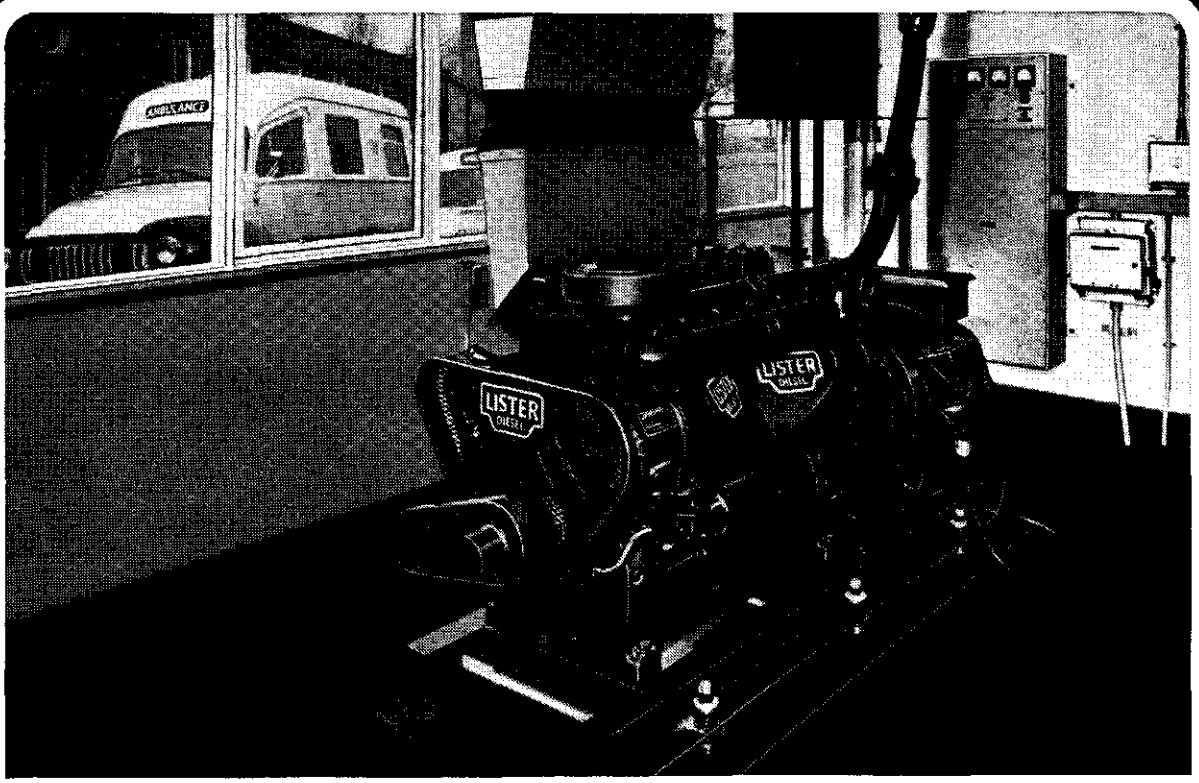
THE HOSPITAL ENGINEER

THE JOURNAL OF THE INSTITUTE OF HOSPITAL ENGINEERING

VOL XXIII No 1
JANUARY 1969

FIVE SHILLINGS



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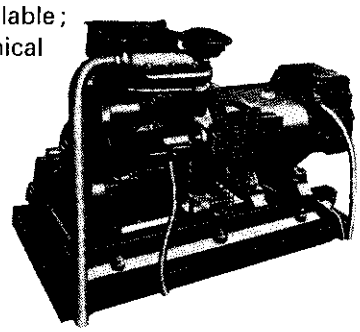

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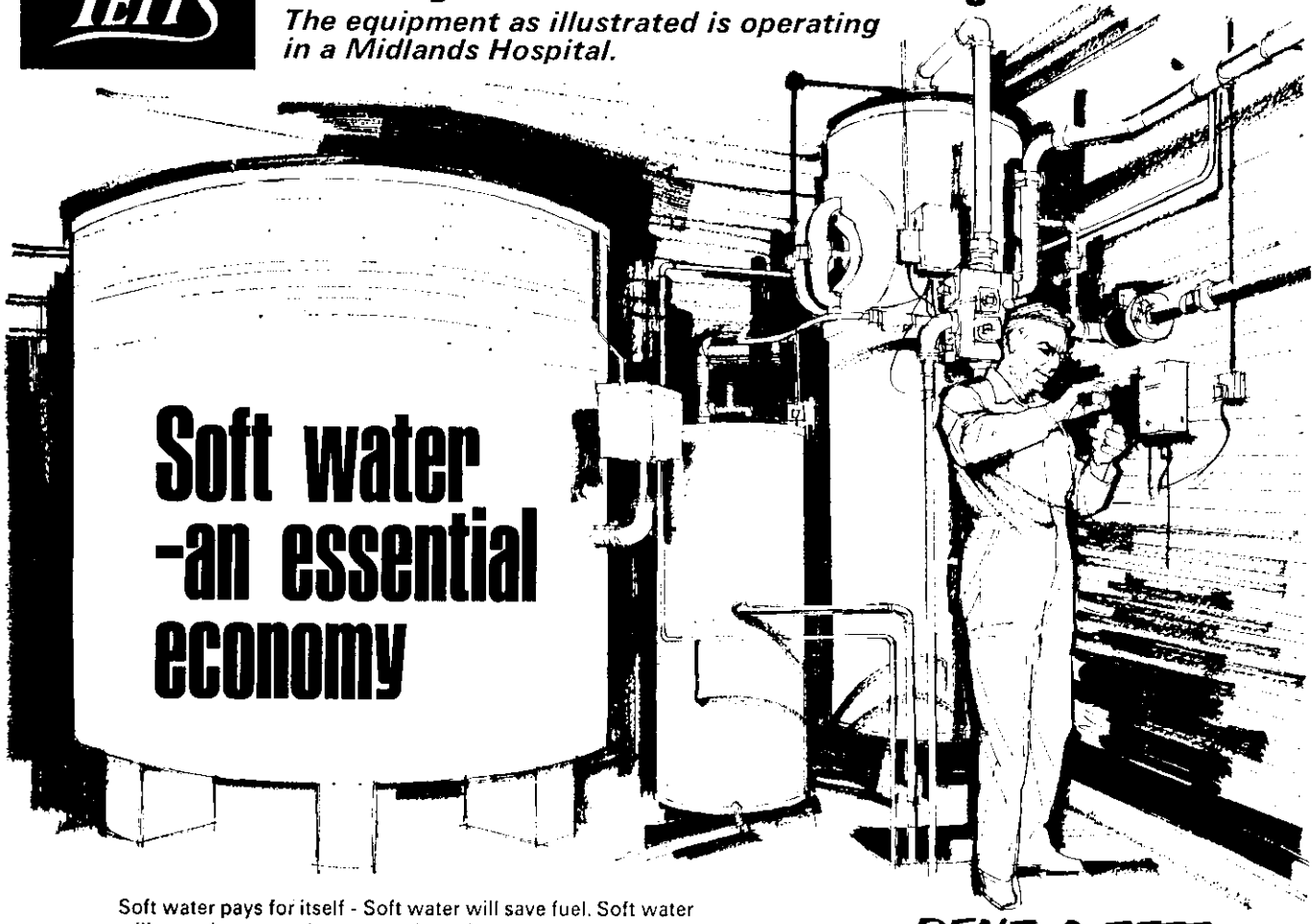

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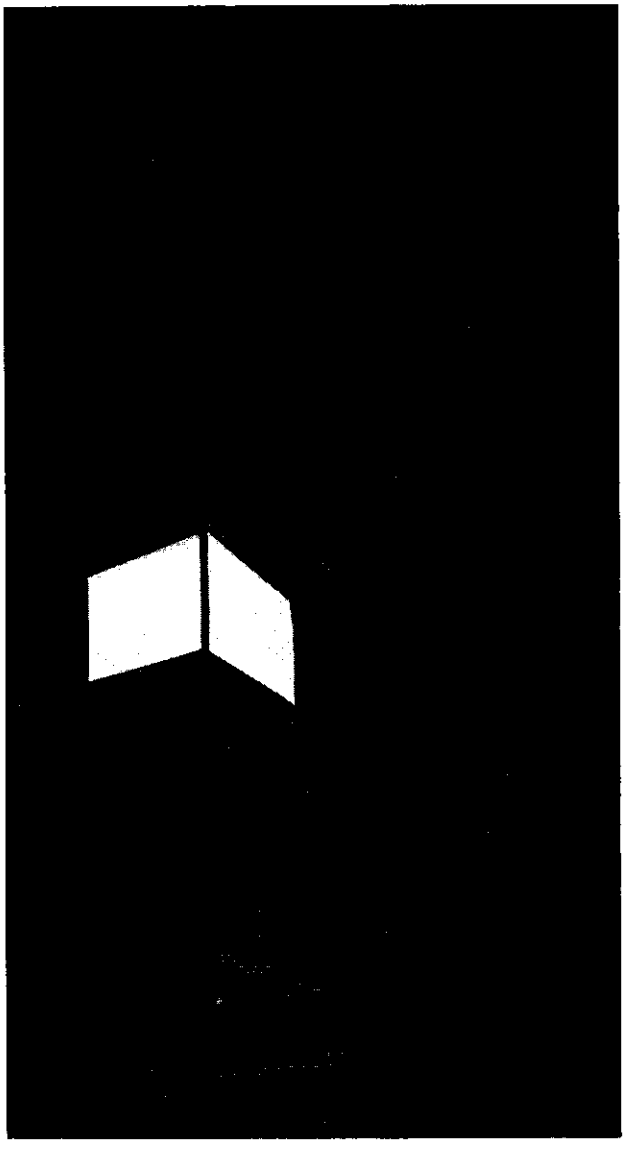

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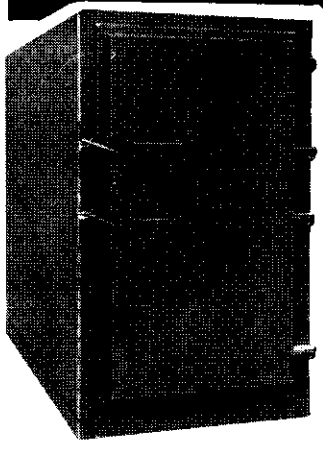

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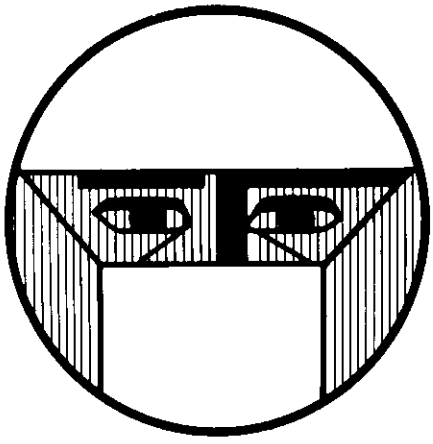
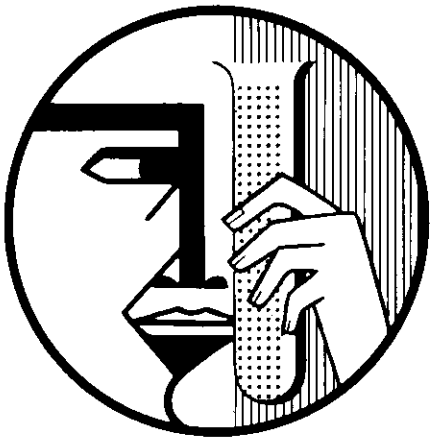
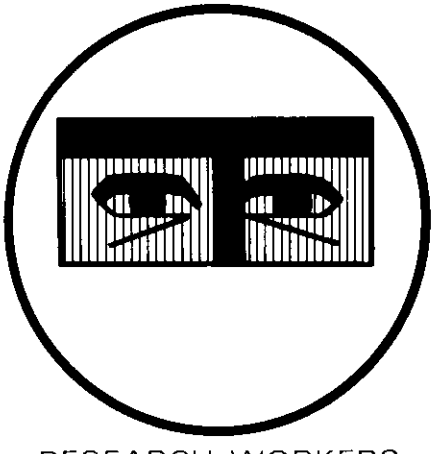


HOSPITALS



OIL REFINERIES



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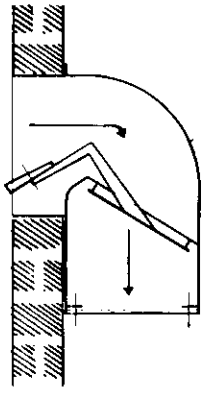

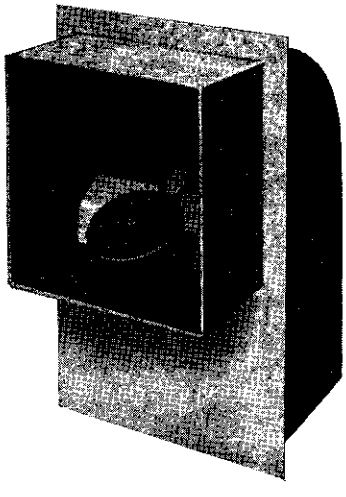

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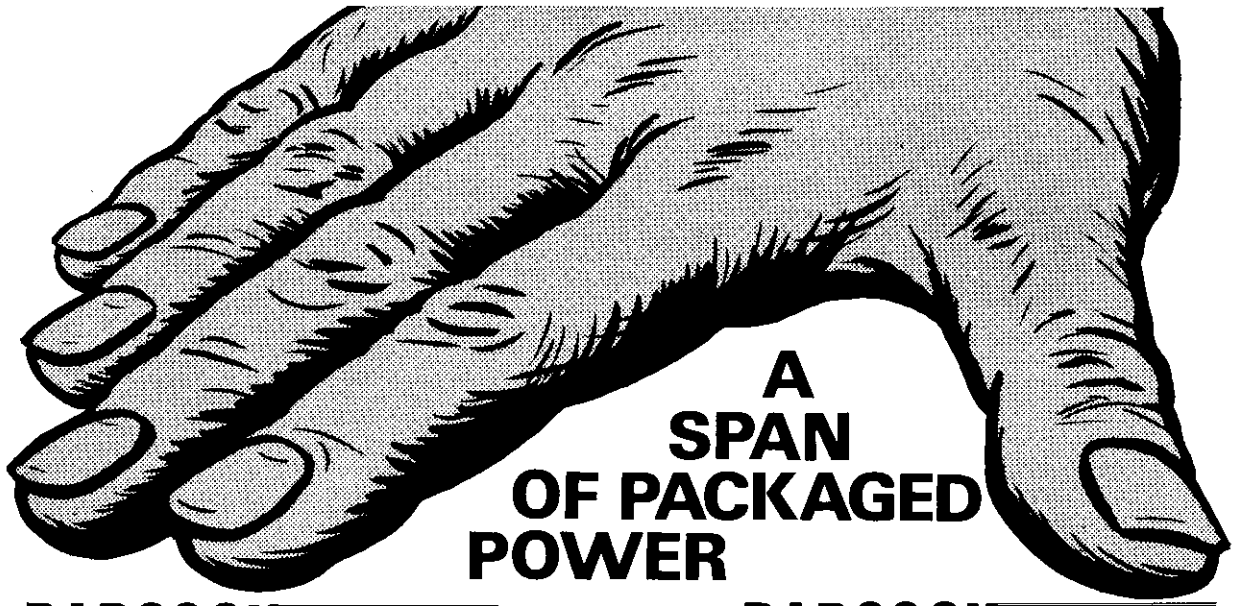

