the matter require some investigation and it may also be possible to install a set of a much lower rating than the maximum demand.

If a single distribution system is installed there could be a saving in the cost of central distribution gear, cables, sub-distribution boards and the cost of installing these items. If the buildings of a hospital are scattered, it is conceivable that the cost of installing two distribution systems would run into several thousands of pounds. By consulting the graph relating cost to size of set, which is appended to this memorandum, it may be found that the difference in cost between a set large enough for essential circuits only and a set large enough to supply the whole of the hospital load can be met from the saving on the distribution.

If, however, it is not practicable to provide a set capable of carrying the whole of the hospital load, there are several methods by which unessential loads could be switched off during the period when the standby supplies are in use. These methods are discussed separately as follows:—

No-Volts Release Method. Under this method an automatic four pole change-over switch would be provided at the central distribution point to channel either the mains supply or standby supply into the distribution system. All essential circuits would have normal switchgear and fusegear but non-essential circuits would be provided either with circuit breakers having no volt release characteristics or standard type direct on starters. These breakers or starters would be connected either into sub-distribution lines if the non-essentials were grouped on distribution boards or in sub-circuit wiring where it was not possible to group them and the sub-circuit load was large enough to warrant cutting out. On the occurrence of a mains failure the standby set would start up but there would be a gap in supply of about six to ten seconds and this would be more than sufficient time to cause the breakers and motor starters to fall out, thus isolating the non-essential circuits. The breaker or starters would have to be reset manually by the engineering staff on the resumption of mains supply but it would be necessary to see that this control gear was

under lock and key to prevent non-engineering staff switching on during a mains failure.

Automatic Switching Method. This method would be arranged similarly to the No-Volts Release Method except that instead of breakers or starters for controlling the non-essential circuits, contactors would be provided. The coils of contactors would be connected to a special control line. This control line would derive its supply from the mains and it would be switched by auxiliary contacts mounted on the four pole change-over switch. The arrangement at the change-over switch would be such that when the mains supply failed, the mains contactor would fall out and break the auxiliary contacts, thus isolating the non-essential circuits. The non-essential circuits would of course come into use again when the mains supplies were resumed.

Ripple Control Method. For this method, the arrangement would be as for Automatic Switching, except that supply connections of the control lines to the contactors would be replaced by a ripple control generator at the diesel alternator set and ripple control receivers on the coils of the contactors. The contactors would be arranged to isolate on mains failure and the ripple generator would bring in or out the contactors as the demand rose or fell so that the maximum circuits could be in use but the set would be protected from possible overload. This method is more fully discussed in Section 7.

5.5 **Prevention of Stalling**

When using automatic change-over switching, consideration should be given to the effect on the alternator of the starting loads of fluorescent lights and motors which may by reason of the system be all applied at the same instant of time.

If it is found that these starting loads are liable to cause trouble (one would expect the circuit breaker on the set to trip rather than any damage to occur) this can usually be remedied by providing dash pots or timing devices on the various items of the motor starter gear or if there are several automatic change-over switches, on these. Where there is no control gear that would take timing devices, these would have to be inserted into the circuits. This problem will not arise where change-over switches are manual as the motor starters will also be manual.

5.6 **Earthing and Testing**

Before proceeding with any method of earthing the supply from a standby set, the Local Supply Authority should be consulted. The Supply Authority may accept a common neutral and earth system but would of course insist on the complete isolation and prevention of accidental connection of standby phase lines to mains phase lines. It may be found satisfactory to use this method but in this case the star point of the set should not be earthed as the Supply Authority earth would achieve this and it is not advisable to have two such earthing points as high circulating currents may result when the system is out of phase balance.

Before accepting the Supply Authority's earth point, consideration should be given to the effect on the earth loop impedence path which would result when the standby set was in use and it may be found better to use four pole isolation and provide a separate earth.

Although it will be found that all manufacturers of special switchgear do not make four pole change-over switches, some do and one such manufacturer is the Electric Construction Company. In addition, this Company will also provide auxiliary contacts as required.

If separate earthing of the star point is decided on, it may not be sufficient just to bond the cable sheaths to the frame of the set (and thus to the star point) as this may only provide the means of isolating short circuits from the 'live' phases to the bonded metal, i.e. cable sheaths, switchgear frames, conduits, etc. It may be necessary to protect the system from voltages which may occur of higher values than the insulation rating of the cables used in the system relative to the earth mass. It will therefore be necessary to provide a leakage to the earth mass by installing an earth electrode.

The testing of the standby set should cover the tests as indicated on the specimen form of test sheets appended to this memorandum. The tests should cover the operation of each item and also the response of the set to the various conditions of loading. The testing of the system should cover the normal insulation tests and the loop impedence test, which latter test would have to be taken with the set running.

This article will be concluded in the September issue of the HOSPITAL ENGINEER.

NEW DEPARTMENT FOR NORTH STAFFS INFIRMARY

The new Central Sterile Supply Department which is being built at the North Staffs Royal Infirmary, Stoke-on-Trent, is the second building of its type for which the A75 system of industrialised building has been used. The first was at Addenbrookes Hospital, Cambridge.

A. H. Anderson Limited, of London, who developed A75 in the mid-fifties, co-operated closely with the Birmingham Regional Hospital Board architects right through the design process, and contracted for the supply and erection of the A75 superstructure. The A75 system uses timber, steel and precast concrete components. It has been used widely for educational, health, welfare, and administrative buildings, where speed of erection, high quality, and permanence are primary considerations. The system may be applied to the design of buildings from single to five storeys.

The value of the Stoke-on-Trent contract is approximately £58,000, and the builders are George A. Poole Limited, of Newcastle, Staffs.

A NEW MULTI-PURPOSE PATIENT HANDLING SYSTEM

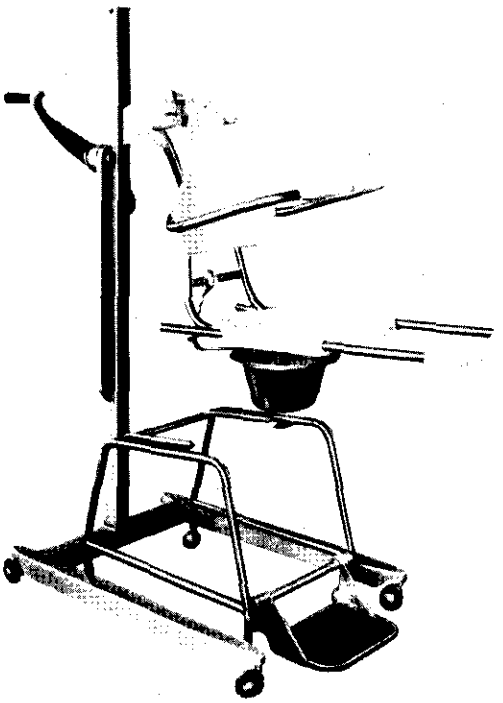
THE Ambulift is a new patient handling system which meets in every respect the need for a simple mechanical lift which is acceptable to nursing staff and patients. This integrated system comprises a mobile lift, chair units and accessories with which one nurse, with minimum effort can lift a heavy, non-ambulant patient from a supine or sitting position. The patient can then be conveyed quickly, comfortably and in complete safety to the bathroom or toilet, bathed and returned to bed *without* leaving the Ambulift chair and without any danger of physical injury to the nurse or her patient.

In use, the Ambulift system effects a valuable saving in nursing time involved in these daily tasks and has significantly improved levels of efficiency and safety in hospitals and nursing institutions. The apparatus displays a clean, neat and utterly functional design, which is not at all unattractive to the eye; it is a simple, compact piece of engineering.

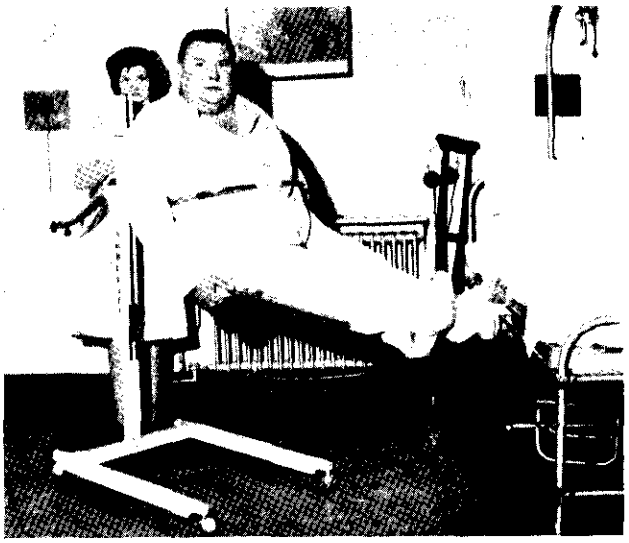
It has been developed by its inventor, Mr. D. R. James at Mecanaids Ltd. (Gloucester), during three years' intensive ward trials, and already about 100 units are in daily use. At £159 complete with all attachments, it offers effective competition to the other seven patient lifts at present available in the United Kingdom which employ crane and hydraulic devices.

Construction

The Ambulift may crudely be compared with a fork-lift truck; it has a wide-track chassis, mounted on castors for mobility, with a rigid box-section mast completely enclosing the manually-operated elevating and lowering mechanism. Rotation of the steering handle operates the lift and a self-locking, non-slip device built into the mechanism permits simple, one-handed operation in perfect safety. The crucial support member is flame-cut from half-inch mild steel. The ascent is chain-operated in a ratchet, and the descent is controlled by a Ferodo-lined clutch, which applies a braking effort proportional to the load applied.