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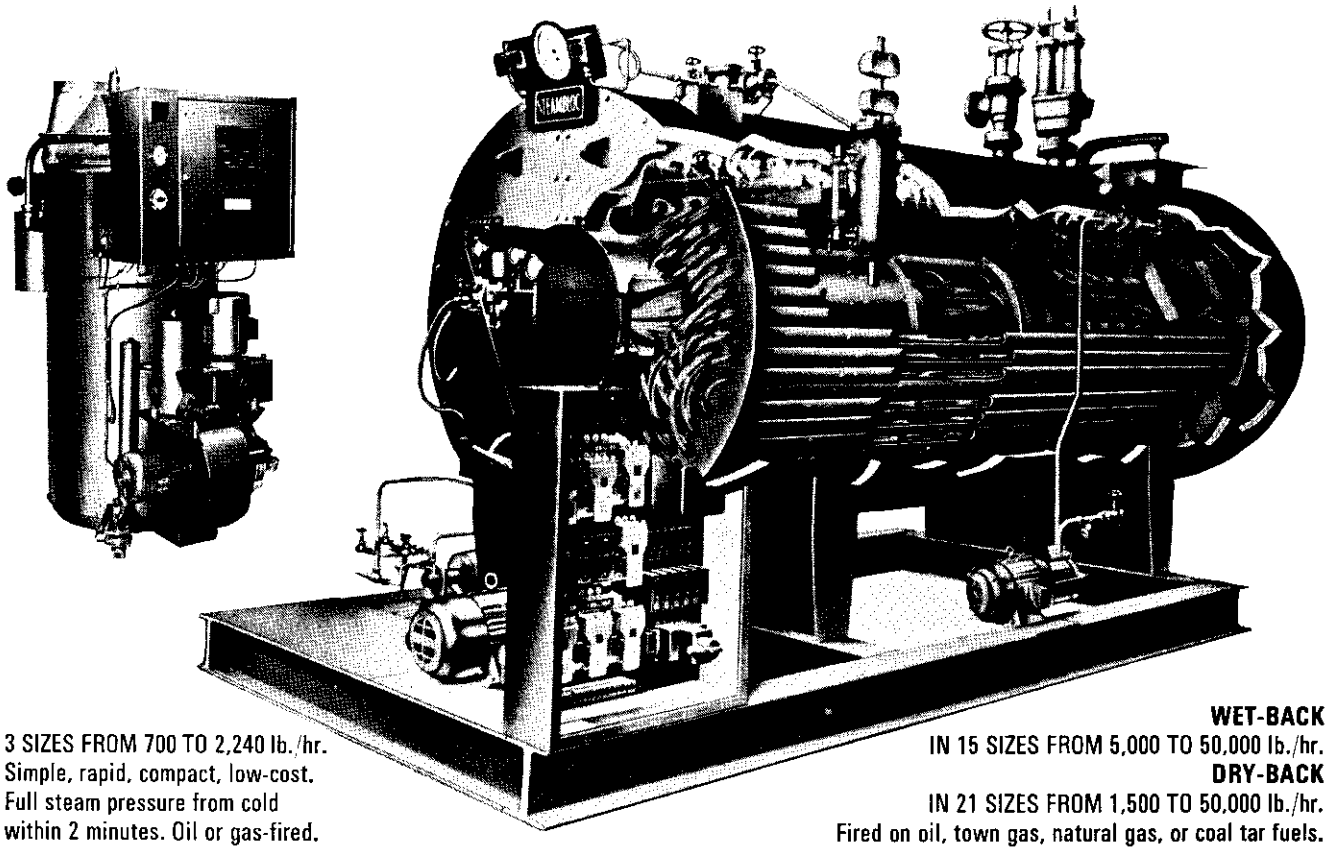

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VOL XXIII No 1
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Gas Goes to Hospital!

By P. W. KING, M.Inst.M., Assoc.I.GasE.
Commercial Sales Officer Glasgow Group, Scottish Gas Board

HOW IT ALL BEGAN

EVERY industry, organisation or service has a hero or a person to whom they look and regard as their founder or pioneer. The gas industry regards William Murdoch as its official pioneer and it would be fair to say that the hospital service regards Florence Nightingale as the founder of hospital services and nursing.

William Murdoch (1754–1839) lit his house by gas at Redruth in Cornwall in 1792 but his experiments lapsed until 1801 when a man called Lebon, who had been experimenting in the use of gas in Paris, caused renewed research and development when news of his achievements reached London. In March 1802, a gas light was placed at the end of Bolton and Watts Works in Soho, Birmingham, on the occasion of the celebration of the peace of Amiens. The same year Frederick A. Winsor Maravian arrived in London and claimed to be the inventor of gas lighting and in 1803 and 1804 he publicly exhibited his gas lights at the Lyceum Theatre. He formed a company for providing streets, squares and houses with gaseous lights by means of conducting tubes underground for distant furnaces in 1808. A bill was presented to Parliament in the same year and was finally passed in 1810.

Whilst Napoleon was retreating from Moscow in 1812, the Gas, Light and Coke Company was receiving the first Charter. This marked the beginning of the gas industry.

A paper read at the Scottish Annual Conference, 1968.

Florence Nightingale pioneered nursing, her work at the Crimea in 1854 saw the need for an efficient nursing service. She set up a training school in St. Thomas's Hospital, London, in 1861 with the £50,000 that was collected for a memorial to her as a token of appreciation for her services at the Crimea War. Neither Florence Nightingale nor William Murdoch could have foreseen their pioneering work achieve so much nor could they have imagined that their enterprise could have been integrated as part of a state scheme in this country.

It is more than likely that the gas engineer and the hospital engineer were brought together for the first time to design the lighting and, by modern standards, primitive sterilising equipment for the training school in St. Thomas's Hospital.

The early pioneering days required close co-operation and interchange of ideas. The last 120 years have seen the introduction of varying types of appliance specially developed for the needs of the hospital services. Gas men and hospital engineers have enjoyed an exchange of ideas and mutual assistance. This understanding is by no means at its zenith as the discovery of natural gas has opened a whole new vista. New techniques will be adopted and the gas man and hospital engineer will tread a new path of greater and closer co-operation.

Natural Gas a Must

The high cost of coal carbonisation forced the gas industry to look for a different source of raw material and intensive research led to the development of a whole new range of gas manufacturing techniques based on

light oils. The oil companies were only too anxious to sell what were to them low value products and were prepared to sign contracts for fairly lengthy periods from 5 to 14 years. The gas industry, however, were still convinced of the need for further feed stocks and natural gas which had been used extensively and satisfactorily in the United States, Canada, France and Germany was considered to be a most suitable substance if it could be obtained at the right price.

The search for natural gas in Britain had proved disappointing; the only known natural gas wells were overseas which was beyond the reach of a commercial pipeline, making it inaccessible to our market. The temptation and the lure of natural gas stimulated development into its transportation in a liquefied form. Pioneer work in this field had already been undertaken by the Americans. Close co-operation and liaison was established between Britain and America and the final conversion of a 5,000 ton American cargo vessel called "Normati" resulted in a 2,200 ton liquid natural gas carrier which was renamed "Methane Pioneer" being developed.

The "Methane Pioneer" crossed the Atlantic in February 1959 in the first of a series of trial voyages with cargoes of liquefied gas for delivery to a terminal which had been especially prepared at Canvey Island in Essex, the land being already owned by the North Thames Gas Board who were acting on behalf of the Gas Council. During a period of 14 months, seven cargoes were brought to Canvey Island. So successful was this operation that the Gas Council submitted a request to the Ministry of Power for permission to import natural gas from Algeria where large discoveries had been made. The Ministry of Power granted this request in 1961. The year, 1963, saw the launching of two specially designed ships called the "Methane Princess" and the "Methane Progress". On the 22nd of September, 1964, the "Methane Princess" sailed for Canvey Island with the first cargo of Algerian natural gas and thus established a regular service. During the first year the two vessels delivered 700,000 tons of Algerian gas to Canvey Island which is equivalent of 333 million therms of town gas representing 10 per cent of the industry's annual output at that time.

The potential of this new source of energy in Canvey Island stimulated and created the need for a trunk pipeline from the south of England to the Midlands and ultimately to Scotland. Work began on the first 200 mile stretch during 1963 with a further 150 miles of branch lines to be extended to Area Boards adjacent to the pipeline, which was to run from Canvey Island to Leeds. The trunk line was completed in just over two years, together with the branch lines.

The importation of liquefied natural gas was a daring feat of commercial drive and highly skilled knowhow that opened up great possibilities for commerce and industry. A new economy, however, reliant on the stability of other nations, was not the best arrangement and during this daring enterprise period, drilling for natural gas in the North Sea was started. This resulted from many years of speculation and the ultimate discovery of natural gas in Holland in 1959. During 1962, seismic survey work began on the coast line of the United Kingdom and in 1964 the Continental Shelf Act was passed enabling drilling to start in predetermined sectors and blocks that were sold by the Government to prospectors.

Serious drilling for oil and gas in the United Kingdom sector of the North Sea began on the 26th of December, 1964 with a well on the Dogger Bank, and the progress since then has been impressive. Gas was first found by the British Petroleum Co. Ltd. (B.P.) 45 miles east of the Humber in the autumn of 1965 and supplies from this find began to flow into the pipeline system in July, 1967. Four important gas fields have now been discovered. In some of the fields, it may be that two or more separate gas reserves will be identifiable. Gas has been found

Field	*Groups*	*Location*
West Sole	B.P.	45 miles east of the Humber
Leman Bank	Shell/Esso and Gas Council/Amoco.	30 miles north-east of the Norfolk coast
Indefatigable	Gas Council/Amoco and Shell/Esso	55 miles north-east of the Norfolk coast
Hewett	Arpet and Phillips	15 miles north-east of the Norfolk coast

in other places but it remains to be seen whether these other discoveries are commercially exploitable. The search continues: up to the end of September, 1967, 54 exploration wells had been completed or were being drilled by 15 different licensees.

It is not possible yet to make precise estimates of the gas reserves, but the recoverable reserves in the fields already discovered are roughly put at 25×10^{12} cubic feet. This is enough to build up a production rate of some 3,000-million cubic feet a day (m.c.f.d.) within five or six years and to continue at that level for perhaps 15 years, thereafter gradually declining if no more gas is found. 3,000 m.c.f.d. is equivalent to about 11,000 million therms a year, nearly three times our present consumption of town gas. Experience in other parts of the world suggests that it would be most unusual if more gas was not found. The rate of discovery in the United Kingdom part of the North Sea so far has been very fast. It was not until 11 years after the discovery of the first natural gas deposits in Holland in 1948 that the field at Groningen was found. A year later the reserves were officially estimated at $2{\cdot}1 \times 10^{12}$ cubic feet to 58×10^{12} cubic feet. Though there can be no certainty as yet, there can be a reasonable assumption for planning purposes that production from the United Kingdom part of the North Sea could reach 4,000 m.c.f.d. in 1975.

Natural Gas: The Origin

Under favourable geological conditions it is possible for hydro-carbons in the form of oil or gas to be produced from the remains of marine organisms. These marine organisms include plankton, bacteria and simple plants; they accumulate on the floor of the sea together with large quantities of mineral matter. As the deposition continues the earlier sediments become buried and start to compact into rock formation. As the pressure and temperature rise due to the increasing depth of burial, hydrocarbons can be formed from the bodies of the organisms by bacterial action in the presence of the mineral impurities which are thought to act as catalysts.

If, at the same time as the hydrocarbons are formed, there are suitable rock structures in which they can accumulate, an oil or gas field may form. This structure, or trap as it is called, must exhibit certain features.

(*a*) The adjacent rocks must allow the hydrocarbons to flow vertically and/or horizontally into the trap.

(*b*) It must have a completely impervious barrier rock above it—often rock salt—called the cap rock.

(*c*) It must be porous reservoir rock below the cap in which the hydrocarbons can accumulate.

(*d*) The combination of (*b*) and (*c*) must have occurred before the migration of the hydrocarbons, i.e. the age of the structure is also important.

The gas in these structures may be by itself (as in most of the current North Sea discoveries) or it may be associated with oil as in most of the major oil fields.

Natural Gas is Different from Town Gas

Town gas manufactured by modern methods consists essentially of hydrogen and gaseous hydrocarbons, the most important of which is methane. Almost half the gas is hydrogen. Natural gas consists almost entirely of gaseous hydrocarbons, usually containing 90 per cent or more of methane.

The absence of hydrogen in natural gas has important consequences in the utilisation of the gas. The two properties of gases that govern how it behaves when burned in an appliance are the calorific value (heating strength) of the gas and the rate at which it burns (flame speed). Calorific values of gases are measured in British Thermal Units (B.Th.Us.) per cubic foot, and the present town gas has an average calorific value of 500 B.T.U. per cubic foot. The unit by which gas is sold is the therm which is equal to 100,000 B.Th.Us. Consequently, to produce one therm of heat, 200 cubic feet of town gas must be burned.

Natural gas has an average calorific value of 1,000 B.Th.Us. per cubic foot and therefore only 100 cubic feet have to be burned to produce one therm of heat. In other words, only half as much natural gas need be passed through the pipeline system to provide the same heat as present town gas, so that the capacity of the pipeline and storage system is approximately doubled.

Although natural gas has twice the calorific value of present town gas, we do not necessarily obtain twice the heat when it is burned. Natural gas requires twice as much air for combustion as the same volume of town gas. Half the volume of gas requires the same volume of air and to achieve this means considerable alteration to the design of burners, the net result of which will give the flame of much the same size and shape as that for town gas and of approximately the same flame temperature.

Properties of Gases

Gas	*Volumetric Analysis* (%)									*Calorific Value* (*B.t.u./ft.*^{3})	*Specific Gravity* (*air* 1)	*Air Req.* (*ft.*^{3})	*Air Req.* (*ft.*^{3}) 11,000 *B.t.u.*
	H_2	CO	CH_4	C_2H_6	C_3H_8	C_4H_{10}	C_5	CO_2	N_2				
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Typical North Sea Natural Gas	—	—	92·0	3·5	0·7	0·3	0·3	0·3	2·9	1,033	0·604	9·76	9·45
Saharan Natural Gas	—	—	86·5	9·4	2·6	1·1	0·1	—	0·3	1,148	0·645	10·85	9·45
Town Gas	47·9	4·9	33·5	—	—	—	—	13·7	—	509	0·475	4·46	8·75
Methane	—	—	100	—	—	—	—	—	—	1,013	0·555	9·57	9·45

CONVERSION PROGRAMME

An essential preliminary step to the conversion of an area for a natural gas supply is

(*a*) The insertion of isolation valves in mains so that any given sector can be cut off entirely from the town gas supply and connected to natural gas.

(*b*) A survey of the appliances, internal piping and meters in use.

This will determine which burners can be modified to burn natural gas and which will have to be replaced by new burners specifically designed for natural gas. The necessary conversion procedures can then be drawn up, the conversion kits obtained in the right numbers and an appropriate labour force assembled.

The additional measures that will have to be taken for the conversion include modification or replacement of pressure regulators to deliver gas to the appliance at a higher pressure, re-setting prepayment meter mechanisms, modification of automatic ignition systems and modification of supplies to controls such as thermostats.

Supplies Need Not be Interrupted While Converting

Experience has already been gained in the first full conversion which was carried out on Canvey Island. The Island was divided into 24 sectors, each of about 300 consumers with some 900 appliances. The sectors were selected so that each one could be isolated from the main system as a whole. About 250 fitters were involved.

In every sector, in each household, the cooker was dealt with first and the result was that the majority of consumers were able to cook on natural gas by lunch time. Where appliances could not be converted in situation, temporary appliances, converted for natural gas, were installed until such time as the original ones could be returned. The whole operation was planned so that a whole sector could be changed over to natural gas in one day. Subsequent to work in Canvey Island, more and more sectors in varying parts of the country have been converted to natural gas. These areas include large commercial sectors in densely populated industrial areas of the Midlands.

Equipment to be converted falls into the following classes with the particular problems attached to each:—

1. New appliances with universal burners which are *multi-gas burners.*
2. Appliances on the Gas Council's approved list currently being sold for town gas.
3. Appliances now superseded in the production lines, but for which spare parts are still being made.
4. Appliances which are classified as obsolete, since spare parts are no longer available. This includes nearly all lines discarded more than 15 years ago.

Appliance Testing

For some years Gas Council approval has been given to appliances only when manufacturers guarantee to continue production of spare parts for 15 years after the appliance has been superseded on the production line.

The first group is easily converted by the exchange of a few injectors. New appliances are designed to be capable of swift and easy conversion. No appliance will now receive the Gas Council's approval unless fitted with *universal burners.*

In the second group, conversion sets have to be produced by the manufacturer and are required to give the same performance in terms of combustion and safety standards. In cases where sets are not obtainable, appliances will be adapted in the Board's own workshop.

Group 3 appliances will receive the same treatment as Group 2.

Appliances in Group 4 will be converted as required, although no doubt many owners would prefer to replace them.

Already the list of appliances approved for both manufactured and natural gases is quite long and, with it growing daily, it is impossible to keep all prospective customers in touch with the latest position. From whatever source new appliances are ordered in future, it is essential to ask if a conversion kit is available. If so, when the change over takes place, the only alteration needed will be the substitution of the spare injectors and adjusting the air control.

Automatic ignition, now normal on domestic cookers but not yet widely developed for the commercial kitchen, has produced many problems. Every manufacturer involved has had a special team working on this and most of the solutions are already tested and approved. Some are extremely simple, one being the doubling of the battery voltage used for heating a platinum filament.

PRIORITIES

The work of conversion and the results will be the same for all classes of consumer. It is realised, however, that the hospital is almost unique as it is one of the few establishments in continuous use throughout the year and at all times there could be a demand for gas for a variety of reasons. This makes it essential that the problems and requirements of each hospital be considered and a plan of conversion and priorities agreed between the Gas Boards and the Hospital Engineers well in advance of conversion. Each hospital will present its own particular problems and, therefore, each hospital premises will need to be examined and information collected well in advance of a conversion date being agreed. One reason for this is that there are appliances in hospitals made by smaller firms who lack the large design teams to produce conversion sets. These appliances will need to be dealt with individually by the area Boards. To ensure an efficient change over to natural gas, it will be necessary to see that all appliances are in good working

Stobhill Hospital, Springburn, Glasgow

Location	*Installation*	*Hours of Use*	*Proposed Action*
Main Kitchen... ...	Frying Range (Carron) 5 pans, 20″ × 24″ × 7½″ pans	6 a.m.–7 p.m. Varies with menus daily, but in use all day Fridays	Category 4 appliances. No replacement parts available. Partial conversion where possible on site. Temporary bottle gas appliances on loan during conversion
Main Kitchen... ...	Island Carron Solid Top Range. 6 oven unit	6 a.m. – 7 p.m. daily	All as above
Main Kitchen... ...	General Purpose Roasting Ovens. 3 units	Day and Night Regular Use	Category 3 appliances. Kits available. Conversion in situ
Main Kitchen... ...	Rotary Oven Melvin & Gillespie	24 hours per day	Category 4 appliances. No replacement parts available. Conversion where possible only
Main Kitchen... ...	Island Carron Solid Top Range. 4 oven unit	6 a.m. – 7 p.m. daily	All as above
Special Diet Kitchen ...	Island Carron Open Top Range. 4 oven unit	6 a.m. – 10.30 a.m. 2.30 p.m. – 6 p.m.	Convert Burner
Pathological Dept. Building	6 Bunsen Burners	Forenoons	Convert Burner
Bacteriology Dept. ...	Bunsen Burners Refrigerator	Intermittent use	Convert Burner
Biochemistry Dept. ...	12 Bunsen Burners	Half of each day	Convert Burner
Engineering Dept. ...	Propane Cylinder used for Incinerator		—
Official Main Block ...	3 Gas Fires in offices 1 Domestic Cooker		Conversion kits available

order immediately prior to conversion and further co-operation is essential to ensure that no appliance is overlooked in the final examination. Needless to say, all alterations and exchanges of appliances would need to be notified to the Gas Board after a survey examination has been made.

If these small but important details are overlooked, it could result in considerable inconvenience to the hospital. It cannot be overstressed that because of the diversity of hospitals, each engineer has his own particular problem which underlies the importance of our maintaining close liaison. A survey recently in one of the large hospitals in Glasgow revealed the above gas equipment installed.

The magnitude of the problem of conversion and the organisation necessary to avoid interruption of supplies can hardly be overstressed, but if properly planned, there need not be any difficulty.

FUTURE DEVELOPMENTS—CATERING

Professor B. S. Platt of the National Institution for Medical Research in his article in the *Architects' Journal* on the 7th of July, 1960 entitled "The Kitchen" observed, "Good catering for patients in hospitals means the provision of good food, well cooked and attractively served."

Hospital catering can properly be regarded as a branch of applied nutrition and, like applied nutrition in general, involves a wide range of knowledge and skills.

Most of the departments of the hospital are in a state of radical change, but in most of them the need of this change is accepted and the technical solution is well in sight. Catering is not in this position!!

Professor Platt continues, "The greater part of hospital cooking should be done, not in the hospital as at present,

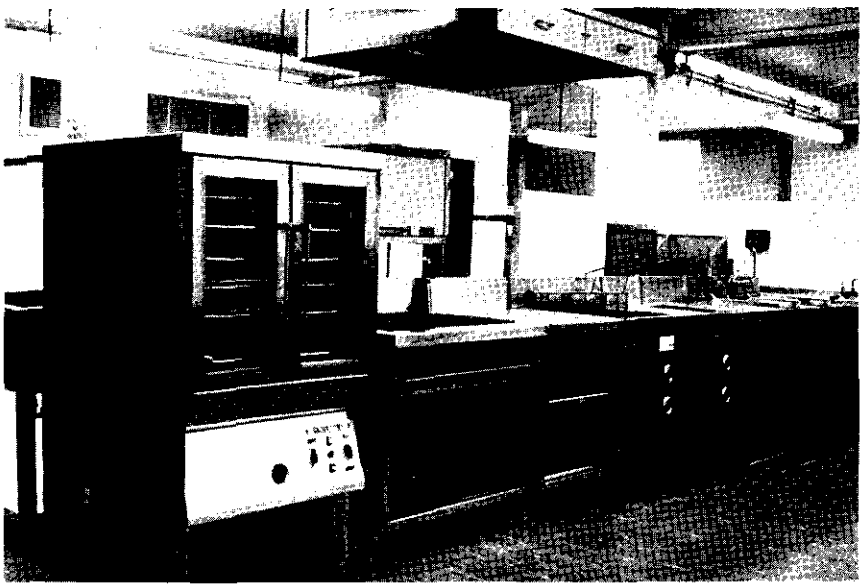

Fig. 1. The Forced Air Convection Oven and other modules which include Square Boiling Pans and V-Shaped Fryers.

but, in the food factory". In making his proposal he is only claiming for cooking a development analogous to what has already taken place in pharmacy. If his proposal is accepted it will mean a saving in space and in staff, a reduction in food served and, above all, food which tastes better and is more nutritious than that which is usually supplied by communal cooking on the spot.

The Chairman of the Hospital and Catering Dietetic Committee, in his third memorandum on hospital diet in 1959, said, "The structural inadequacy of kitchens in many hospitals, which are not only poorly equipped but also badly designed, are also under staffed. It is felt that under present conditions hospital service will not attract its proper portion of talent".

"Hospital catering just grew as the number of patients fed in hospitals increased; the size of cooking containers increased from that of domestic saucepans to huge containers designed at a time when food science and technology were in their infancy".

Professor Platt considers that a system along the following lines seems to be feasible.

(1) Bulk of the preparation of the food to be done in food commissaries.

(2) Appropriate storage and, ultimately, proper transport to hospital stores.

(3) Suitable storage on hospital premises, possibly for only short periods of time.

(4) Distribution within the hospital on the day of issue.

(5) Assembly of meal components and, where required, rapid heating immediately before serving of groups (eating units) of about 50 patients.

Research by food processing companies since Professor Platt's article has approved the feasibility of what he suggests. Blast freezing and accelerated freeze drying (AFD) are almost common place in all commercial establishments and even the domestic house.

The large food factory has been tried and proved fairly successful but with the development of freeze drying and blast freezing equipment it is now possible to carry out these operations economically in the smaller unit within a hospital and works canteen.

The gas industry has seen the desirability of Professor Platt's comments and has successfully developed the forced air convection oven for the reheating of foods produced in this manner. The convection oven has an added bonus in that it is a perfectly good catering unit and is therefore dual-purpose in that it can roast and bake as well as any appliance on the market and can reconstitute frozen food within the requirements of the health authorities.

Modern gas catering equipment, with its increased efficiencies and high recovery rates, can produce food locally within the hospital to standards never before dreamed about.

The square boiling pan, for instance, can cook potatoes and green vegetables to as high standard as one is used to at home or that is normally associated with small saucepans—the caterers' dream! (Ref. Fig. 1).

V-shaped fryers can cook chipped potatoes and other fried foods to standards hitherto only dreamed about. (Ref. Fig. 1).

The aesthetics external and internal finishes of this equipment is stainless steel, ensuring high standards of cleanliness and hygiene. Because of the accepted use of stainless steel the costs are not as would first seem prohibitive, and the increased efficiencies prove savings in the amount of equipment required.

In a commercial kitchen, the cost of providing vegetable preparation in a small restaurant only serving 300 meals is as follows:—

Area occupied by vegetable preparation in a staff restaurant serving 300 meals	200 sq. ft.
Allow average rent per sq. ft. super £3	£600 per annum
Cost of mechanical heating and ventilating plant per sq. ft. super of kitchen area £2 2s.	£420 per annum
Amortisation on capital expenditure involved on ventilation plant at 10 per cent per annum ... ... —	£42 per annum
∴ Total cost of Vegetable Preparation Area	£1,062 per annum

By using pre-prepared vegetables and convenience foods from a central stores of preparation factory, smaller kitchens and less staff are possible. In George Square, the Scottish Gas Board has a restaurant which operates on this basis: when fully operational it will feed 300 people every day in two dining rooms and prepare a further 400 meals for blast freezing. These will then be sent out to all the gas works in Glasgow to be reconstituted in gas forced air convection ovens: All this with a staff of 10 in an area 30 × 36 feet.

The hospital service may not be cost-conscious to this extent but it is certainly worthy of consideration in that money spent unnecessarily on mechanical service—heating, lighting, etc. for over-sized kitchens could be used elsewhere. The hospital engineer, no doubt, can suggest many other places that the money could be spent.

High Standards of Safety

The Gas Council has worked hard to ensure a high performance of gas catering equipment and to see that all necessary safety aids and precautions are provided by the manufacturers.

The British Standards Institution Specification 2512 for gas heated catering equipment was introduced in 1954. The publication defined standards of safety performance and durability and detailed the necessary tests that the equipment should undergo before receiving approval.

These standards were subsequently reviewed in 1963 and of course are under constant review. Most of the testing is carried out at the Gas Council's laboratories at Watson House, Fulham, but there are centres in the South Eastern, Northern and other Gas Board Areas.

Seal of Approval

Appliances conforming to the standards are entered on a Gas Council approved list and receive a seal of approval. This list is published annually in January with a quarterly amendment. The basic requirements of B.S. 2512 are:—

1. Is it safe? i.e. Does the surface get too hot and is the combustion correct?
2. Does it work? What is the cooking quality?
3. Will it last? Are the metals used adequate and is the workmanship up to standard? If it is enamelled, will the enamelling last?