The Ambulift with its accessories.



Six persons were previously required to lift this patient; with the Ambulift one nurse can lift the heaviest patient.

The sanitary pattern chair unit is secured to the gravity support hook of the lift by a quick release safety catch. Its long contoured seat and back rest are "wipe-dry" glass fibre reinforced plastic mouldings. They are mounted on a tubular steel frame with folding support arms which encircle and retain the patient in a comfortable and secure position. An extendable leg rest of similar construction can quickly be attached to the front of the chair unit, when necessary.

When required for use in the toilet or shower, the chair unit is readily secured to a castored sub-chassis which gives added mobility and flexibility to the system. A special commode attachment can be fitted to the chair when on the sub-chassis or on the lift while the patient is in the chair.

A transfer frame with a specially designed seat replaces the standard chair unit when lifting patients from the sitting position, as from a chair.

Operation

(a) To lift a patient from a bed, the patient lies on one side facing away from the Ambulift. The arm rests on the chair unit are folded back and the seat, with its back to the lift, is inserted under the patient's thighs. The patient is then rolled back over the seat and raised to the sitting position. One arm rest is then lowered to support the patient's back and the other is lowered to provide forward support.

The chair unit is now hooked to the Ambulift and raised just clear of the bed to allow the leg rest to be fitted, and then lowered on to the bed again. The patient is then turned

through 90 degrees to face forward in the chair with his legs placed on the rest.

(b) To transfer the patient from the Ambulift to a bed the Ambulift is moved into place with the chair unit just above the bed and the leg rest removed. The chair is lowered on to the bed, the patient turned through 90 degrees to face the foot of the bed and the chair unit is released from the lift. The arm rests are then swung clear, the patient laid back on the bed and rolled on to one side facing away from the nurse to allow the chair unit to be withdrawn.

(c) To lift a patient from a chair the front of the transfer frame seat, which is flexible, is placed under the patient's thighs, the rear tails drawn round the buttocks and crossed at the back. The Ambulift is then moved into place in front of the patient who is encircled within the hinged arms of the transfer frame, which is attached to the lift. The flexible seat is attached to the frame and the patient raised in the normal manner. This operation is reversed to return the patient to a sitting position.

Summary

With the Ambulift, patients are moved from place to place, bathed, showered or can use any standard W.C. without leaving the comfort and security of the chair. Nursing staff quickly learn to accomplish all these tasks in complete safety, without fear of injury to themselves or their patients and with speed and minimum effort. Mecanaids do insist, however, that their own staff instruct nursing personnel before using the Ambulift.

The apparatus can handle patients of up to 26 stone easily, and in fact has been factory tested to 38 stone before any permanent plastic deformation set in. Maintenance and lubrication are minimal, and their necessity infrequent. All these factors, combined with the great stability and simplicity of operation of the Ambulift, engender a sense of security and confidence in nurse and patient alike. Any further information may be obtained from the manufacturers, Mecanaids Ltd., at Mercia Road, Gloucester.

ELETTRA EQUIPMENT AT PETERBOROUGH & DISTRICT MEMORIAL HOSPITAL

ONE of Britain's latest and most modern hospitals, now under construction at Peterborough, is being equipped throughout with an Elettra sound system, providing intercommunication facilities between patients and nurses as well as a choice of radio and television programmes. The system, designed by the Marconi Marine Company in conjunction with the Engineer's Department, East Anglian Regional Hospital Board, will be by far the largest of its kind in this country. All fourteen wards are to be fitted with the system, the wards being made up of separate rooms containing one, two or four beds, totalling some 364 beds in all. Each of these beds will have its own flush-mounted wall control panel complete with patient's remote control bed unit, from which a call can be made to the duty nurse at any time.

The wall control panel will provide selection of six broadcast entertainment programmes including television sound, vision being provided by a separate mute receiver. An emergency call button, two 13 amp power sockets for use by the medical staff, and a bed-head light switch will also be provided on each wall panel. The bed-head light will also be switchable from the patient's bed unit, which is fitted with a volume control for all sound programmes.

A patient using the combined intercommunication and entertainment system to speak to a nurse.

Each ward will be divided into three zones, a 'red' zone, 'yellow' zone and 'green' zone. Tri-colour luminous indicator boards are to be fitted in the kitchen, two nurse stations, ward control room, ward sister's office and the treatment room of each ward. A three sided indicator board will be installed at the T-junction of the two main corridors of each ward, so that one side of this board will be visible from any point in these corridors.

Answer-back telephone units, with zone indicator boards, are to be installed in the kitchen, ward control room and two nurse stations of each ward. In addition a ward reset unit will be fitted in each patient room on the ward with an indicator lamp outside.

A patient requiring the attention of a nurse will press the call button on the remote control bed unit. This action will immediately illuminate all the indicator lamps of the particular colour allocated to that zone. In addition an audible call will be reproduced at all answer-back telephone units on that ward, and the relevant 'overdoor' lamp and the lamp associated with the ward reset unit will be illuminated.

A nurse receiving the audible or visual indication that a call has been made will, by reference to any of the indicators, immediately recognise whether or not the patient making the call is associated with the zone under her care.

The nurse caring for the particular zone indicated can, by reference to the 'overdoor' lamps, proceed direct to the patient's room, or, if in another part of the ward, proceed to the nearest telephone unit to answer the patient's call. When the conversation is ended the nurse can cancel the

call from the telephone position; if, on the other hand, the nurse proceeds straight to the patient's room, she will cancel all the call indicators by depressing a button on the reset unit on her arrival. The luminous indication will remain in operation until cancellation of the call occurs, when the system will be automatically restored to normal and the patient's position returned to entertainment without any action on his or her part. An emergency call button is fitted at each bed position to enable a nurse to call for assistence if necessary.

In the toilets and bathrooms, where voice intercommunication is not required, call and reset units are to be fitted enabling the patient to call the nurse in an emergency. The pulling of a cord or pressing of a push button will result in the lighting of the indicator lamps as before, and at the same time will cause a tone signal to radiate.

If a nurse is already talking to a patient or proceeding to a patient's room when another presses his or her call button, the second call will be automatically stored in the control panel and will start the calling operation again immediately the first call is cancelled.

A separate Elettra two-way intercommunication system is to be installed for operation between the X-ray registration room and the X-ray reception room. This will comprise a single control amplifier with two flush-mounted loudspeaker talk-back units.

The whole hospital intercommunication system is transistorised in order to achieve the very high degree of reliability essential in such a system.

(At the time of going to press, work has come to a standstill at Peterborough, as a result of a dispute between the structural contractors, Mitchell Construction Co., and the Regional Hospital Board.—Ed.)

The Need for Sound Systems

Extract from Paper Relating to Patients' Call Systems prepared by Maurice J. Burke, Assoc.I.E.E., Regional Engineer, East Anglian Regional Hospital Board.

In the old Nightingale type of large open ward at least one of the nursing staff is always present and patients requiring attention can, by their own efforts, make this known either direct to the nurse or via a patient in a neighbouring bed. In other words the staff can both see and be seen at all times.

On the other hand, with modern ward units made up of separately enclosed single and four bed wards, there is a danger that the patients may lose the feeling that the nurse has a personal interest in them. It is a nurse's duty to go into the wards to see how the patients are, and in fact there are regular routines for them to do just this, but with the present shortage of nurses it is unreasonable to expect them to pass in and out of individual rooms sufficiently often to give quite the same sense of personal nursing as is possible in the Nightingale type ward.

The introduction of simple bell and buzzer type call systems into enclosed wards does not provide the personal contact with the nurse that is missing and such systems can give rise to additional work for the already overworked nursing staff. Depending, of course, on the layout of a particular ward unit it could mean that a nurse at one end of a long corridor, on seeing and hearing an indication that

Patient/nurse intercommunication system showing a sister on duty answering a call from a patient whose location is shown by a light on the indicator panel.

a patient requires attention, may well have to drop whatever she might be doing, walk from one end of the unit to the other, only to find that all that was wanted was a drink of water, or some other non-urgent item. Having ascertained the patient's wants she may have to walk back along the corridor that she has just traversed, pick up whatever is required and return the same distance. Obviously the total length of the journey undertaken by the nurse is greater than would have been necessary in the open type of ward and there is thus a danger of both overworking the nurse and losing some of the close contact that has always existed in the past between nurse and patient.

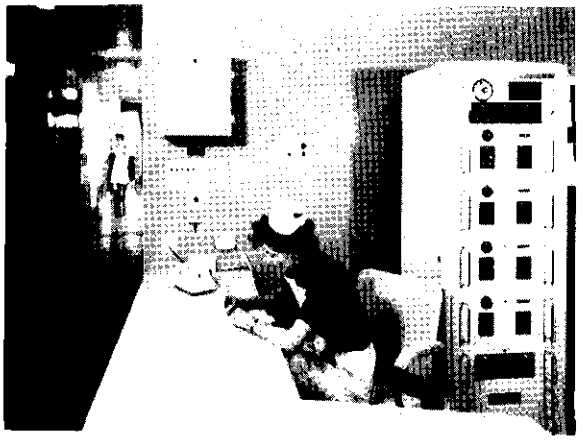
I think it is everyone's hope and desire that the personal nursing aspect will be maintained in our modern hospitals without placing unnecessary work and strain on the nursing staff. If this aim is to be realised it is often necessary to provide a means by which nurses and patients can easily converse and it is with this need in mind that patient/nurse intercommunication systems have been introduced.

Hospital Equipment Demonstration on tour

As mentioned in the HOSPITAL ENGINEER last month, the Elettra trailer is now touring British hospitals. The vehicle's installation of electronic equipment for hospitals includes examples of the latest developments in the field of patient/nurse intercommunication systems designed in consultation with the Ministry of Health, Regional Hospital Boards and Medical Authorities, which are as follows:

1. The Elettra Patient/Nurse Calling and Entertainment System with 2-way speech communication.

2. The Elettra Patient/Nurse Luminous and Audible Calling and Entertainment System. (The bedhead units of this system have been designed in close consultation with the Ministry of Health.) With the system is a newly developed adaptor which automatically relays an unanswered call at the nurse's position on to the Mimcall system to locate the nurse.



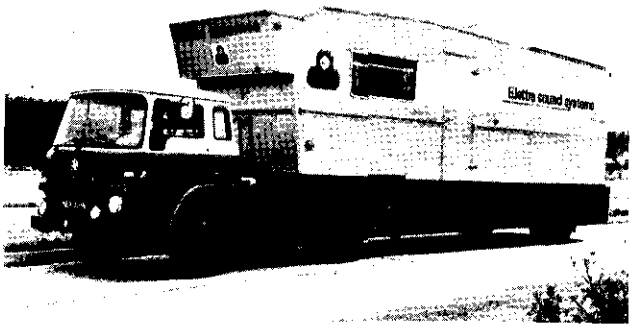
Nurse station, showing a ward indicator panel, answer-back telephone and main amplifier/entertainment rack.

3. The Elettra Patient/Nurse Luminous and Audible Calling System using solid state switching. Part of the system uses semi-conductor devices instead of relays and buzzers and emphasises the saving in maintenance costs on such systems with no moving parts.

4. The Elettra Patient/Nurse Luminous and Audible Calling and Entertainment System without conventional cabling. An interesting new development is a patient/nurse calling and entertainment unit integrated in a bedside locker that requires no ward cabling. This is still on the confidential list as it is not quite ready for the market, but the manufacturers wish to obtain the reaction to this type of system from all interested parties.

Also on display are an Entertainment Rack, Record Player and Tape Recorder; the Mimcall Radio Paging System complete with VHF staff location demonstration system; the Radiomic system with portable sound reinforcement demonstration unit; a TV aerial distribution system, and other miscellaneous equipment, including Amplifiers, Loudspeakers, sound columns, etc., an Electronic Stethoscope and Speech Aid Equipment.

During the last few years, Elettra Sound Systems equipment has been fitted in about twenty hospitals in England.



Elettra mobile exhibition.

On the Market

A review of new equipment and materials and their development

NEW LIGHTWEIGHT FUME CABINET FOR HYGIENIC CONDITIONS

A new, lightweight fume cabinet specially designed for use in industrial, teaching and hospital laboratories where very high standards of hygiene are required has been introduced by **Turner & Brown Ltd.** Called the Dundee type, the new fume cabinet is specifically constructed so that all internal surfaces can be easily washed down. The body of the cabinet is moulded in one piece from glass fibre reinforced polyester resin and is completely resistant to most acids, alkalis and solvents. All internal corners are rounded for ease of cleaning and to eliminate infection pockets. An extract port and a sealed window for a fluorescent lighting strip are incorporated in the moulding. A sliding sash of toughened glass housed in a p.v.c. frame is fitted.

The cabinet is expected to be particular value in situations where avoidance of bacterial growth and contamination are prime considerations. Other features include two specially designed safety panels which spring out immediately in the event of an internal explosion, thereby greatly reducing the risk of injury to personnel and damage to the cabinet. The two safety panels are manufactured from p.v.c. and are housed in rectangular apertures on either side of the body.

The cabinet is mounted on an underbench fabricated from plastic-covered steel tubing, and is provided with adjustable feet. The replaceable bench top is also moulded from glass fibre reinforced polyester resin and embodies a recessed central portion fitted with a drain channel. Service fittings and a drip cup are incorporated in an integral shelf at the rear of the bench top, and controls are extended to the front of the cabinet to permit operation from the outside. The cabinet can be made in a variety of sizes to suit requirements, and only needs connection to the various services for operation.

NEW FUME CUPBOARD ROOF EXTRACT UNIT

A new glass fibre roof extract unit suitable for fume cupboards and other installations where corrosive fumes are produced is announced by **Brooks Ventilation Units Ltd.** of Bedford Park, Croydon, Surrey. The unit has a centrifugal backward inclined non-corrosive impeller and can operate against system resistance up to 1·0 in. w.g. The centrifugal fan ensures quiet operation.

The unit throws air upward to prevent re-entry and ensure rapid dispersal of fumes into the atmosphere. An

important feature is that it is possible to connect several fume cupboards to extract through one of the larger units, thus simplifying installation and lowering capital and operating costs. These units are fully weatherproofed and will obviate the need for a costly extract plant room.

The unit is easy to install and maintain and all components are accessible from roof level. The motor is isolated from the airstream and two speed motors are available. For essential service dual motors can be installed and a means of instant on-site adjustment of air volume is provided.

The Brooks-Jenn centrifugal fume cupboard unit is produced in six sizes with fans from 14 in. to 24 in. diameter. Each size has a selection of nine operating speeds and performances range from 600 to 5,240 cubic feet a minute.

ELECTROWRITERS

Electrowriters transmit handwriting over ordinary internal or external telephone lines. Electrowriters leave a permanent record on paper at both sending and receiving ends and can transmit to any number of instruments at the same time. As signatures and handwriting are reproduced by the receiving machines exactly, electrowriters may be used for ordering as well as general administration. There are already electrowriters at the Cabinet Office in Whitehall, at the Ministry of Aviation and in two R.N. destroyers. Further information may be had from **Modern Telephones (GB) Ltd.,** Chalcot Road, London, N.W.1.

DIESEL/ALTERNATORS

Newman Industries Ltd. of Yate, Bristol, announce a new range of self-contained Diesel Alternator Sets. These sets consist of "Leyland" engines direct-coupled on skid type baseplates, matched to alternators of our own manufacture. The engines are radiator cooled and are arranged for electric starting with batteries mounted in the bedplate. Mounted on a framework supported from the bedplates and over the alternators are the control panels and also the daily service fuel tanks.

This self-contained design lends itself to easy lifting from place to place and the sets are available in three sizes, 85 kVA, 110 kVA and 137 kVA. All are suitable for 400/440 volt, 3 phase, 50 cycle, 4-wire output, 1,500 r.p.m. Delivery seven days.

HORIZONTAL SLIDING WINDOWS IN ALUMINIUM

A new range of aluminium horizontal sliding windows which can be ordered by the builder to any size within certain maximum dimensions is being introduced by **E. D. Hinchliffe & Sons Limited** of Tipton, Staffs. They are for both domestic and industrial use.

Factory glazed with 32-oz. substance glass, they can be supplied in the timber surround of softwood or cedar. Or the surround can be provided by the builder himself or any other supplier.

Sliding tracks and glazed sashes are of extruded aluminium, fully weatherstripped, with a locking device at the meeting rail. As required, they can be cut and fitted by the builder to give any size window up to a maximum height of 5 ft. and an overall width of 9 ft. The widths are in two or three panes, which give up to 6 ft. and 9 ft. respectively. Surrounds with top and bottom track can come separately, with the glazed sashes to be fitted later.

As with other Hinchliffe products, these windows are also available purpose-made to any size within the maximum limits, eliminating all standard range restrictions. They can be used in pairs for double glazing, too, either as separate units with inner and outer cill, or with a composite timber surround.

INSTANT NAMING OF HOSPITAL PERSONNEL

The Handy Angle Hospital Advisory Service, Uxbridge Road, Hayes, Middlesex, reports that their all-purpose Labelmaker is being widely used by hospital personnel to print their names for display on their coats for identification by patients.

A $\frac{1}{4}$ inch wide tape is used for this purpose. The dial head, which has 49 characters, resists heat, light and moisture and can be applied to any clean, dry surface. There is a colour coding selection of twelve colours. The printing of letters or figures, spacing and cutting the self adhesive tape are all achieved by a simple one trigger action.

An additional hospital use for the Labelmaker and for its $\frac{1}{2}$ inch wide dial head of 40 characters has been found in the Medical Records departments where colour coding for documentation has been found useful. Handy Angle provide a free on-site advisory and demonstration service for hospitals of their labelling identification system.

AUTOMATIC AUTOCLAVES

Two entirely new and fully automatic medical autoclaves suitable for speedily sterilising unwrapped instruments, bowls and utensils, by self-generated, "closed circuit" steam, both requiring only an electric supply to operate one completely portable for small wards and flexibility of use -are announced by the designers and manufacturers, **Surgical Equipment Supplies Ltd.,** of Westfields Road, London, W.3.

Both sterilisers, "Little Sister"—a compact overall size of 19 in. x 14 in. x 16in. with a chamber size of 8 in. dia. x 12 in. and "Matron" a floor standing console model with a larger chamber size of 12 in dia. x 20 in. long (with a useful cupboard beneath) and overall dimensions of 20 in. wide x 32 in. deep x 54 in. high, use sections of Fagersta spirally welded stainless steel tube for the all important pressure chambers. This application is unique, it is claimed, making a significant contribution to the very revolutionary prices applying on both pieces of equipment over steam mains and similar apparatus.

Fagersta stainless tubes of 8 in.-14 in. o.d. respectively are used. They are specially spirally welded at their Swedish plant and supplied through Fagersta Steels Ltd., of Great Britain.