It need hardly be said that British Standards improved the quality of gas catering equipment and spurred manufacturers to carry out development as well as improving the aesthetics.

It is these improvements that have enabled Professor Platt's prophecies, requests and advanced warnings on hospital catering to be reality.

The gas industry has specialists available who can advise on these subjects and has the equipment to offer hospital engineers for the improvement of catering standards.

INCINERATION

Waste disposal is the problem of every hospital engineer. Many organisations have attempted to tackle this tremendous problem. The Gas Industry has been able to offer incinerators in a number of sizes from sanitary use to cremators. Despite this apparent abundance of knowledge and variety of appliances available, the need for specialised equipment has not hitherto presented itself. The hospital boiler-house has always been a long stop!! Today, however, refined fuels, Clean Air Acts and many other reasons prevent disposal in appliances other than purpose designed equipment.

Regrettably there is not, to date, any British Standard classification of waste and appliances designed to deal with these classifications.

The Americans have faced their problems which have probably been with them longer than in this country. The Incinerator Institute of America is a body set up to design and test appliances to deal with waste disposal. They have classified waste and produced standards for the incinerators, having first decided that incineration was generally the best method of dealing with it.

At least one manufacturer of gas-fired incinerators has adopted these classifications and is, therefore, able to offer appliances capable of dealing satisfactorily with most, if not all, incineration problems.

Before installing any appliance, they complete a comprehensive survey form, a copy of which is left with the hospital engineer for future reference. Particular problems are noted and the form submitted to their design teams for analysis; an incinerator designed for the particular purpose is then offered to the hospital engineer.

There are many problems yet to be solved with waste disposal by incineration and the possible subsequent air pollution—particularly from radio-active laboratory material.

The flexibility of gas and the advisory service the industry offers, together with the forethought and efficiency of enlightened incinerator companies, will deal with these problems in the future when refined fuels, and possibly total energy, supersede the traditional hospital boiler-house.

Heating and Hot Water

More favourable tariffs will be available to Regional Hospital Boards as natural gas is delivered into their areas of operation. This could result in a planned replacement programme for existing hospital boilers as funds or necessity permit. The practice of installing all plant in one boiler house was to obtain the maximum working efficiency by having only one team of boiler operators.

The problems connected with low load steam production are well known during the summer months when demand falls to approximately thirty per cent of the maximum load. This can result in a reduction in boiler efficiency of as much as twenty per cent, condensation in the flue, and the possible emission of dark smoke.

Gas boilers work efficiently in all sizes, without constant attention, and therefore lend themselves to dispersal. They can be installed where steam and/or hot water is needed, resulting in savings in transmission losses and the cost of pipe lines.

The area available for development will usually affect the functional requirements of a building. In built-up areas space limitations will force the architect to use tall blocks; roof top boiler houses are perfect for this type of development. In country districts, however, environmental requirements have to be carefully considered, requiring the erection of single storey buildings over wider areas. It is this form of development that necessitates a rethink on heat distribution, perhaps by the planned installation of a number of strategically sited gas boilers to meet the demands for heating and hot water.

Decentralisation of plant is a major factor in economy by the reduction of heat distribution losses.

The inherent advantages of gas are known, the major points are given without elaboration:

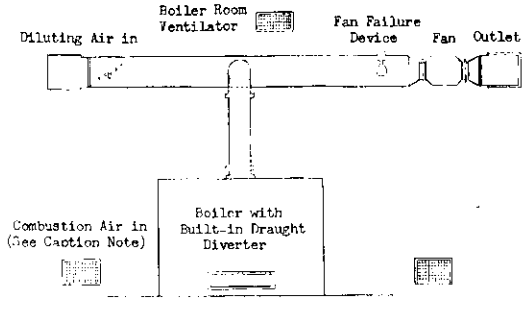

Fig. 2. Diagrammatic Illustration of Method of Fan Diluted Flueing.

Note: Air Supply for Combustion and Ventilation must comply with either (a) C.P. 332·2: 1964 Gas Boilers

(b) C.P. 337: 1963 Flues for Gas Appliances

(c) Draft Code of Practice Warm Air Heaters C.P. 332·4

(d) C.P. 332·3 (in preparation) Central Heating Boilers for Commercial and Industrial Premises.

Fig. 3. The Neat Flame Boiler conversion.

(1) Saving in floor and storage space
(2) Boiler house labour reduced to a minimum
(3) Maintenance of plant simple and effective
(4) Modern control systems are both flexible and efficient, leading to economy
(5) Cleanliness in boiler house
(6) Greater flexibility with flue installations.

Research in recent years has provided a number of aids in overcoming problems and reducing installation costs. Considerable experience has been gained in the installation of gas-fired boilers at roof level with a consequent saving in erection of flue stacks. The development of the Fan Diluted Flue system for low level discharge of products of combustion in tall blocks has made possible the installation of gas boilers without any flue stacks. This arrangement is one of the latest developments in mechanical extraction and operates with fresh air being drawn in through a duct by fan, mixing with the products of combustion from the boilers and finally discharged to the atmosphere at a convenient level. Design data ensures that dilution of the discharged products is not in excess of 1% CO_2. Gas with its low sulphur content is ideal for this method of flueing. (Ref. Fig. 2).

Boiler Conversions

Existing solid fuel boilers are able to be converted to gas firing without the need to drain down the heating system. The efficiencies of converted boilers are comparable to purpose designed appliances. 78% or even higher, depending on the method adopted, is normal—with all the inbuilt advantages of gas. The cost to convert a boiler in situation is about 25% of exchanging the appliance. Savings in fuel, handling and labour are an added bonus. Conversions will enable the hospital engineer to take

advantage of natural gas without being involved in heavy capital costs. Several large boilers have been converted in Glasgow and Edinburgh, and are working satisfactorily. Both the gas industry and burner manufacturers see this type of business as lucrative as the boom for oil conversions in the late nineteen fifties. (Ref. Figs 3. and 4).

Inferential Meters

One of the many advantages claimed for gas is space saving. You may consider, however, that gas meter sizes are directly proportional to the connected load. This is not so. Larger capacity meters are being produced in smaller cases, and research in this field continues. The greatest advance, however, is the development of the inferential meter.

Fig. 4. The Pressure Jet or Induced Draught Burner conversion set on a solid fuel boiler.

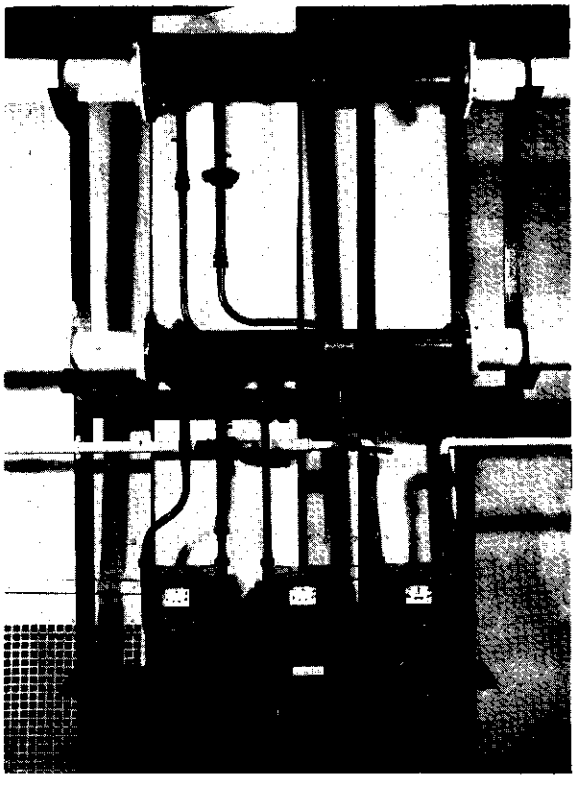

Fig. 5. An Inferential Meter installation showing the Domestic Sized Meters for Measuring Pilots as well as Main Gas Supply.

A brief description is that a four foot length of gas service pipe is prepared with an orifice plate and venturi. This is fitted to the incoming service line. A precise proportion of the gas flowing through the pipe passes through a direct reading gas meter of the size fitted in a domestic house. Any plant that works on an ON/OFF basis and is not required to modulate can have its consumption recorded by this device. The accuracy

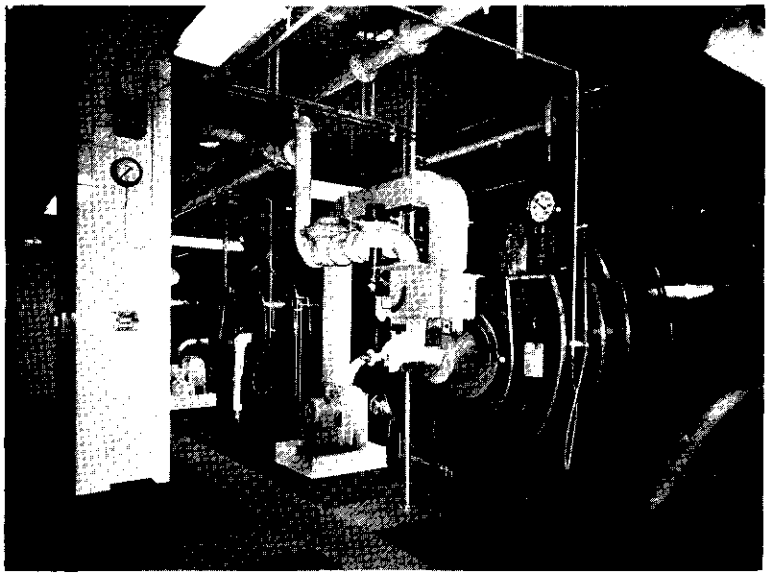

Fig. 6. An Inferential Meter installation controlling boiler rated at 4,850,000 B.T.U's per hour (5,000 lbs. steam per hour).

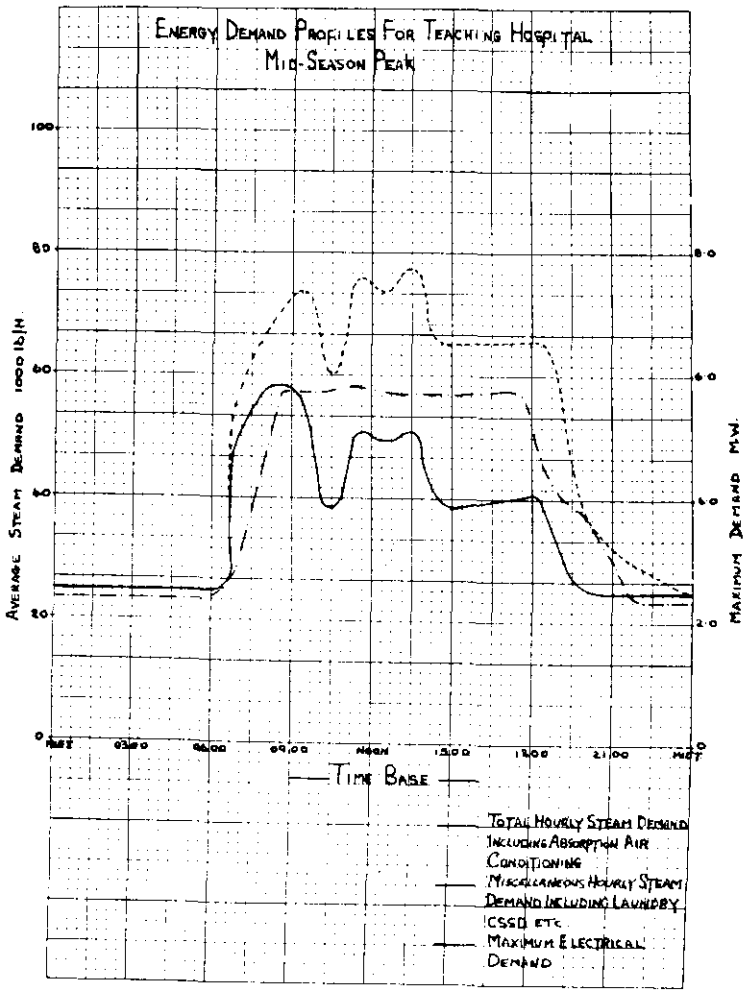

Fig. 7.

of the registration meets with the requirements of the Ministry of Power.

An additional domestic sized meter is fitted to register gas used on ignition devices. (Ref. Figs. 5 and 6).

TOTAL ENERGY

Total energy is not new. Many industrialised countries produce large quantities of electricity by total energy systems. The motor car is a good example of total energy.

Natural gas is the reason for the increase in interest, as well as developments of gas turbines and dual fuel reciprocating engines. Heavy diesel engines have been with us for many years and still have an important place *in the future.*

Let us consider the motor car. It has a reciprocating internal combustion engine, burning petrol to produce:

(*a*) Horsepower via the shaft to drive the wheels.

(*b*) Heating from the engine cooling water via the heater battery which in turn is blown into the passenger saloon for space heating.

(*c*) Electricity via the dynamo for lighting, the hooter, and various other controls.

(*d*) Waste heat discharged via the exhaust.

From the single fuel (Petrol) the car produces shaft horsepower, electricity and low temperature heat.

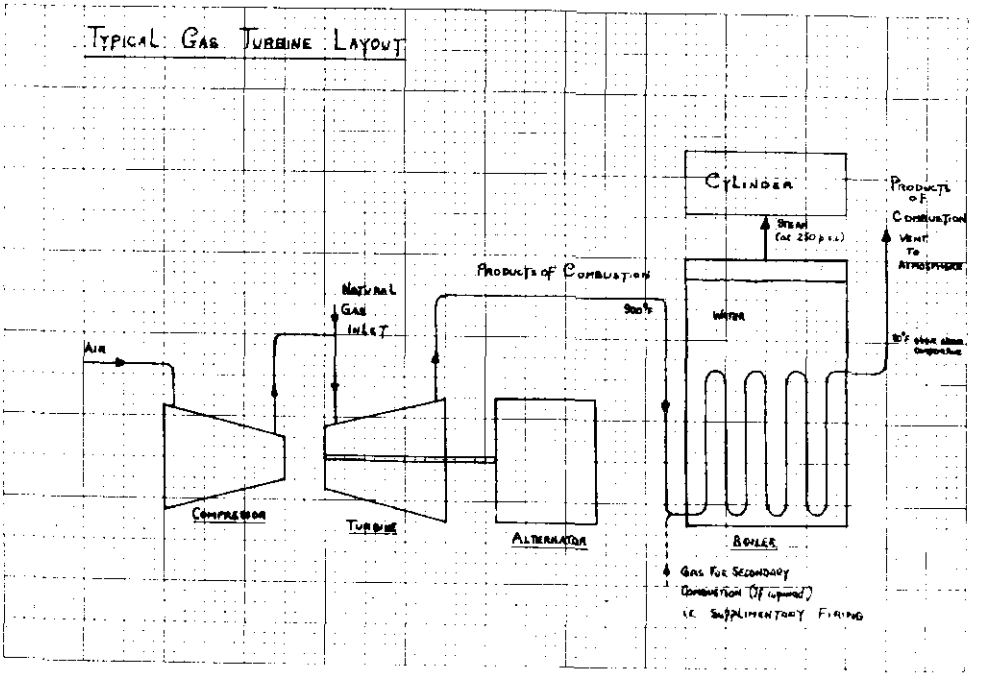

Fig. 8.