Compactness, portability and re-use of water by virtue of the "closed circuit" design and operation from any electrical supply have prompted orders from hospitals throughout the world.

B.S.I. News

Abstracts of information supplied by the British Standards Institution

NEW CODE OF PRACTICE

B.S. CP 212 : Wall tiling

CP 212 : Part 2: 1966 External ceramic wall tiling and mosaics 8s.

For application under normal conditions using fire clay tiles, vitrified tiles, earthenware tiles (exterior type), treated tiles (interior type rendered suitable for exterior use), mosaics (clay ceramic—glazed or unglazed), glass or marble mosaics; sizes range up to 144 in.^{2} Covers a range of types and classes of backgrounds and gives recommendations on their suitability to receive tiled or mosaic finishes using one of three methods: sand and cement bedding over a floated coat; cement based adhesive over a floated coat or as a direct fixing; mastic adhesive over a floated coat or as a direct fixing. Quality and tolerances for the floated coat and the finished tile surface, tabulated data summary relating to the various prescribed methods of fixing tiles or mosaics.

B.S. 1334: 1960 The use of thermal insulating materials for central heating and hot and cold water supply installations 7s.

Minimum thicknesses of insulating material for heat conservation or for frost protection on installations working at up to c. 100°C, based on manufacturer's declared thermal conductivity values. Appendices describe methods of calculation.

The revision incorporates B.S. 1304 and B.S. 1589.

B.S. 1651 : 1966 Industrial gloves 15s.

A range of 19 preferred types of gloves (including mitts, gauntlets, and handguards) associated with particular hazards; size, materials, construction, finish and manufacture. Gloves made of leather, rubber, felt, mole, polyvinyl chloride and cotton, for use in all industries, are covered.

B.S. 1910 : 1966 Carbolic soap 4s.

Hard soap containing additions of phenolic bodies such as cresylic acid.

Limits for total fatty matter, rosin acids, matter insoluble in ethanol, phenols, free caustic alkali, total free alkali, and chloride. Methods of test.

B.S. 3425 : 1966 Method for the measurement of noise emitted by motor vehicles 4s.

Intended to meet the requirements of simplicity, consistent with reproducibility of results and realism in vehicle operating conditions. Excludes signalling devices.

AMENDMENT SLIPS

Please order amendment slips by quoting reference number (PD . .) and not the B.S. number.

	Ref. No
B.S. 659 : 1963 Light gauge copper tubes for water, gas and sanitation. Amendment No. 2	PD 5839
*B.S. 693: 1960 General requirements for oxy-acetylene welding of mild steel. Amendment No. 1	PD 5837
B.S. 919 : — Screw gauge limits and tolerances Part 1 : 1960. Gauges for screw threads of unified form. Amendment No. 3	PD 5836
*B.S. 938 : 1962 General requirements for the metal-arc welding of structural steel tubes to B.S. 1775. Amendment No. 1	PD 5840
*B.S. 1126 : 1957 General recommendations for the gas welding of wrought aluminium and aluminium alloys. Amendment No. 1	PD 5838
B.S. 1212 : 1953 Ballvalves (Portsmouth type) excluding floats. Amendment No. 9	PD 5829
B.S. 1218 : 1946 Sluice valves for waterworks purposes. Amendment No. 7	PD 5841
B.S. 1679 : 1965 Containers for pharmaceutical dispensing. Amendment No. 1	PD 5828
B.S. 1877 : 1963 Domestic bedding excluding cellular rubber bedding. Amendment No. 3	PD 5831
B.S. 3948 : 1965 Cast iron parallel slide valves for general purposes. Amendment No. 1	PD 5843

**These amendments are of an editorial nature, consequent on the publication of the revised edition of B.S. 499 'Welding terms and Symbols'.*

NOTE: A few copies of B.S. 1125 "W.C. flushing cisterns (including flush pipes)" have been inadvertently issued with Amendment No. 6 (ref. PD 5844). This amendment is in abeyance and any copies of it should be disregarded.

NEW BRITISH STANDARD FOR X-RAY PROTECTIVE LEAD GLASS

Prepared in response to a request from users and manufacturers of diagnostic X-ray equipment, B.S. 4031: *X-ray protective lead glasses* published in July, will ensure that panels of glass supplied for the purpose will be marked with the minimum lead equivalent at a specified voltage. The new standard is also intended to ensure that guidance will be available to the user on the variation of the lead equivalent for X-rays generated at different kilovoltages.

Two types of lead glass for use as X-ray protection are specified, and a standard method is given for measuring the lead equivalent of such glasses used in installations employing X-radiations at voltages up to 300 kVp. The characteristics of typical glasses widely used in the U.K. are also given as examples. The use of the B.S.I. Certification mark scheme, with its independent assurance of quality, is recommended to ensure that only suitable glasses are used for X-ray protective use.

CUTLERY STANDARDISED

A new British Standard, which has been published recently, covers cutlery used by such public bodies as local authorities, schools, hospitals, nationalised industries, government departments, and the armed services.

B.S. 4038—*Specification for cutlery for local authorities, hospitals, and other public bodies*—gives requirements for the materials, design, manufacture and performance of table knives, bread knives, carving knives, forks and steels, and trade knives and forks. These requirements apply to any design, but there are also illustrations with detailed dimensions for a range of cutlery required by government departments. Most of these patterns are traditional, but a modern design—recently introduced for armed services married quarters—has been included. A Standard for spoons and forks is in course of preparation.

Abstract of Reports

MID-GLAMORGAN HOSPITAL MANAGEMENT COMMITTEE

The Annual Report of the Mid-Glamorgan HMC covering the period January to December 1965, was received in July this year.

Capital and Maintenance Work

The decision to build new hospitals and develop existing hospitals as District Base Hospitals has meant that minor capital works at these hospitals which are to be developed must, of necessity, be kept to a minimum as the replanning and rebuilding will need to be done on existing sites.

Difficulty in accommodating medical staff, both married and single, increases year by year. Married accommodation is already available for five doctors at Neath and five at Bridgend, but this is insufficient. Unmarried junior medical staff based on Neath General Hospital are accommodated at Tonna and Cymla Hospitals. Whilst it is fortunate that such accommodation is available, it is unsatisfactory as doctors who should be resident and quickly available on call are, in fact, sleeping more than two miles away from the hospital. They have to be called and transported to and from the hospital and this takes time.

Everything possible is being done to acquire houses in close proximity to both hospitals to accommodate both married and single doctors. There is some chance of acquiring such property in Bridgend, but, as yet, no suitable property is available at Neath. The Committee have asked all the local authorities in the area for assistance.

It was reported last year that the construction of a building of a temporary nature which would include full nurse training accommodation, a hospital reference library, and a conference room for clinical and other professional meetings, had commenced at Neath General Hospital. This building was actually completed towards the end of October 1965, and was put to use almost immediately. It was officially opened on 12th January, 1966.

A room was built alongside the Bronchoscopy Room in the Out-patient Department at the Port Talbot General Hospital, and these two rooms are now used as a waiting room and treatment room for casualties. This small Casualty Department has its own separate entrance leading to the waiting room, which includes a small office for records, and there is a communicating door to the treatment room which was formally the Bronchoscopy Room and which is no longer needed for its original purpose. This accommodation, although limited, has meant a great improvement in the facilities for the treatment of casualties.

The adaptation of one of the cubicle wards at Cefn Hirgoed Hospital was completed in March 1965, and the transfer of mothers with their babies from the Maternity Department at the Bridgend General Hospital commenced on 19th September, 1965. There was some doubt as to whether this experiment would prove successful, but all the mothers speak highly of the accommodation, and the pleasant surroundings and the peace and quiet after a busy Maternity Unit.

The building of a new mortuary at the Cymla Chest Hospital is proceeding and it is expected that this will be completed towards the middle of 1966. The present mortuary is most unsatisfactory and the new building, although small, will be a vast improvement.

Mention was also made in last year's Report of the endeavours to provide a large Day Room for male and female patients at the Maesteg General Hospital. The total cost of the building and furnishing approximates £4,500. The work was completed and the Day Room was officially opened on 8th December, 1965. The new building is in stonework to match existing buildings. It is a large room which it has been possible to site conveniently for both the male and female wards. It has ample accommodation for all the ambulant patients.

Urgent Future Developments

Unfortunately, little progress can be reported with regard to the hospital development in the Mid-Glamorgan area as envisaged in the Ministry of Health's Ten Year Plan, and it is very obvious that very little, if any, will be completed by the end of that proposed period.

The project team responsible for the proposed new Maternity Department and Premature Baby Unit at Neath General Hospital has been, and is still working on this scheme. The layout of the buildings has been agreed and the stage has now been reached when drawings are in preparation showing the major items of equipment in each room in position. It is envisaged that a final costing of the scheme will be prepared towards the middle of 1966 and this will then have to be submitted to the Ministry. It is only after Ministry approval of this final costing has been obtained that working drawings can be prepared.

It is also hoped at that stage to proceed with the necessary alterations to the main kitchen to cope with the additional number of patients to be fed, the temporary enlargement of the Pathology Department, the provision of a building for non-resident staff changing accommodation and the building of a small bungalow to release accommodation in the Nurses Home which is urgently required for resident nursing staff.

The amount of work being done at both the main hospitals still shows a remarkable increase and this in turn brings demand from all sources for an increase in accommodation. At the Neath General Hospital this is particularly so insofar as out-patient and casualty accommodation is concerned. The needs of the Pathology Department are also very evident and it is becoming more and more obvious that the turnover of work within the present building cannot be much further increased without additional space. The demand for beds in the main hospital is also increasing. The one female surgical ward of 26 beds is quite inadequate to cope with all female surgical patients, including general surgical and traumatic and orthopaedic cases.

On the other hand, it is obvious that the rebuilding of the hospital cannot be carried out piecemeal, and that each phase of rebuilding can only consist of a limited number of wards or departments. The two theatres are quite insufficient to cope with the needs of a hospital of this type and the demands of the area, and at least three if

not four additional theatres are required. The planning of the phases will have to be done very carefully as theatres without beds or beds without theatres will be of little use.

At the Bridgend General Hospital the limitations of the Theatres, the X-ray Department and the Pathology Department are also very obvious, and these limitations may well decide, very shortly, the extent of the work which can be done within the hospital as a whole.

Serious difficulties which already exist, will increase owing to shortage of Consultant suites in the Out-patient Departments, shortage of theatre accommodation, too few X-ray diagnostic rooms and an acute shortage of accommodation in Pathology Departments, to mention only some of the most important. It has already been reported that the X-ray work in the area has been carried out by two Consultant Radiologists over the last fourteen years. The increase in the work in these Departments has been phenomenal and it is extremely doubtful whether any more appointments of Consultants can be made unless both X-ray Departments are enlarged and the number of Radiologists increased.

The rebuilding of both these major hospitals is bound to present administrative difficulties. It may well be possible to construct a large building on the site of the Neath General Hospital, in addition to the proposed new maternity unit, without interfering with the present buildings. But even here, a point will be reached when decanting of patients and some Departments may well have to be done in order to complete the hospital.

At the Bridgend Hospital the position is likely to be much more difficult. It may well be possible to build a small additional new section, such as an acute psychiatric/geriatric unit, and to enlarge the out-patient accommodation, without interfering with existing buildings. No further new buildings, however, can then be erected without demolishing part of the existing hospital. This has been commented upon in previous Reports and serious thought will have to be given to the use of the small hospitals in the neighbourhood and to the provision of some temporary accommodation, either within the curtilage of Bridgend General Hospital or nearby, such as at Cefn Hirgoed Hospital, for a limited period whilst demolition and new building is being carried out. These temporary buildings could be used for a considerable period at Bridgend and could then be dismantled and used elsewhere—perhaps at Neath. There does not seem to be any other way to rebuild the hospitals and it must be accepted that the Service must be maintained at as high a level as possible during the rebuilding period. It had been hoped that it would have been possible to commence the building of an X-ray Department in a prefabricated type of building at Bridgend General Hospital during the year 1965. Schedules of accommodation and a preliminary sketch drawing had been prepared and a site chosen which would not interfere with rebuilding, so that the temporary building could remain until a new permanent X-ray Department was provided. Unfortunately, however, the necessary money has not been available. This, however, must be one of the preliminary steps which will have to be taken in connection with the rebuilding of this hospital.

There are still several comparatively minor capital works which will have to be tackled in addition to the ones already detailed. These include new boilerhouses at Maesteg General, Cymla Chest and Cefn Hirgoed Hospitals and smaller items, such as visitors' toilets, at Tonna Children's Hospital and Cefn Hirgoed Hospital. All these hospitals will continue to function after the implementation of the Ten Year programme and items such as those already mentioned are essential in order to make them satisfactory working units.

THE NATIONAL INDUSTRIAL FUEL EFFICIENCY SERVICE FUEL OIL FIRING COURSE

NIFES' Fuel Oil Firing Course covers many aspects of the utilisation and application of fuel oil. It includes lectures and demonstrations given by NIFES' engineers and guest speakers from the oil companies and fuel distributors.

The instruction covers the use of all fuel oils for industrial and commercial purposes. The firing of boilers, furnaces, kilns and driers with oil, oil storage, atomisation, burner controls and combustion principles, are all dealt with during the course, which is designed to meet the needs of industrial plant engineers, heating engineers and supervisory staff responsible for oil-fired installations. It is also useful for representatives of firms about to install oil-fired equipment.

The three-day course is held at Reading, Berkshire; the fee is 12 guineas, exclusive of hotel accommodation. Further details and application forms can be obtained from NIFES, 71, Grosvenor Street, London, W.1 (telephone: HYDe Park 9706).

Dates of Future Industrial Courses

18th-20th October, 1966.

13th-15th December, 1966.

17th-19th January, 1967.

14th-16th February, 1967.

11th-13th April, 1967.

9th-11th May, 1967.

Continued from page 134

Mr. Dryden then referred to Mr. Derek Ayres, the new Regional Engineer, whom he was delighted to see.

He then went on to refer to the impending retirement of Mr. Aubrey Jones, Engineer for the Portsmouth Group, who had given very long service indeed to the country's hospitals.

Although he and Mr. Jones had not always agreed—as his wife had said, they were individualists—they had got one thing in common, that was the theory that a double scotch solved all problems!

"I would like to take this opportunity on your behalf, members of the Institution of Hospital Engineers, to say to Mr. Jones how much we have appreciated all he has done for the Hospital Service, and to wish him and his charming lady sitting next to me a very long and happy retirement".

On behalf of the guests Mr. Dryden added: "Thank you for a most enjoyable evening. It has been marvellous."

Notes for Members

THE 23rd ANNUAL DINNER

We give here a brief summary of the speeches at the Annual Dinner which was held during the 1966 Conference at The Guildhall, Portsmouth.

The Institution of Hospital Engineers is to be granted Incorporation by the Board of Trade. Giving this news at the 23rd Annual Dinner of the Institution at Portsmouth Guildhall on 3rd June, 1966, Mr. H. A. Sandford, the President, said:

"I think it is fair to say that during the 23 years since this Institution was founded it has gone a very long way.

"I believe I am not letting too much of a secret out of the bag when I tell you that today we have had information from the Board of Trade that the Institution has been granted Incorporation."

Midst applause he added: "There are some formalities to be cleared up, so we are not really in a position to tell you more about it."

The first toast of the evening, "The Lord Mayor and Corporation of the City of Portsmouth", was proposed by Mr. H. A. Adams, Chairman of the Institution of Hospital Engineers.

He referred to Portsmouth's very long Naval history as one of the Royal Navy's home ports, going back to the days when sailors wore pigtails and King Alfred launched his first Fleet in Portsmouth to fight many battles in the Channel and at Spithead.

Mr. Adams spoke of Portsmouth and Southsea's fortune in having wide open spaces along the sea front, the beautifully laid out gardens, the four miles of beaches and other attractions.

In referring to some of the accomplishments of the Lord Mayor, Mr. Adams mentioned that he had made with his own hands some beautiful pieces of furniture from bits of flotsam cast up by the sea. There was, for instance, the plant holder stand in his sitting room window made from a mahogany table top washed up on the shore.

The Lord Mayor was also understood to be a lover of machinery, one of his hobbies being its repair.

"Sir, I would suggest you would make an excellent Hospital Engineer", observed Mr. Adams midst laughter.

The Lady Mayoress, he said, had for many years interested herself in the Girl Guides movement, and with the Lord Mayor had started the Old Friends of Portsmouth. Among their many achievements was the levelling and planting of the Cathedral Green.

"My Lord Mayor, I cannot sit down without expressing our thanks for the wonderful welcome and hospitality you and the Corporation of this City have extended to us, and for the very valuable time which you and your good lady have spent with us. We do appreciate this", Mr. Adams said.

Replying to the toast, the Lord Mayor of Portsmouth, Councillor Clifford A. Worley, J.P., thanked Mr. Adams for his kind remarks, and recalled how "two long days ago" he had promised members wonderful weather for their stay in Portsmouth.

"When I look at your sunburned faces I take credit for every one of them because if you had not delayed your visit here for 23 years you would still have pallid faces like you have when you meet in London", said the Lord Mayor.

He had lived in Portsmouth all his life and he recalled how, as a boy, he had been taken out to the *Victory* when she was afloat in the harbour. Later, with his schoolboy cap, he used to go into the dockyard. If he was asked why, he would say he wanted to see *Victory*. Once past the policeman the dockyard was wide open to him and he wandered around wherever he liked.

In these days the Lord Mayor said he knew more about the dockyard than perhaps many who entered its gates to see the *Victory*, and who just saw that part of the dockyard.

"It was nice of you, Mr. Adams, to suggest that I might have had another calling—that of a Hospital Engineer" the Mayor continued. "I agree that task would have suited me very well."

One often read in newspapers notices by people who had recovered after a long illness thanking the nurses for their wonderful attention. Rightly so, but it was a pity they did not also thank the engineer who provided the hot water when they turned on the tap.

"People don't realise, of course, the amount of work which goes on in a hospital with your organising ability behind the scene: the boilers which have to be maintained, the equipment, the floor covering and carpets which have to be kept right, and ceilings prevented from falling down. It all comes under your care in one way or other and I do think it would be nice if you had a little more thanks sometimes. The nurses seem to get it all."

The Lord Mayor concluded by thanking Mr. Adams for proposing the toast, and thanking those present for the way in which they had received it.

Mr. Derek Ayres then proposed the toast to "The Institution of Hospital Engineers". While carrying out some research, he said, he found that the Institution was formed some 23 years ago by a group of engineers in Cardiff—"you know, the place where Shirley Bassey comes from!"

These gentlemen held their first annual meeting abroad in Nottingham and from this modest beginning formed the movement as we knew it today, with members in Africa, Australia and all over the world.

"Your activities are to be commended, especially in the process of training engineers and therefore in conjunction with the Ministry of Health at Keele University. These have a strong bias to management, and I think rightly so", said Mr. Ayres.