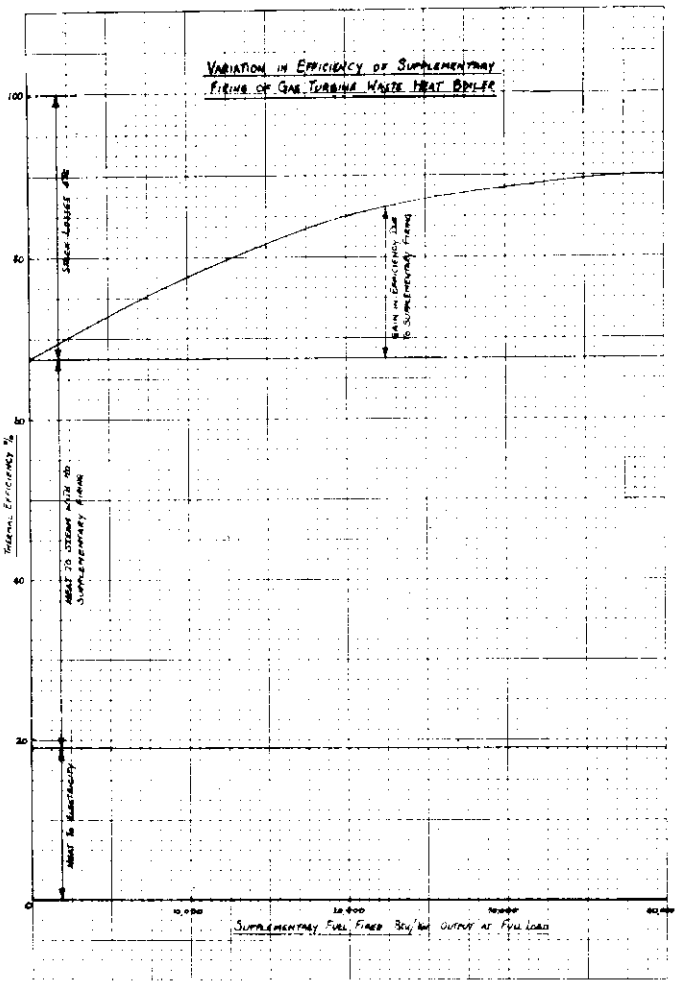

Fig. 9.

Electricity is transformed into light, sound, motive power, and high temperature heat if a cigarette lighter is fitted.

The basic rules for total energy are:

(1) Heat power ratios of prime movers must fit the heat power profile of the building.

(2) Heat demand of buildings must normally be constant throughout the year, i.e. in public buildings the air conditioning load is required and this should be of the absorption type using waste heat (18 c.ft. of natural gas per hour per ton of refrigeration, or 18·5 lbs. of steam per hour per ton of refrigeration). (Ref. Figs. 7 and 11).

Typical heat power ratios:

(*a*) Gas turbine 3:1 upwards with supplementary firing (or 9 lbs. of steam/per kw. output).

(*b*) Diesels and dual fuel engines 1:1.

Gas Turbines as Prime Movers

There are various types available. Some were originally designed for industrial purposes, others were aero engines which have been adapted for use with natural gas in total energy systems. Gas turbines originally designed for aviation purposes are usually quite small, light, and fairly easily replaced. The products of combustion from a turbine using natural gas are clean and can be used for direct heating purposes. The turbine is a flexible engine and is adaptable. Dilutant air can be added to the exhaust gases if they are required for direct heating, this arrangement however is not recommended for hospitals. If the temperature of the gases are low more fuel can be added, as the exhaust is oxygen rich. Should steam be needed, the exhaust gases can be passed through a waste heat boiler. Supplementary firing systems can be added if still more steam is required. (Ref. Figs. 8 and 9).

Reciprocating Engines as Prime Movers

These engines are usually medium to high speed engines that have been developed for natural gas with spark ignition. Larger medium speed (750 revs. per minute) are also available as dual fuel engines, using about eight per cent diesel oil injection to start combustion.

It is not advisable to use directly the exhaust heat from these engines because of the incomplete combustion usually associated with reciprocating engines. There are several ways of heat recovery, depending on the circumstances, the normal being a waste heat boiler, capable of producing steam at 15 p.s.i. Higher pressures and temperatures can be obtained.

Each prime mover has advantages dependent upon the purpose for which the system is designed. The hospital is ideal for the dual fuel engine, although there will be particular instances where certain individual buildings would be better served by a gas turbine.

The building heat: power ratio will determine which type of prime mover will be used. Remembering that total energy only becomes a really viable operation when the waste heat can be used to its full. That is to say, a maximum load factor for every month of the year. Waste heat can be used during the winter with the possibility of supplementary firing on peak days. In the summer, the same system could be embarrassed. (Ref. Fig. 10).

The case for air conditioning in hospitals cannot be overstressed. It is practice at this present time to air condition the operating theatre fully, but the more enlightened of the medical profession would prefer to see the entire building air conditioned. A typical energy consumption chart for perimeter wards in a city hospital would indicate that air conditioning could bring the annual load factor to vary no more than 10% for a 12 month period with a total energy concept and absorption cooling. The variation being in the summer period

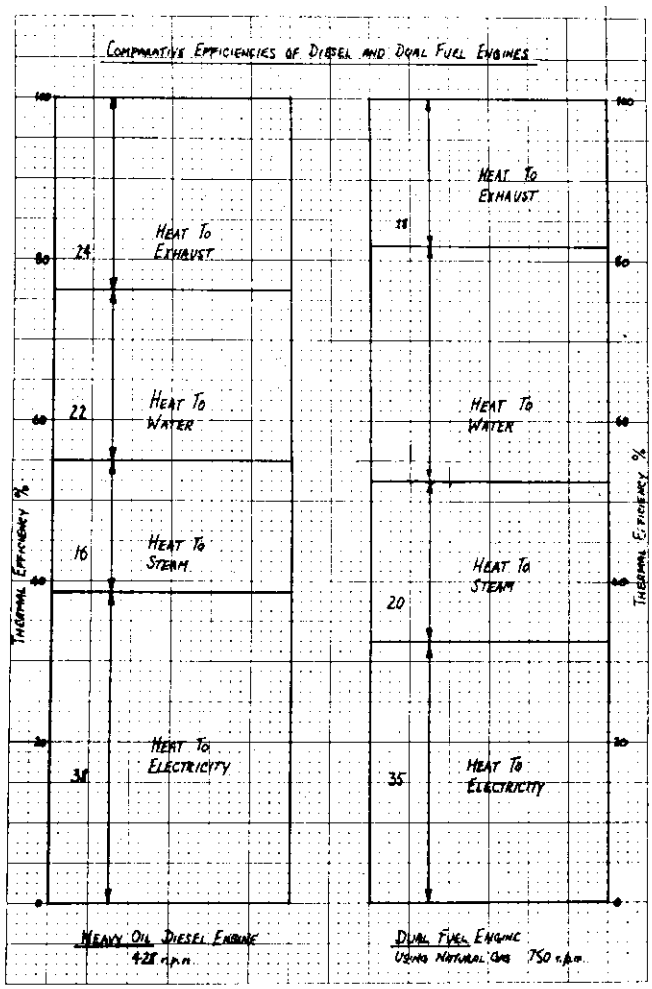

Fig. 10.

where an increase in consumption would be recorded Normally, the curve for a heating year would be at its lowest. Such an event would be an attractive proposition for interruptable load tariff if it were offered by the gas industry. (Ref. Fig. 11).

Economics will govern what systems are used in hospitals and whether they continue with their present mixed fuels or if they change to a one-energy source. The facts about total energy are simply that, provided the correct prime mover is selected in accordance with the building profile, a natural gas total energy system could show savings up to 25% on operating costs resulting in a return of capital invested within four to five years. Experience would suggest the dual fuel engine rather than the heavy oil diesel engine, which although cheaper to run from the fuel point of view is more costly to buy and is less flexible than the dual fuel engine. This must surely be better than any known investment to date.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the assistance and co-operation received from his colleagues in the Scottish Gas Board and to thank the Scottish Gas Board for allowing him to prepare and present this paper. He extends his gratitude for assistance given by Mr. D. G. Axford and Mr. R. Winch of Oscar Faber and Partners, and to Mr. Huston of Vauxhall, Joseph Goder Incinerators Limited for information and assistance given.

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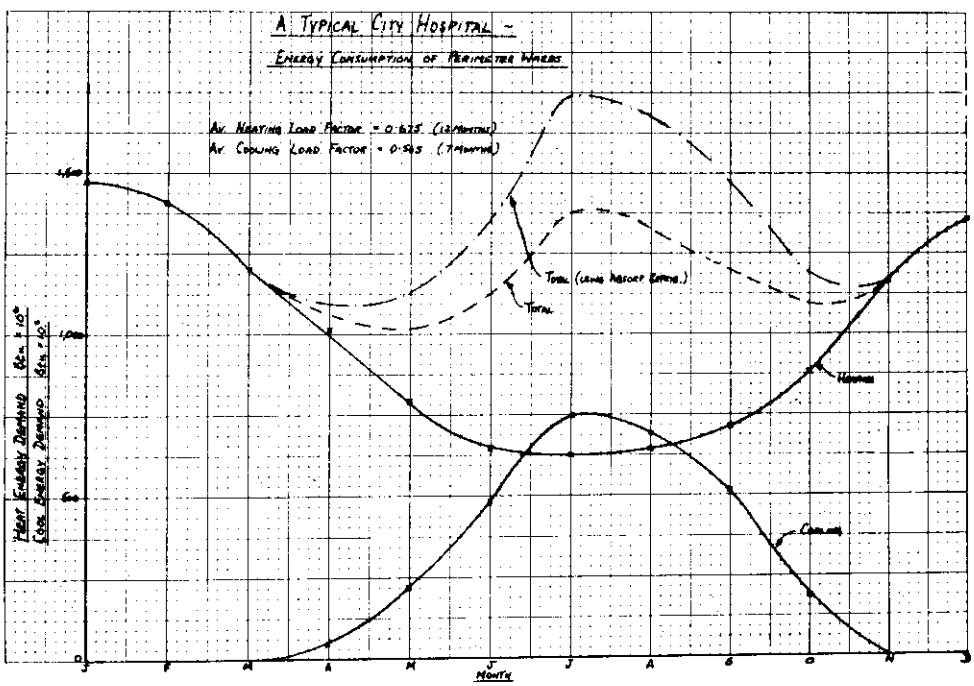

Fig. 11.

Recommended Guide to Essential Fire Protection in Hospitals

By J. C. FOX, M.I. Fire E.
Acting Chief Fire Officer, Swansea Fire Brigade

(a) Fire Risks

It is generally found that fires in hospitals are mainly caused by similar conditions to other establishments which accommodate people for living and sleeping. There are some specialized high risks in various departments that present serious problems.

The human element is involved more often than electrical or mechanical faults, but, since the occupants are incapacitated in some way, fire prevention must be treated very seriously and constantly in view.

(b) Objects

(*a*) To prevent uncontrolled fire;

(*b*) To prevent the spread of smoke and fire;

(*c*) To prevent loss of life.

The fact that fires in hospitals are infrequent is accounted for by the diligent enthusiasm of hospital staff and liaison with instruction from the local Fire Service. The existence of this atmosphere and proficiency must not cause a relaxation; there are still rigid lines of action that must be observed and maintained.

(c) Responsibilities

(1) Provision and maintenance of fire-fighting equipment, alarms, water supplies etc., with recorded tests;

(2) Instruction and training of staff in precautions and procedure for 'Action in Case of Fire.'

(3) Designated Fire Party members, Assembly Points and evacuation procedure;

(4) Posting of notices in detail for instruction of staff for 'Action In Case of Fire' at relevant positions.

(d) Pre-arranged Plans

Confer with Fire Service on:—

(*a*) Persons designated for responsibilities in paragraph (c);

(*b*) Internal Alarms;

(*c*) Routing of Fire Calls to Fire Brigade and Communication Installations;

(*d*) Syllabus of Instructional Training;

(*e*) Practice Fire Drills and testing of Fire Detection and Call equipment;

(*f*) Plans of Hospital, alterations in building and staffing for operational needs of Fire Brigade;

(*g*) Evacuation and Means of Escape in Case of Fire at any level of buildings.

(e) Fire-Fighting Equipment

This can be put into three categories:—

(*a*) First Aid equipment such as portable Extinguishers, Hose Reels and miscellaneous such as Asbestos Blankets in kitchens, etc.
These can be inspected, tested and, when done, recorded to effect proper maintenance and immediate availability. They are to be considered for the immediate use of staff in case of fire and *practical training* is essential by actual operation.

(b) Installed equipment such as electric or steam pumps for premises where the public supply is low in pressure or insufficient in supply. Alternatively, a large storage of water for fire-fighting only and accessible to fire-fighting pumps; hydrants, standpipes and hose.

(c) Automatic and fixed installations such as CO_2, sprinklers, drenchers etc. that need inspection and recorded testing.

(f) Means of Escape

At least two avenues must be available for use from every level of buildings, and leading to a protected area with the avenues indicated by posted signs.

External staircases have an exposure risk by being subjected to flame and smoke from lower apertures like doors and windows where an outbreak of fire will envelope the staircase.

Smoke-stop doors have a purpose and are to be closed when an outbreak occurs. This requires proper maintenance and use. A close watch on the use of wedges and latches or locks.

Avenues should be kept clear at all times.