On the subject of maintenance the engineer had a varied task, keeping in order very complex medical equipment down to the humble hospital bed.

After Mr. H. A. Sandford, the President, had, in his reply to the toast, given the Board of Trade's news, he mentioned that among those attending the Conference had been people from Scotland, Northern Ireland and Wales in quite large numbers. The Institution had managed to spread itself fairly well over the British Isles. As Mr. Ayes had rightly said, they had members scattered all over the world.

Mr. Sandford concluded: "It is getting along very well but it is the good wishes of so many people who have kindly entertained us here and in other places that have helped. I would thank you Mr. Ayres for your very good, kind thoughts on behalf of the Institution."

The toast to "Our Guests" was proposed by Mr. William Hendry, J.P., Chairman of the Southern Branch, who referred to the top table guests.

"We are pleased, Mr. President, to see that you are well supported on this day. We do congratulate you on that", he said.

In welcoming the Lord Mayor and Lady Mayoress, Mr. Hendry mentioned that the Lady Mayoress went to London the previous day and said prayers in the Abbey for the Institution. "We are most grateful for that", he said.

Also welcomed was Mr. McCaw, chairman of St. James's. "We are delighted to have Mr. McCaw here because he is a chartered accountant", said Mr. Hendry. "At St. James's Hospital, of course, he is tops as far as finance is concerned. Not only that, he is a wonderful shot. He is going to Bisley next week and he will bring back cups that big because he has already got them. We do thank you very much for supporting us this evening."

Mr. Hendry expressed regret that Ald. Asquith-Leeson was unable to be present. He is Chairman of the Portsmouth Group and Vice-Chairman of the Board, and he had asked for his apologies to be conveyed to those present.

One very important guest was from the Ministry of Health, Mr. D. A. Hughes, Chief Engineer.

"I had not forgotten Mr. Hughes, but brought him a little further down the scale because I consider him one of us. He is an Honorary Member of the Institution, so I still have to welcome you, Sir, as one of our honoured guests and we are delighted to have you and your good lady", Mr. Hendry said.

Mr. Hendry went on to welcome Mr. and Mrs. Ayres. Mr. Ayres was the new Regional Engineer.

Last but not least among the important guests was Mr. Dryden, of the Portsmouth Group, who would respond to this toast. Mr. Hendry in welcoming his presence thanked him for all his help while the Institution was visiting Portsmouth.

Mr. K. G. Dryden, Group Secretary, Portsmouth Group H.M.C., in replying to the toast, said how very much they had enjoyed being present.

Mr. Dryden continued: "I would like to take this opportunity of paying tribute to hospital engineers. As an administrator in a hospital I have a lot to do with you and have little opportunity to say what we owe to you. I am just going to take this opportunity.

"We all know that the Hospital Service today is developing rapidly indeed. There are new buildings going up all over the place. Everybody criticises Mr. Robinson because the programme is not quick enough but we Administrators and you engineers know that we can only go a certain speed."

He recalled that after the last war only six hospitals had been put out of action in this country by enemy bombing. Those hospitals went out of action because the engineering services and boiler houses had been bombed, otherwise the hospitals could have carried on. This was an example of the importance of the engineering services.

Continued on page 132

Continued from page A.11

ENGINEER
MINISTRY OF HEALTH

Post in the X-ray Section of the Scientific and Technical Services Branch based in London for man or woman aged about 35. Some travelling involved.

DUTIES include: leading a small team providing advice on the suitability of X-ray and allied equipment; assisting in the critical evaluation of new types of equipment; investigating faults or failures; preparing specifications for X-ray and allied diagnostic and therapeutic equipment, film processing units, X-ray film and accessories.

QUALIFICATIONS: Corporate membership of I.E.E., I.Mech.E. or I.E.R.E. Candidates elected by 31st December, 1966, also considered. Engineering or Physics degree or equivalent an advantage. A recognised engineering apprenticeship or equivalent practical training, together with wide experience and sound knowledge of medical X-ray equipment, particularly of design and performance in relation to hospital requirements, essential.

SALARY (Inner London): £1,747–£2,312; starting salary may be above minimum. Non-contributory pension; local government service may be aggregated with civil service for pension purposes.

WRITE to Civil Service Commission, Savile Row, London, W.1 for application form, quoting S/6472/66. Closing date extended to 12th October, 1966. Candidates who have already applied need not do so again.

SWINDON AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE

PRINCESS MARGARET HOSPITAL

Applications are invited for the post of Assistant Engineer to assist the Hospital Engineer in the management of all engineering services, and to be responsible for the operation of the Planned Maintenance system. Candidates must have completed an apprenticeship in electrical engineering, or have otherwise acquired a thorough practical training as appropriate to the duties and responsibilities of the post and must hold the Ordinary National Certificate in Electrical Engineering. Applicants will be given every encouragement to obtain the Higher National Certificate and endorsements for promotion within the Health Service. Salary scale £834 - £31(8) –£1,082. A commencing salary of up to £896 p.a. may be awarded in respect of relevant experience since the completion of practical training. Applications stating age, *qualifications and experience, together with* names of three referees, including one technical, to be sent to the Group Secretary, Princess Margaret Hospital, Swindon, by 4th October, 1966.

BRIGHTON & LEWES HOSPITAL MANAGEMENT COMMITTEE

GROUP ENGINEER required on retirement of present holder in March, 1967.

Present salary scale based on pointage of 88 (£1,730 to £2,060 p.a.) *with special responsibility allowance of £175 p.a.* A *house* can be made available for the successful candidate if required.

The first phase of a new district hospital is in course of construction.

The person appointed

(i) will be responsible for the satisfactory operation, maintenance and co-ordination of all engineering services in the Group;

(ii) may have responsibility for (a) the design and execution of minor new engineering capital works and (b) assisting in the site supervision of engineering capital works.

Applicants must

(1) have completed an apprenticeship in mechanical or electrical engineering or otherwise have acquired a thorough practical training appropriate to the duties and responsibilities of the post and have had wide experience in the management of mechanical and electrical engineering plant, the control of staff, the preparation of maintenance estimates and reports and the carrying out of engineering renewal or constructional works.

(2) *hold one* of the following qualifications or an equivalent approved by the Minister of Health:

(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, if this was not taken as a subject of the course; or

(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, 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.

Applications, giving full details of age, qualifications, present post and previous experience, together with the names and addresses of two referees, should be sent to the Group Secretary, Brighton and Lewes Hospital Management Committee, Royal Sussex County Hospital, Eastern Road, Brighton, 7, Sussex, by 31st October, 1966.

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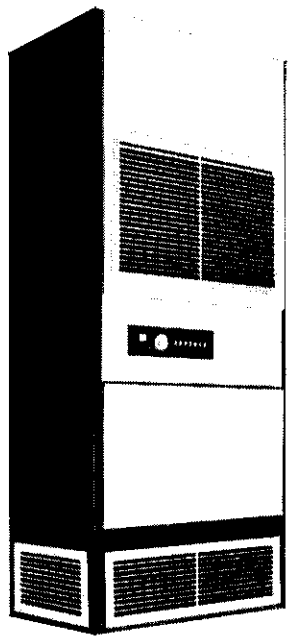

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SITUATIONS VACANT

ST. CRISPIN HOSPITAL MANAGEMENT COMMITTEE

Applications are invited for the post of GROUP ENGINEER to be responsible for the satisfactory operation, maintenance and co-ordination of the Engineering Services, both Mechanical and Electrical, of a psychiatric hospital of 1,000 beds. Applicants must have completed an apprenticeship in General Mechanical Engineering or equivalent and be fully experienced in the maintenance and efficient operation of Major Central Boiler Plants, Ancillary and Laundry Equipment, and in the keeping of records needed for the control of Engineering Staff, Plant, Services and equipment. He must also hold one of the following qualifications or an equivalent qualification approved by the Ministry of Health:—

(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, if this was not taken as a subject of the course; or

(ii) Higher National Certificate or Higher National Diploma in Electrical Engineering with endorsement in Industrial Organisation and Management and including (at S.III or O.2 level, or with endorsement in) Applied Heat and Applied Mechanics, provided he has suitable practical experience in mechanical engineering.

Salary £1,343—£1,560.

A house is available on the hospital estate. The terms and conditions of service are governed by the Whitley Councils for the Health Service and the salary is based on a bed or pointage basis. The first phase of a new hospital for the Mentally Subnormal of 450 beds is to be built in the near future and will be within the control of this appointment.

Applications, with full particulars, together with the names and addresses of three referees, should be sent to the Group Secretary, St. Crispin Hospital, Duston, Northampton, by 5th October, 1966.

ASSISTANT ENGINEER
required at
BRIDGEND GENERAL HOSPITAL
Quarella Road, Bridgend, Glam.
(408 beds)

This appointment covers the full range of mechanical and electrical engineering duties and responsibility under the supervision of the Group Engineer and Hospital Engineer for the maintenance of services at Bridgend General Hospital and nine other hospitals in the Mid-Glamorgan area. Applicants must be in possession of an Ordinary National Certificate in Engineering or an equivalent qualification approved by the Ministry of Health. Salary on scale £834 to £1,082 per annum and, if the successful applicant is in possession of appropriate qualifications and experience since completion of his practical training, the Committee have discretion to grant up to two increments above the minimum salary. Application forms may be obtained from the Group Secretary, Mid-Glamorgan Hospital Management Committee, Garthmor, Old Road, Neath.

BOARD OF MANAGEMENT FOR CENTRAL LANARKSHIRE HOSPITALS

APPOINTMENT OF GROUP ENGINEER

Applications are invited for the post of GROUP ENGINEER based at Hartwood Hospital, Shotts, who will be responsible to the Board of Management for the satisfactory operation, maintenance and co-ordination of all the engineering services and activities in the Group which consists of four hospitals with a total beddage of 2,448. Candidates must have acquired a thorough practical training in mechanical or electrical engineering, whether by apprenticeship or otherwise; have wide experience in the management of modern mechanical and electrical plant, in the control and deployment of maintenance and operational staff and in the preparation of estimates and reports for maintenance and minor new construction work; and hold one of the following qualifications or an equivalent qualification approved by the Secretary of State for Scotland:—

(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, if this was not taken as a subject of the course; or

(ii) Higher National Certificate or Higher National Diploma in Electrical Engineering with endorsements in Industrial Organisation and Management and including (at S.III or O.2 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.

Salary scale (48½/60 points) £1,566 per annum by five annual increments to £1,854 per annum with, in addition, a special responsibility allowance of £50 per annum.

Applications, giving details of age, experience and qualifications, with names of three referees, to the Secretary and Treasurer, Board Office, Hartwood, Shotts, Lanarkshire.

ASSISTANT ENGINEERS required. Salary on scale £834—£1,082 plus £75 London Weighting. Applicants must have completed an apprenticeship or acquired sound practical training in mech. engineering. Apply giving age, qualifications, experience and two references to Group Engineer, University College Hospital, Gower Street, W.C.1.

READING AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE

HOSPITAL ENGINEER

Applications are invited for the post of Hospital Engineer at Battle Hospital, Reading. To be responsible to the Group Engineer for the operation and maintenance of engineering services at the Hospital where major development is proceeding.

It is desirable that applicants should possess H.N.C. or H.N.D. in either Mechanical or Electrical Engineering with appropriate endorsements, or City and Guilds Mechanical Engineering Technicians Full Technological Certificate (Part III). Applications would also be considered from those holding the City and Guilds Mechanical Engineering Technicians Certificate (Part II) which must include Plant Maintenance and Works Service, or the Ministry of Transport First Class Certificate of Competency. Candidates must have completed an Apprenticeship in Mechanical or Electrical Engineering or have otherwise acquired a thorough practical training.

Salary Scale: £1,107—£1,287.

Application forms and further particulars from Group Secretary, Reading & District Hospital Management Committee, 3, Craven Road, Reading.

ASSISTANT ENGINEER required (Resident, Hospital flat for rental) at St. Chad's Hospital, Birmingham, 16. Candidates must have completed an apprenticeship in Mechanical or Electrical Engineering or have otherwise acquired a thorough practical training as appropriate to the duties and responsibilities of the post and must hold an Ordinary National Certificate in Engineering or an approved equivalent qualification. Modern up-to-date plant. Planned Maintenance in operation. Arrangements made for further study and training. Salary scale £834 to £1,082: suitable candidate may start at £896 per annum. Removal expenses may be paid within the existing regulations. Detailed applications naming three referees to Group Engineer, Dudley Road Hospital, Birmingham 18 (from whom further details may be obtained) within 14 days.

TECHNICAL SUPERINTENDENT (HOSPITAL INSTALLATIONS)

Required by GOVERNMENT of HONG KONG Public Works Department on contract for one tour of three years. Salary according to experience in scale rising to £2,692 10s. a year. Free passages. Liberal leave on full salary.

Candidates, preferably not under 35, must possess either (1) B.O.T. First Class Certificate of Competency in Marine Engineering or (2) City and Guilds Mechanical Engineering Technicians Full Technological Certificate which must include Plant Maintenance and Work Service or (3) Higher National Certificate or Higher National Diploma in Mechanical Engineering with appropriate endorsements, or equivalent. They must possess considerable experience in Mechanical Engineering with background experience of electrical installations and heating and ventilating engineering. Previous experience in hospital equipment maintenance and services an advantage.

Apply to CROWN AGENTS, M. Dept., 4 Millbank, London, S.W.1 for application form and further particulars, stating name, age, brief details of qualifications and experience and quoting reference M2M/63193/HR.

LONDON BOROUGH OF HARINGEY

MAINTENANCE ENGINEER

Misc. Grade VIII. £1,095 rising to maximum of £1,225.

The Maintenance Engineer will be directly responsible to the Deputy Baths General Manager for the whole of the engineering services located in 10 public baths and laundry establishments and three school swimming pools. He will supervise a staff of Fitters and Instrument Mechanics.

Application forms obtainable from the under-signed, to whom they must be returned within 14 days.

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Baths General Manager.

Central Baths, The Green,
Tottenham, N.15.

DONCASTER HOSPITAL MANAGEMENT COMMITTEE

DONCASTER ROYAL INFIRMARY

HOSPITAL ENGINEER

Applications are invited for the post of HOSPITAL ENGINEER at the Doncaster Royal Infirmary. Applicants must have a thorough knowledge of Economic Steam Boilers, their operation, steam distribution, a wide experience of Mechanical and Electrical plant and equipment also full knowledge of its maintenance on a Planned Basis, and should possess one of the following qualifications or an equivalent qualification approved by the Minister of Health:—

(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, if this was not taken as a subject of the course; or

(ii) Higher National Certificate or Higher National Diploma in Electrical Engineering with endorsements in Industrial Organisation and Management and including (at S111 or O2 level, or with endorsement in) Applied Heat and Applied Mechanics, provided he has the necessary practical experience in Mechanical Engineering.

Salary scale is currently under review but is expected to be on 24½ points or over scale, i.e. £1,154 per annum rising through five annual increments to £1,339 per annum plus £75 per annum current Unit Allowance rising to £100 per annum.

The Infirmary is under intensive development, which will continue for the next three years. The post is interesting and requires the successful applicant to be of a high technical administration and managerial calibre. The person appointed shall be directly responsible to the Group Engineer for all engineering activity at the hospital.

Applications stating age, full details of experience, qualifications and the names and addresses of two referees to the Group Engineer, St. Catherine's Hospital, Tickhill Road, Doncaster, Yorks, not later than 5th October, 1966.

EDINBURGH SOUTHERN HOSPITALS BOARD

APPOINTMENT OF HOSPITAL ENGINEER

Applications are invited for the post of HOSPITAL ENGINEER at Liberton Hospital, Lasswade Road, Edinburgh (being extended to 244 beds) with responsibility also for Bruntsfield Hospital, 1a Whitehouse Loan, Edinburgh.

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

(1) City and Guilds Mechanical Engineering Technicians Certificate (Part II) which must include Plant Maintenance and Works Services; or

(2) City and Guilds Certificate in Plant Engineering; or

(3) Ministry of Transport First Class Certificate of Competency if it includes an Ordinary National Diploma or Ordinary National Certificate.

Salary scale is in the range of up to 24 points £1,082, rising by annual increments to £1,262, with an additional responsibility allowance of £25 p.a. National Health Service Whitley Council Conditions.

Applications, giving age, qualifications, details of previous experience and the names and addresses of three referees, should be sent immediately to: Secretary and Treasurer, Edinburgh Southern Hospitals Board, 61 Grange Loan, Edinburgh, 9.

MID-SUSSEX HOSPITAL MANAGEMENT COMMITTEE

CHAILEY HERITAGE (CRAFT SCHOOL AND HOSPITAL) NORTH CHAILEY, SUSSEX

HOSPITAL ENGINEER

Suitably qualified engineer required having sound practical engineering knowledge and supervisory experience at this children's orthopaedic hospital. Responsible to the Group Engineer for maintenance of all engineering services. Knowledge of building fabric maintenance also necessary.

Salary £1,082 x 36 (5)—£1,262.

Detached modernised house in delightful surroundings available at nominal rental.

Application form and detailed information of the post obtainable from the Hospital Secretary.

Completed application forms should be returned immediately

PEWSEY HOSPITAL MANAGEMENT COMMITTEE

APPOINTMENT OF GROUP ENGINEER

Applications are invited for the post of Group Engineer. Salary scale £1,401 rising by five increments to a maximum of £1,643 per annum, with a special responsibility allowance of £75 per annum.

The person appointed will be responsible for the engineering services of the six hospitals of the Group.

Applicants should

(1) have completed an apprenticeship in mechanical or electrical engineering, or have otherwise acquired a thorough practical training and have wide experience as appropriate to the duties and responsibilities of the post.

(2) hold one of the higher qualifications stipulated by the Minister of Health.

Consideration will also be given to applications from persons not possessing the full stipulated qualifications. Should such a person be selected, his appointment would be subject to the approval of the Ministry of Health and the salary scale abated appropriately.

Applications, giving details of age, training, qualifications, experience and the names of two referees, to be addressed to the Secretary, Pewsey Hospital, Pewsey, Wilts (not later than 14th October, 1966.)

SOUTH WEST WALES HOSPITAL MANAGEMENT COMMITTEE

Applications are invited for the post of HOSPITAL ENGINEER at St David's Hospital, Carmarthen. The person appointed will be directly responsible to the Group Engineer for the engineering services of the Hospital. Preference will be given to applicants who possess a Higher National Certificate or Diploma in either Mechanical and/or electrical engineering with appropriate endorsements, or an equivalent qualification approved by the Minister of Health. Salary scale £1,154 to £1,339 per annum plus a responsibility allowance. Consideration will also be given to the appointment on an abated scale of persons without the stipulated qualifications, this abatement being £200 p.a. at each point of the above salary scale. Whitley Council Conditions of Service and National Health Service Superannuation Scheme.