This article is the summary of a paper given to the Welsh Branch of the Institute.

(g) Training of Staff

Persons Discovering a fire should raise the alarm, call for assistance and attack the fire with available equipment.

Persons Hearing an Alarm—join the Fire Party if you are a member, if in the ward area call for help to evacuate patients to safe area behind smoke-stop doors.

Other staff assist public, if present, to leave premises.

Report to Assembly Point and remain until ordered to leave by a responsible person.

Keep calm and assist Fire Brigade Officers on their arrival and when required.

Switchboard Operators on being notified of an outbreak must dial '999' and give the address of the Hospital. Operate the Alarm if not previously operated.

Notify Matron, Hospital Engineer and Hospital Secretary of the fire and its location.

Notify other members with nominated responsibilities as laid down in posted instructions.

Nominated Persons on Fire Party—

Ascertain all rooms in affected areas are clear.

See all doors and windows are closed.

Report to pre-determined areas.

Receive Fire Brigade appliances and Officers at prearranged assembly area.

Preparations for Roll Calls at evacuation to designated Assembly Points should be made in advance.

Inform Fire Brigade Officers of missing persons and possible whereabouts.

(h). This guidance is comprehensive as far as main tasks are concerned but expansion to final details can only be made by conference with Fire Prevention Officers and Hospital Staff and related to specific buildings, occupancies and special risks or features.

Special risks such as Operating Theatres, Laboratories, Dispensaries, Stores and the like need individual attention for Fire Protection but the foregoing will remain for procedure in case of fire.

FIRE PROTECTION IN OXYGEN ENRICHED ATMOSPHERES

Oxygen enriched atmospheres are a very high fire risk. The hazard which is presented by oxygen enrichment cannot be completely assessed.

We know what will happen when hydrocarbons are involved in a fire under normal atmospheres, but with enriched atmospheres we cannot establish certain factors, thus oxygen enrichment becomes a hazard to patients, hospital staff and fire fighting personnel.

Before combustion can take place three essentials are required.

(1) Oxygen to support combustion.

(2) Ignition to start combustion.

(3) Combustibles.

In normal atmospheres there is approximately 21% oxygen and 79% nitrogen, therefore 4/5 of normal air is nitrogen which will not support combustion and can be considered a dilutant. If the pressure of oxygen in a fixed volume is increased by 4lbs/sq in. the enrichment will be 33%. As the enrichment is increased the fire hazard becomes greater, because of the large quantities of oxygen to sustain combustion without the dilutant effects of nitrogen.

It has been found that the incipient fire in oxygen involves exothermic reaction—the instant expansion of temperature and pressure. The initiation of flame reaction is complex and not yet well understood. The increase of temperature increases the rate of chemical activation between the fuel and oxygen and in an enriched atmosphere there is sufficient thermal energy released to make the reaction self sustaining regardless of whether the combustible is solid, gas or liquid.

The effect of fire in enriched atmosphere when in an enclosed (fixed volume) condition will be rapid generation of temperature and pressure resulting in rapid fire spread and consequently an explosive rapture.

There are three principal sources of ignition:

(1) Electrical (electrostatic or sparks from broken contacts)

(2) Hot surfaces (friction sparks or heated wires)

(3) Heated gases.

The methods of effective fire protection in enriched atmospheres are:

(1) Elimination of sources of ignition.

(2) Minimise all combustibles and exclude where possible all flammable liquids and gases.

(3) The use of fire walls to isolate high risk zones.

(4) Fixed fire extinguishing systems with rapid discharge by automatic, or automatic and manual operation.

The need for reliable detection is of paramount importance. Automatic detectors are based on their ability to detect

(1) Temperature rise.

(2) Radiation emission.

(3) Combustion products.

The detectors should be arranged to initiate both alarms and fire extinguishment, but the extinguishers must be of the rapid discharge type; the best known of these are CO_2.

There are three main methods of extinguishing fires in enriched atmospheres:

(1) Reduce the temperature.

(2) Release the pressure.

(3) Where fire is in an enclosed chamber, CO_2 or Nitrogen can be used as dilutant.

It is essential that the above points should be considered when equipment and areas involving oxygen enrichment are at the design stage.

It should also be remembered that some solids and gases which are normally nonflammable become flammable when in an enriched atmosphere.

HYPERBARIC TREATMENT

This involves the establishment of an environment where the patient is treated with air, oxygen or other gases at a pressure above that of normal atmosphere.

There are three types of Hyperbaric Unit:

(A) One-man Pressure Vessel—Adult type.

(B) Infant type Hyperbaric Oxygen Trolley.

(C) Purpose made Pressure Chamber.

The internal pressures do not usually exceed 30lbs/sq. in.

The Fire Hazards

The fire hazard is greater with 100% oxygen than in compressed air containing oxygen and nitrogen, probably due to the chemical and thermal quenching effect of nitrogen present.

In the presence of 100% oxygen the flame propagation can be by the means of the nap of clothing and hair on the skin.

Many materials which will not support combustion in normal atmospheres will burn vigorously in oxygen at three atmospheres. Fabrics normally flameproof at normal temperature and pressure burn slowly in air at three atmospheres.

Possible Causes of Fires

When considering hyperbaric units, the following likely causes of fire should be avoided:

(*a*) Static spark.

(*b*) Mechanical spark from impact or abrasion.

(*c*) Electrical spark from breakdown of insulation, or switch contacts.

(*d*) Overheating of combustible material by leakage of current or contact with conductors carrying excessive current.

(*e*) Chemical reaction, e.g. between oxygen/oil/grease.

Comparison and Observations on Three Types of Hyperbaric Unit

(1) *One-man Pressure Vessel—Adult type.*

This type consists of an adult trolley with a transparent cover. Normally working on 100% oxygen at 3 atmos.

The oxygen is supplied from either a liquid oxygen evaporator permanently situated or from storage cylinders of 240 cu. ft. capacity.

The trolley is exhausted from a pipe at floor level giving a rich content surrounding the trolley. This could be reduced by the use of an extension pipe taken to outside atmosphere.

Fire Risk

The fire risk is very high in the immediate vicinity of the trolley. The emphasis should always be on fire prevention more than extinction.

Sources of Ignition

(1) The spark of an electrostatic discharge.

(2) The overheating or sparks in the electric motors in the accelerator chamber, the trolley raising and propulsion mechanisms.

(3) Accelerator installations including high-voltage circuits and the possible breakdown of insulation is a risk.

To reduce the risk of ignition by the above sources, it is essential to ensure a high standard of maintenance of electrical fittings and equipment. The use of flameproof fittings will also reduce the risk.

Mechanical Damage

The oxygen supply pipe and the electrical cables are sometimes encased together in a flexible tube, this is pulled along the floor and is subject to injury. An alternative would be to provide pressurised oxygen at a fixed point and use spring loaded drum for cable coil. The possibility of using battery operated trollies should be considered.

Lubrication

Caution should be exercised in the selection and applications of oils and greases.

Smoking

The danger of visitors and out-patients smoking in areas of high fire risk should always be considered.

Emergency Evacuation

The procedure for the decompression of the chamber should be evolved and all staff involved should be instructed in the procedure.

Fire Detection and Fighting

Smoke detectors should be provided in the casing of the accelerator and transformer units. The detectors can be arranged to operate a CO_2 installation, cut off the electrical supplies and raise the alarm.

Portable CO_2 Extinguishers for first aid fire fighting should also be provided.

(2) *The Infant Type Hyperbaric Oxygen Trolley*

The oxygen is supplied from a fixed installation or storage cylinders.

Fire Risks

The risks are similar to the One-man Pressure Vessel, but to a smaller degree.

The possible dangers may arise from the following:

(*a*) Electrostatic sparks.
(*b*) Electrical equipment.
(*c*) Lubrication.
(*d*) Oxygen supply piping.

Fire Fighting

Adequate portable CO_2 extinguishers to provide for first aid fire fighting.

(3) *The Purpose Made Pressure Chamber*

The chamber is capable of containing the patient, members of the medical and nursing staff with other ancillary equipment. The chamber is pressurised from a pump room to about 3 atmospheres.

A period of some eight minutes may elapse before the chamber can be opened to avoid the danger of decompression sickness.

Fire Risk

The fire risk is increased by the increased oxygen content. The danger of electrostatic sparking will be increased if man-made fibres are used in staff clothing.

The electrical equipment used within the chamber should be flameproof. Converted iron beds should not be used within the chamber due to the mechanical spark danger. The use of flammable gases and liquids should be avoided.

The use of flammable clothing should be avoided. Lubricating oils should be used with great care.

Fire Fighting

A high pressure water hose reel would be effective whilst the chamber is under pressure, *but this can only be used after cutting off the electrical supply.*

Bibliography.— Fire Journal, Western Region Hospital Board, June, 1967.

BRITAIN'S FIRST ROBOT MEDICAL LABORATORY

THE BRITISH United Provident Association are to install the world's most advanced 'robot medical laboratory'—the £165,000 Swedish-made AutoChemist—in Britain's first multi-phasic medical screening centre which they plan to open in London during 1969.

The machine can carry out automatically up to 24 chemical tests on blood or urine samples, which are set up in a series of test tube 'trains' on a conveyor belt principle. The results are printed out via a built-in computer in one hour, with a warning mark against any abnormal readings in the analyses.

It has been calculated that the machine—which weighs four metric tons, and needs more floor space than a London bus—can handle a work load which would normally need 100 qualified technicians using conventional analytical methods.

The BUPA AutoChemist will be the first of its kind in use in Europe outside Sweden; it will be supplied by the British subsidiary of AGA Medical Division, Stockholm.

The machine has a maximum capacity of about a quarter million samples a year, performing in hours tests which would normally take days or weeks, and will automate some 90 per cent of the pathological work at the BUPA Medical Centre. In practice, this means that a doctor referring a patient to the Centre could expect a detailed test profile to be posted back to him the same evening.

It is thought that the BUPA Medical Centre will be used mostly for patients without any apparent symptoms, referred by their doctors for a periodic health check, although the Centre will also obviously be of use to physicians seeking urgent and detailed tests for patients.

It is for these reasons that the Centre will place emphasis on radical blood analysis through the use of the AutoChemist. Incipient disease can often be spotted by skilled interpretation of the state of the patient's blood chemistry, before obvious symptoms appear. At this stage, an illness can often be alleviated, or even completely avoided, by early, preventive action.

"The AutoChemist is in no sense a 'robot doctor'—there cannot be a substitute for a doctor's personal examination of his patient", says Eric Roberts, BUPA's General Manager. "But one could call it a robot path lab. This machine will remove a lot of the donkeywork and delay which the doctor faces at the moment when he calls for blood tests—for these have to be done mostly by hand, often in widely separated and overworked hospitals and laboratories."

Since the AutoChemist can handle so many tests at one time, it will actually be quicker and cheaper to provide a doctor with a full medical profile than to run a few selected tests by conventional means.

Most of AGA's production is going to the United States at the moment, where the concept of multi-phasic health screening is well developed.

"So great is the demand for the AutoChemist that if we had not seized this opportunity of installing a machine now, Britain would not have been able to obtain one until 1972", adds Mr. Roberts.

The unit will be delivered in 12 months time, but the BUPA Medical Centre will be able to operate the blood analysis service as soon as it opens, by flying blood samples from the London Centre to Sweden as an interim measure.

BUPA would be willing, if approached, to negotiate the use of the machine's surplus capacity by other organisations in the medical field.

Technical Description

AutoChemist is an automatic chemical analyser designed for the large-scale analysis of discrete samples. The main unit is a Central Chemical Processor which is fed with samples, and in which the actual analysis is carried out. The various functions within the Central Processor are controlled by an Electronic Control Unit which supervises the various stages in the analytical procedure. The results in the form of electric signals are transmitted via an amplifier to an 'on-line' Computer in which they are processed prior to being printed out by a Teletypewriter. Other equipment includes a Power unit and a Regulator Unit for the photometer lamps, both in separate cabinets. The entire installation is supervised from a control console which has an alarm signal panel.

In addition to the basic equipment outlined above, a number of auxiliary units have been designed. Examples of such equipment are Special Measuring Heads required for certain analyses and Satellite Stations for analytical procedures which are not suited for automation. In order to increase the memory capacity of the computer, one or more magnetic tape units can be added.

Central Chemical Processor

One of the basic ideas in designing AutoChemist has been to keep the entire procedure for individual tests completely separated, i.e. discrete sample handling, in order to reduce the danger of contamination.

The Central Processor consists of a mechanical conveyor system for samples and reaction tubes, pneumatic systems for the movement of pipettes, optical heads, etc., systems for reagent supply, pipetting, heating and cooling, as well as colorimetric measurement of the reaction solutions, ventilation system and apparatus for the washing and rinsing of a large number of test tubes, pipettes and measuring heads per hour.

The Central Processor has 24 analytical channels divided among four conveyors each with six channels. Three of these conveyors -the long ones- permit incubation for a maximum of 30 minutes at room temperature and a maximum of 50°C. The fourth shorter conveyor does not include facilities for heating.

Electronic Control Unit

The Electronic Control Unit is responsible for the operating reliability and accuracy of the entire installation. The electronic components are of solid state type. Thus the unit controls the various functions via a minimum of relays and switches.

Measuring Heads

Most laboratory analyses are made by colour determination of solutions in a photometer. The photometer is a double-beam ratio colorimeter fitted with interference filters. AutoChemist has a separate measuring head for each analytical channel, which makes it possible to use fixed narrow band interference filters.

Computer and Teletypewriter

The basic version of the apparatus is supplied with a fast small computer, model PDP-8, made by Digital Equipment Corp., and has a 4096-word memory and a 1·5 microsecond cycle time. It normally works with 12-bit words, but if greater accuracy is required its speed permits words twice as long.

The computer works in real time on line with the Central Processor.

Special Measuring Heads

Over and above the photometers included in the basic version, other measuring procedures using photometry with ultraviolet light, potentiometric and other physico-chemical measuring procedures may be incorporated. Flame photometers, fluorimeters, and pH-meters can also be built into the Central Processor by modifying the standard instruments.

Minicubes

Certain determinations require incubation at temperatures which normally are higher than 50°C or reactions with highly corrosive or bad-smelling liquids. Such determinations are best carried out separately from the normal ones. A hermetically sealed automatic analyzer with two channels called Mini-Cube has been developed to meet this need. The vital parts are made of corrosion-resistant materials and it can be built into the Central Processor, which in its basic version has space for up to four MiniCubes. The maximum operating temperature is 110°C.

Analytical Programmes

The field of clinical analysis work is growing steadily. The list of examples below is therefore by no means complete. Many other desired determinations can also be carried out. One of the unique features of the AutoChemist is its ability to analyse different sample material at the same time, e.g. blood serum and urine. It is possible to select a combination of analyses which covers more than 20 types of analyses for blood serum and at the same time may include the urine analyses. Such a combination is more comprehensive than that generally considered complete today.

An analytical programme can also be designed to fulfil specific medical purposes. For example, the determination of phenylalanine in blood for phenylketonuria (PKU) or other tests for metabolic disturbances in infants can be carried out during intervals in between the routine work of the analyzer. This is possible with AutoChemist, since the Central Processor has such a large number of analytical channels, some of which can be set aside and programmed for special determinations of this kind.

Examples:

Serum iron
Iron-binding capacity
Direct bilirubin
Total bilirubin
Transaminases (GOT and GPT)
Phosphatases (acid and alkaline)
Lactic acid dehydrogenase
Amylase
Lipase
Cholesterol
Beta-lipoprotein
Albumin
Total protein
Thymol turbidity
Zinc Sulphate reaction
Haptoglobin
Urea N
Creatinine
Uric acid
Glucose
Protein-bound hexoses
Sialic acid
Calcium
Potassium
Sodium
Chloride

COMPUTER COMMUNICATION NETWORK FOR HOSPITAL CENTRE

THE Department of Health & Social Security, the Birmingham Regional Hospital Board and International Computers Ltd. are co-operating in the development of a large hospital information system and communication network using remote access terminals connected to a central computer at the North Staffordshire Hospital Centre. The project, based on an I.C.L. System 4–50 computer, aims to improve the standard of patient care and raise the level of hospital efficiency by speeding the flow of information and increasing communication between different departments.

A system for handling out-patients' bookings and clinical records will be developed first and will be followed by the development of a similar system for in-patients. The I.C.L. System 4–50, which will have connected to it 12 video terminals and 4 teleprinters, will be installed in a new building in Stoke-on-Trent in April 1970. Further remote terminals will be added to the system as the project develops.

Clinical records produced automatically for outpatients

Video terminals located in the outpatient clinic areas will be used for making appointments, requesting tests and displaying test results if required, entering patients on hospital bed waiting lists, and also to book patients for examination in other clinics.

In addition, summary clinical information on patients, such as diseases diagnosed, test results, operations performed and drugs prescribed, will be printed out by the computer for the doctor. These print-outs will be raised automatically by the booking system.

Computer terminals in the wards

Initially, video terminals will be installed in the admission offices of the two main units of the Hospital Centre, the North Staffordshire Royal Infirmary and the City General Hospital. These terminals will be used for admission and bed allocation procedures.

The next stage will involve the extension of the system into selected wards of the two main hospitals by the installation of teletypewriter terminals at strategic points to serve groups of wards. It is hoped that the system will subsequently be expanded to all wards.

Doctors' attention drawn to abnormality

The terminals in wards will primarily be used to make requests and receive reports on investigations, to aid the prescription and administration of drugs and for putting patients on operating lists. They will also help to establish the existence and location of all records relating to a patient. In certain cases, for instance the reporting of biochemical tests, the computer will detect and draw to the attention of the medical staff any abnormal results. A further use of ward teleprinters will be the recording of diagnoses. The computer will maintain dictionaries of the most commonly diagnosed diseases and commonly used drugs, which will enable drugs and diseases to be input in plain English with any necessary coding done by the computer.

I.C.L.'s team has been developing the systems so far in collaboration with the staff of the Regional Hospital Board and the Hospital Group, and will continue to assist as the Hospital Centre builds up its team.

The Company is helping the development of a similar multi-access system at King's College Hospital, London, based on an I.C.L. 1905E computer.

CHICHESTER HOSPITAL EXTENSION AHEAD OF SCHEDULE

COSTAIN Construction Ltd. is ahead of schedule on its £664,000 extension scheme at St. Richard's Hospital, Chichester, Sussex.

Work began in early May for completion in two years and, despite the sophisticated nature of the specialised plant and equipment to be installed, good progress is being maintained.

Work on the outpatients' block is three weeks ahead of programme, and is on schedule for the theatre and sterile department block.

Two new blocks will be built. One will house the Out-patients/Diagnostic Department, and the other Operating Theatres and Central Sterile Supply Departments. The ground floor of the buildings will have a reinforced concrete frame, the first floor a light steel frame.

The Out-patients Department will be part single storey and part two storey. On the ground floor there will be a Central Records Department, X-ray Diagnostic Department, Pharmacy, Accident and Emergency Centre, and Short Stay Recovery Ward. The upper floor will contain general purpose and specialist consulting suites together with treatment facilities and a Department for Hospital Social Workers.

This block will be linked to the Theatre block and existing Hospital by twin corridors which will eventually be integrated within the hospital in a future stage of the development.

The existing Sterile Supply Department will be increased in size and two new Operating Theatre Suites will be added to the existing ones.

A feature of the contract is the large amount of complex heating, ventilation and medical equipment to be installed. The construction and installation programmes are agreed at the regular sub-contracts co-ordination meetings held on site to ensure that the present rapid rate of progress is maintained.

The scheme has been designed by Mr. Richard Mellor, F.R.I.B.A., succeeded by Mr. B. W. East, F.R.I.B.A., Architect to the South West Metropolitan Regional Hospital Board. Mr. K. J. Eatwell, C.Eng., M.I.Mech.E., M.I.H.V.E., Engineer to the Board, is responsible for the design of the mechanical and electrical services. Messrs. Clarke, Nicholl & Marcel are the Structural Engineers, and Messrs E R. Babbs & Sons the Quantity Surveyors.

The main sub-contracts are being carried out by Lorne Stewart Heating Ltd., and by William Steward and Company Ltd., electrical contractors.

Abstract of Reports

FAZAKERLEY AND DISTRICT H.M.C.

The summary below covers the year ending 31st March, 1968. During the year admissions and discharge of patients continued normally.

The various forms of intestinal infections kept the enteritis wards busy throughout most of the year: it is a reflection of the imperfect standards of food hygiene in this country that such cases continue to occur. The incidence throughout the country shows no sign of falling.

Aintree Hospital

During the current year 3,155 patients were admitted to the hospital, a small increase from last year of 180, and consequently for the second successive year there was no general alteration in the allocation of beds for tuberculous and non-tuberculous medical chest patients.

The Geriatric Wards, combined with the out-patient clinic, continues to work to capacity throughout the year. As yet there is no definite information on the building of the Geriatric Day Hospital but negotiations continue to be pursued with every hope of a successful conclusion.

Work on the provision of a new Respiratory Physiology and Cardiographic Unit based on the old Pathology Laboratory building has been completed during the year apart from some minor furnishing. In the unit which comprises two laboratories for lung function tests, two rooms for electrocardiography, patients waiting room, office and toilet accommodation for patients and staff has been installed.

The improvement made on South Upper with the opening up of the cubicles and glazing of the verandah has been extended to South Lower Ward and these wards now are an outstanding example of what can be done to upgrade old and inconvenient wards. It is hoped in future to upgrade the East Block and to enlarge North Ward which was formerly a children's ward and is not ideal for adult patients.

As the hospital buildings are in the region of 60 years old there are many other improvements needing to be made, especially the provision for lounges for 'up' patients, and a quiet room or interview room for visitors wishing to have a confidential talk to a patient or who are resting between periods of sitting by the very sick. This is not an easy problem to solve owing to the geography of the wards.

Thoracic Surgical Unit

Regarding the thoracic surgical patients, tne number of major operations has increased from 277 to 311. There was little change in the number of minor cases but included in these were 19 patients who received benefit from the new cardioversion apparatus. This has proved more than useful in restoring cases of cardiac irregularity after operation for mitral stenosis back to sinus rhythm. Apart from its use in post-operative patients, it is a useful standby for other forms of cardiac arrhythmias.

As regards the work carried out in the last year, there has been a very welcome reduction in the number of malignant cases in lung, stomach, and oesophagus, and these have been replaced by patients for whom a much better possibility of long-term cure is possible.

Another suction apparatus is required in one of the theatres as at the moment one sucker has to be used in turn by the Anaesthetist and the Surgeon, whereas the occasions often arise when both need its use at the same time.

The overhead lamp in the old theatre gives a rather inadequate light, and is extremely difficult to manoeuvre into a suitable position in relation to the patient. In view of its age, which must be well over thirty years, it is felt that serious consideration should be given to the fitting of a modern up-to-date form of lighting.

Geriatric Unit

The Geriatric Unit continues to provide long term care for patients living in the Unit's catchment area, and the waiting list has been kept short, suggesting that the demand for this sort of care is being met. Pressure, however, from the bed-bureau and general practitioners indicates that the acute cases are not being admitted as freely as would be desirable.

X-Ray Department

Whilst there has been a reduction in the number of in-patients for X-ray examinations, the number of out-patients referred by General Practitioners has increased, the work-load during the year having remained unaltered.

Department of Pathology

No major changes have occurred in the laboratory's work this year. Some extra benching has replaced antiquated and inconvenient cupboards with benefit to working conditions, but the building, which is highly appreciated by those who use it, is substantially unaltered.

The benefits of having a part-time registrar are seen in a steady increase in the morbid anatomy workload: there is now always a pathologist on duty in the group, a provision of importance should a surgeon need a quick opinion on a fragment of tissue during the course of an operation.

Laundry

It is, of course, recognised that the modern machinery which has been installed is not running, at the moment, to full capacity, but plans are afoot to undertake work from other hospitals when older laundries situated in them become redundant, and, of course, a considerable flow of work will come from the new Maternity and General Hospital in due course. The building, plant and staff amenities are superb and the Laundry staff would like to place on record their appreciation to all concerned.

Catering Services

In the very near future it is anticipated that the new Maternity Hospital will be functioning and the Catering Department are busy preparing for the task of providing a plated meals service to the patients there, who will ultimately number 112.

November saw the opening of the new Staff Cafeteria which is proving to be very popular and functions very well. This accommodation will be used by the staff of the new Maternity Hospital. In preparation for the additional work load, monies were provided out of the Regional Hospital Board's winter works allocation, to equip the main kitchen with the most up-to-date cooking facilities, including the new forced air convection oven which has been installed amongst other things and which is creating considerable interest.

On the Market

A review of new equipment and materials and their development

BOSSMATIC CONTROL VALVES

The range of Bossmatic Control Valves has been extended to cover all sizes from ½" to 12" nominal bore and valves with either screwed or flanged connections are now available.

Of particular interest are the entirely new Fig. 56 Three-position Regulating Valves which are characterised by a new type of double diaphragm drive, providing the following positions of actuation:

(*a*) Main diaphragm for opening.

(*b*) Auxiliary diaphragm for throttling.

(*c*) Spring bias for closing.

The diaphragm chamber can be loaded manually, via pneumatic or electric remote controls. Automatic actuation can be carried out in conjunction with volume control mechanisms, e.g. quantity meters with batch and pre-batch facilities, scales, etc.

The double diaphragm drive is mechanically adjustable, and can therefore be set to give perfectly reproducible valve settings —OPEN—THROTTLING—CLOSE—making three-position regulating valves extremely versatile. Thus, for example, all filling and tapping processes where volume, weight, fluid level, etc., need to be closely controlled, can be carried out automatically.

Further information from **British Steam Specialties Ltd.,** Fleet Street, Leicester LE1 3QQ.

MINI-VISOR INVISIBLE RAY

A smaller model of the invisible ray Type BBA 150L has been introduced by **Radiovisor Parent Ltd.,** London, S.W.19.

This unit, which is a true scaled-down version of the standard model, has identical technical features but the maximum beam length is limited to 35 feet. The projector lamp, having a rated life of six years, is electronically modulated.

Constructed on a printed circuit board employing fully transistorised amplifier, all short life expendable components have been eliminated. Because of this the unit requires no regular maintenance and will run for years with little attention.

The range of the present standard invisible ray model Type BBA 150L has already been extended to 350 feet and the Mini-Visor has been introduced to meet the need for a smaller and less expensive unit for shorter distances. The unit will show considerable saving in the protection of windows.

NEW KODAK X-RAY INTENSIFYING SCREENS

Kodak Ltd. has announced the introduction of new X-ray intensifying screens giving very high resolution, to be used particularly in conjunction with the Kodak R.P. "X-Omat" system. The new products are calcium tungstate screens of extremely fine grain, coated on to a plastic base.

The screens are intended to provide an alternative method of exposure for radiography of the extremities, in place of non-screen exposures with Kodak R.P. "X-Omat" Medical X-ray film, to reduce exposure times. They will enable the Company's R.P. "X-Omat" medical X-ray films in conjunction with the R.P. "X-Omat" Processor to be employed for all types of radiography.

The High Resolution Intensifying Screens can also be used with other screen-type medical X-ray films where these are to be processed either manually or automatically, and where the highest level of information is required.

Further information from Kodak House, Kingsway, London, W.C.2.

NEW RANGE OF HEAT EXCHANGERS FOR HERMETIC REFRIGERATION SYSTEMS

Danfoss (London) Ltd., of 6 Wadsworth Road, Perivale, Greenford, Middx., have announced the introduction of a new range of heat exchangers specially designed for use with hermetic refrigeration systems. Available in four basic suction length sizes, namely: 63 in. (1,600 mm.), 71 in. (1,800 mm.), 79 in. (2,000 mm.) and 89 in. (2,250 mm.), the exchangers are made of copper and supplied coiled with the suction line ends closed (with rubber plugs) and the capillary tube ends pinched and stamped for identification purposes.

With the range, twenty different combinations of suction line lengths and restrictors are available, the restrictors having an outside diameter of either 0·078 in. (2 mm.) or 0·098 in. (2·5 mm.) according to application. The suction lines have an outside diameter of either 0·25 in. (6·35 mm.) or 0·313 in. (7·94 mm.).

Further details, including price and delivery, are available on request to the manufacturer.

NEW FLEXIBLE PIPE INSULATION FROM VAN DEN BOSCH

Van den Bosch Ltd., the U.K. member of the Europair International organisation, announce that their comprehensive product range has been further extended with the addition of Europair Flexible Pipe Insulation.

The insulation is manufactured from a self-extinguishing flexible foamed plastic material with a closed cell structure and with an outer skin forming a very efficient vapour barrier.