A three bedroomed house is available. Application forms from the Group Secretary, South West Wales Hospital Management Committee, Glangwili, Carmarthen, to be returned by the 7th October, 1966.

Continued on page 134

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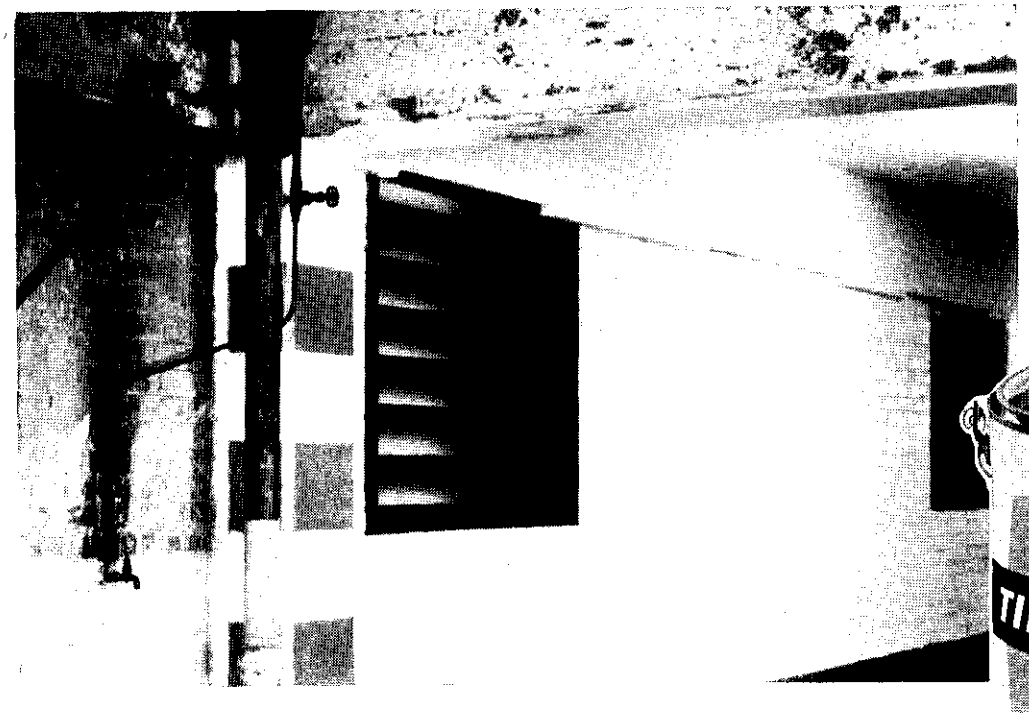

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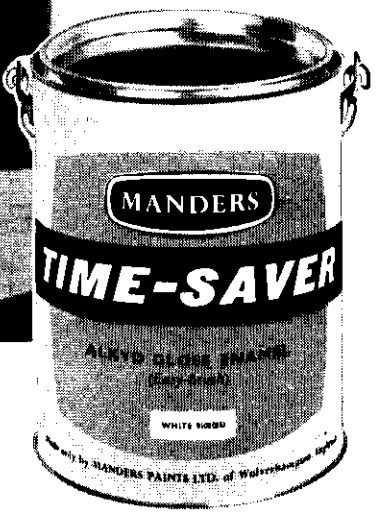

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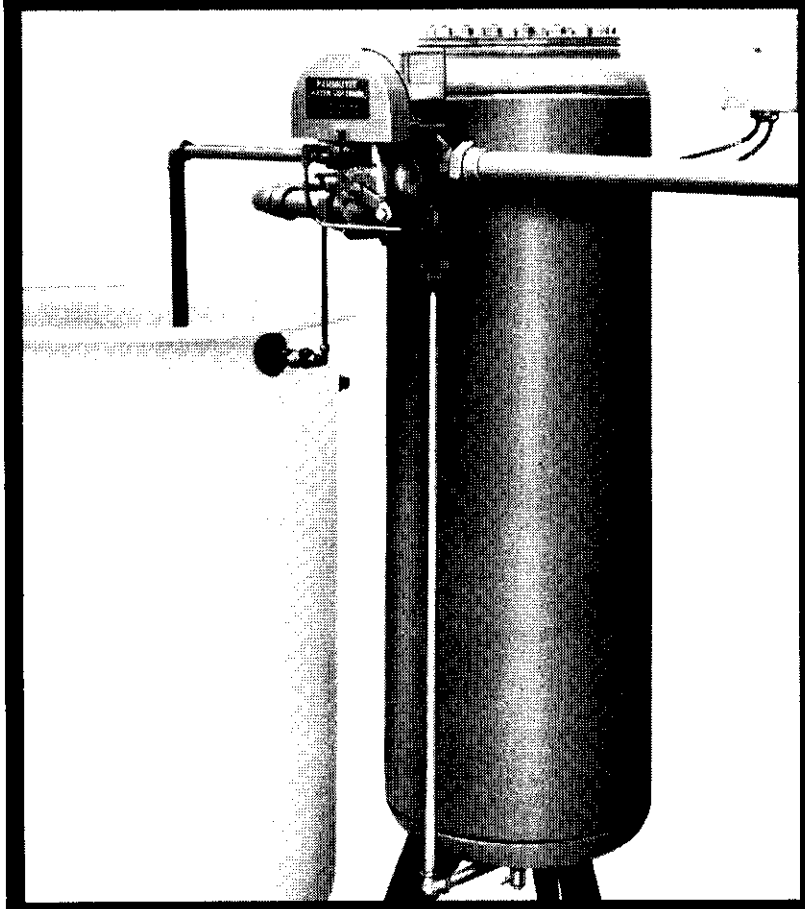

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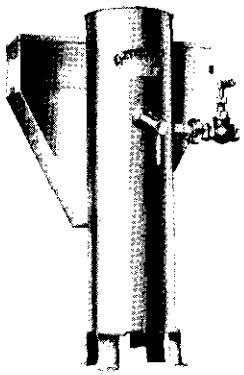

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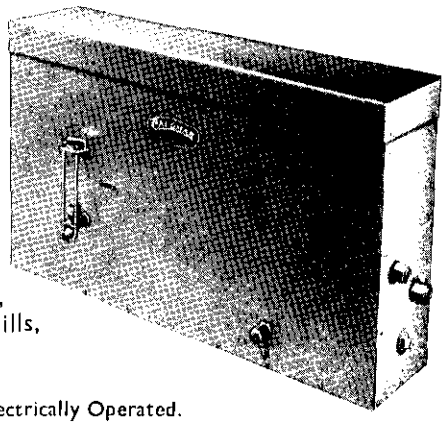

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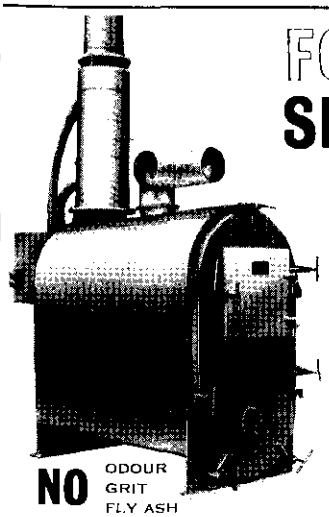

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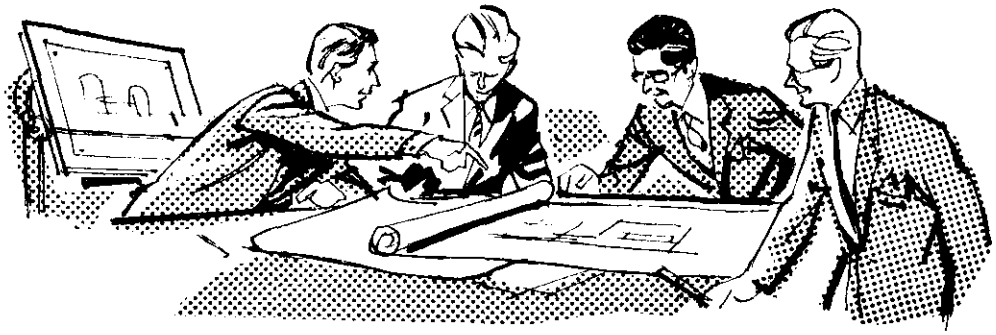

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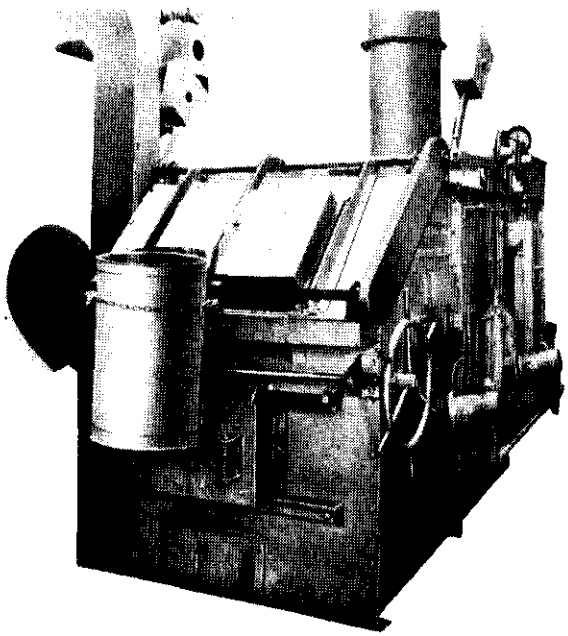

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