This feature makes the product particularly valuable on condensation control applications, and its operating temperature range is from —40°F. (—40°C.) to +220°F. (+104°C.). The product is eminently suitable for pipelines containing refrigerants, chilled water and hot and cold water.

Supplied in lengths of 6 feet, to suit pipe sizes from ¼" o.d. copper to 3½" nominal bore steel, the insulation is supplied as a cylindrical sleeve for direct application to pipes before they are fitted. For use on pipes already installed, the sleeve can be slit along its length and the joint sealed with brush-applied Euroflex Instant Bond Adhesive. The same adhesive is used on butt joints between adjacent lengths and in the fabrication of Europair Flexible Insulation Covers for tee fittings and sharp elbows. The straight lengths of the material are sufficiently flexible to follow normal pipe bends without cutting.

For further details apply to Van den Bosch Ltd., Europair House, Alexandra Road, Wimbledon, London S.W.19.

PUSH-BUTTON BRAKING FOR HOSPITAL CASTORS

A new range of swivel and wheel braking Tente castors is announced by **A. James Grant Ltd.**, of The Dutch House, Holmwood, Dorking, Surrey, who are sole agents in G.B.

The castors offer a really effective brake which is operated by a single push button. It is not purely a wheel brake, it positively locks the double ball bearing swivel head as well. Hospital staff can see at a glance whether or not the castor has its brake applied, by noting the disappearance of a colour indicator on the push button itself. The mechanism is fully adjustable for tyre wear and a production sample push button has already been depressed over a million times on a test castor with no detrimental effects. The whole of the braking mechanism is contained within the natural contour of the castor, which of course means that there are no projections to damage walls or furniture.

Wheel sizes are 4, 5 and 6 inches diameter in either blue-grey rubber or black non-marking, non-staining antistatic rubber. They all contain twin, caged ball races and have threadguards to prevent the intrusion of dirt and threads.

A further feature is the provision of an expanding metal adaptor fitting for tubes, which does not undo itself when a unit to which the castor is fitted is moved whilst the brake is on. Solid plug, flat top plate and screwed stem fittings are also available as standard.

NEW HOVAL THERMOSTATIC BLENDING VALVE

Simplicity of construction, the virtual elimination of maintenance and the lasting accuracy of control even in hard water areas, are three of the principal features of an entirely new thermostatic blending valve just introduced to this country by **Hoval Boilers (U.K.) Ltd.**, Northway House, High Road, Whetstone, London, N.20.

Known as the Irgumat 1550, the valve is completely automatic in operation, and is pre-set at the factory to ensure that the blended water is maintained at a constant temperature.

The "heart" of the valve is the thermostat, immersed in the blended water flow. The thermostat reacts to the temperature of the surrounding water, comparing it with the pre-set temperature. Any variation in temperature alters the volume of a compound in the thermostat head, causing a corresponding movement of the valve piston. Any increase in pressure on the piston opens the valve further, thus increasing cold supply to the blended water circuit and reducing hot water flow. Similarly, any decrease in pressure on the piston allows the valve to close by means of a return spring, having the effect of increasing the supply of hot water and reducing the flow of cold water to the circuit. When the pre-set temperature is reached, no further movement of the valve takes place.

In the event of the cold water supply ceasing for any reason, the thermostat automatically closes the hot water inlet.

The valve can be fitted in any position and, because of its relatively wide waterways, is largely unaffected by lime deposits or other impurities in the water.

The new valve gives an accuracy of $\pm 2°C.$ (3·6°F.) in relation to the pre-set temperature, and can be supplied with any of eight different settings ranging from 25°C. (770°F.) to 78°C. (172°F.). Should a different blended water temperature be required at some later date, it is possible to remove the valve cover and to exchange the complete sensing equipment.

Valves are available with $\frac{3}{4}$ in., 1 in., $1\frac{1}{4}$ in., $1\frac{1}{2}$ in. or 2 in. connections.

NEW BEVERAGE UNIT

W. M. Still & Sons Ltd. announce the availability of a completely new coffee machine known as the Unit-One. It is Still's first single cylinder coffee machine and has a capacity of one gallon.

As with all Still's beverage units, it operates from an under-counter boiler which can be either a Rapide or Standard Vertical model, the heating medium being either gas, electricity or steam. Although the unit's appearance is quite unlike the standard Still's coffee machine, it nevertheless embodies all the recognised advantages. The chromium plated outer casing is lined with Pyrex glass, while the brewing capacity is one gallon every 10 minutes. The machine incorporates a steam injector for the rapid heating of milk, soup, etc., and there is an availability of boiling water through an instant draw-off tap. An additional advantage is that the Unit-One provides both a percolated and, if required, "instant" coffee brew.

A most attractive feature of this new coffee brewing unit from Stills is its price at £115 0s. 0d.

NEW HOSPITAL LIGHTING FITTINGS

Recommendations from the Ministry of Health engineers have been incorporated in a new range of bedhead lights produced by **Falks Ltd.**, 91, Farringdon Road, London, E.C.1.

The range comprises five types, all having rectangular die-cast aluminium backplates with quadrant plates for two-hole fitting at 2 in. centres. The backplate is of the heavy duty type, with ample space for incoming wiring. All types use an identical arm, terminating in a ball joint specifically developed for hospital purposes.

Of the five, one has the specially contoured shade anodised silver inside and outside. With a 40-watt lamp it gives the efficiency of a 60-watt wall bracket lighting fitting; but with no temperature problem. There are two with cylindrical shades with white exterior and interior, and silver finish top lampholder cover. Both of these are fitted to take a 60-watt lamp. Additionally, one is wired with an extra lampholder for a 15-watt Pygmy lamp for night use. The remaining two units are similar but have a parabolic reflector extension to the cylinder, which is finished black inside for glare reduction.

Prices range from £4 14s. 0d. to £5 11s. 0d. All types can be supplied with a pull chain switch plus Pattress with knockouts for surface wiring.

THERMODYNAMIC STEAM TRAP

A new Thermodynamic Steam Trap with integral strainer has been introduced by **Lancaster & Tonge Ltd.**, "The Lancaster" Works, Statham Street, Pendleton, Manchester 6, to supplement their range of mechanical steam traps. This trap is available in three types.

The Mark 1 Trap has a bronze body and cover and will shortly be available in cast steel. The pressure rating is 5–200 p.s.i.g.

The Mark V11-C Trap is for high pressures.

The Mark 10-B Trap, which is available in $1\frac{1}{2}$" and 2" sizes, is of cast steel and the pressure rating is 5–300 p.s.i.g.

All the above traps embody the feature of on line maintenance because they are fitted with renewable valves and seats. A brochure (No. 108) is available on request.

Notes for Members

STANDING CONFERENCE NATIONAL QUALIFICATION AND TITLE

At the conference held on 10th December, 1968 considerable progress was made. A draft Constitution for the new Council was prepared for submission to the Board of Trade for registration as a Company limited by guarantee.

The Institute, of course, has representation on this new Council, and further details will be announced as and when they become available.

ONE-YEAR TRAINING COURSE FOR HOSPITAL ENGINEERS

At the request of the Department of Health and Social Security, the Leeds, Birmingham and Sheffield Regional Hospital Boards have agreed to organise a further one-year training course for potential Group Engineers, commencing in June, 1969.

The scheme will follow the pattern of the pilot experimental course set up in June 1968, and will again consist of 12 months practical and theoretical training in hospital engineering at selected training hospitals, supplemented by intensive management and technical training at appropriate Training Centres.

The number of available places on the Course will again be limited and preference will be given to candidates already employed in the Hospital Service who hold, or expect to obtain by June, 1969, the qualifications for a Group Engineer laid down in P.T.B. Circular No. 191. Successful candidates would retain their existing salaries throughout the training period and would qualify for travelling expenses and subsistence allowances, at the normal rates applicable, in connection with the Training Programme.

Further details of the Training Scheme, together with the appropriate application form, will be provided by the Secretary, Leeds Regional Hospital Board, but in the first instance applications should be sent to the Secretary of the local Regional Hospital Board.

ANNUAL CONFERENCE, INTERNATIONAL HOSPITAL EQUIPMENT, MEDICAL ENGINEERING & SERVICES EXHIBITION

2nd to 6th June, 1969

As is usual, the Institute will hold a three-day technical Conference during this Exhibition. This time, the Conference will be held on the first three days, from 2nd to 4th June.

The Institute will also hold a Dinner during the Conference, on the evening of Tuesday, 3rd June at the Rembrandt Hotel, Thurloe Place, S.W.7.

Full details will be distributed to Members in due course.

Conference Programme

Monday, 2nd June

Morning

Paper: "The Role of the Engineer in the Hospital Service"
Speaker: A. S. Marre, C.B.,
Second Permanent Under-Secretary of State,
Department of Health and Social Security

Tuesday, 3rd June

Morning

Paper: "Disposal of Hospital Waste"
Speaker: E. Davies, C.Eng., M.I.Mech.E.,
Deputy Regional Engineer, South West Metropolitan R.H.B.

Afternoon

Paper: "Some aspects of Medical Engineering"
Speaker: M. Brown,
Department of Medical Electronics,
St. Bartholomew's Hospital, London

Wednesday, 4th June

Morning

Paper: "The Engineering Services in the new St. Thomas' Hospital"
Speaker: Poul Hansen, M.Sc., M.Ing.F., Partner,
Steensen, Varming, Mulcahy & Partners

Afternoon

Paper: "Engineering aspects of the Best Buy Hospital"
Speaker: B. R. Joseph, C.Eng., A.M.I.C.E.,
M.I.Mech.E., M.I.E.E.,
Department of Health and Social Security

LANCASHIRE BRANCH

The Lancashire Branch held a meeting on 28th November, 1968 at the offices of the Manchester Regional Hospital Board.

A talk and film on Air Conditioning was given by members of the How Group Ltd., a firm of engineers who deal with mechanical services.

Points that must be watched in order to achieve a satisfactory heating and air conditioning system were covered in some detail. It was quite obvious that great care has to be taken at the design stage, and co-ordination between engineer and architect is vital if the finished product is to be worthy of the time and money spent.

Air conditioning is more costly than mere heating but need not be expensive if properly designed in conjunction with correct building design.

It was apparent from the lively discussion which followed, and the many points of view heard from both members and visitors, that air conditioning was becoming more of a necessity than a luxury. As one member said, "who knows but that tomorrow we may have the mini air conditioning system in our homes as standard practice".

EAST ANGLIAN BRANCH

A Branch Meeting was held at Addenbrooke's Hospital, Cambridge on Saturday, 2nd November, 1968 and was

addressed by Dr. D. H. Clark, M.A., M.B., Ch.B., F.R.C.P. (Ed.), D.P.M., Physician Superintendent of the Fulbourn and Ida Darwin Hospitals. Dr. Clark's subject was "The Engineer in the Therapeutic Community", and he outlined details of this new idea with regard to the treatment of the troublesome type of patient.

These patients are housed together and the errors of their ways are pointed out to them and they are trained in such a way that they can see their mistakes. All their fellow patients' problems are discussed. Although the result can often mean much work for the Engineer to maintain services, etc., benefits of this type of treatment are considerable.

Dr. Clark contrasted present practice with the old institutionalised life prior to World War 2, and there followed a lively discussion.

NORTH EASTERN BRANCH

A meeting of the North Eastern Branch was held in the Board Room of the Royal Victoria Infirmary, Newcastle on Wednesday, 20th November, 1968 at 7. p.m., to hear a paper entitled "The Artificial Kidney" given by Professor D. N. S. Kerr. Professor Kerr was recently appointed to the Chair of Medicine of the University of Newcastle on Tyne and is in charge of the Artificial Kidney Unit at the Infirmary.

Professor Kerr explained that patients with reduced renal (kidney) function could cope by strict diet down to 1/50th of normal renal function. Below this level, or when renal function was totally absent, the only real solution was artificial dialysis. The number of artificial kidneys in service was rapidly increasing and at the present time 54 long term patients were being "serviced" in the Unit attached to the Infirmary.

The professor spoke in very straightforward terms on the function of the Artificial Kidney, describing some of the many engineering problems associated with the development of these units. The type of pump used was discussed at some length—conventional types of pump being extremely injurious to the blood cells. The increasing use of Home Dialysers costing £1,500—£2,200 each has brought further problems of reliable but uncomplicated controls and alarms.

Following the main talk, we were conducted by Professor Kerr around the Artificial Kidney Unit, where the different units were inspected with interest, and further information was given in response to questions.

The paper was received with great interest by all present. In thanking Professor Kerr for the very worthwhile evening, Mr. Meyer expressed the hope that greater co-operation between the engineering and medical professions would bring an early solution to many of his problems. In particular, any help that members could provide would be enthusiastically given.

SOUTHERN BRANCH

A meeting of the Southern Branch was held on 16th November, 1968 at the Post Graduate Medical Centre of Southampton General Hospital.

A. Newton, C.Eng., M.I.E.E., M.I.E.E.E., P.Eng., Main Grade Engineer to the Wessex Regional Hospital Board, addressed the Meeting and commenced by saying that his talk was based on Electronics, and equipment associated with its use, and followed this with a short discourse on Electron Theory.

The audience was then taken step by step through the more practical aspects of electronics and how they can be made to serve usefully within the field of the Hospital Service. Different applications such as Nurse Call, staff communication with 2-way control, closed circuit T.V., patient monitoring in an intensive care unit, computers, all aspects of plant and boiler house control were discussed with their advantages and possibilities.

Such an interesting talk left little time for questions but Mr. Newton dealt with those that were raised and an enlightening session was brought to a close by the Chairman thanking Mr. Newton, who, in reply, said it was such a comprehensive subject that he was quite prepared to attend again at some future meeting and enlarge on it.

B.S.I. News

Metrication

The code letters printed on the right hand side of the titles of relevant standards have the following significance:

M — Standards in which the requirements are specified only in metric units (in some instances, approximate imperial conversions are included).

M · I — Standards in which the requirements are specified in both metric and inch units, so that either set of units can be used exclusively to meet those requirements.

N — Standards which by their nature are independent of any system of units, e.g. colour codes and glossaries.

Standards not coded are still expressed in imperial units; they generally include approximate metric equivalents.

NEW BRITISH STANDARDS

B.S. 1000 : Universal Decimal Classification. English Full Edition.

1000 (628) : 1968 Public health engineering. Water. Sanitation. Illuminating engineering. 28 pp. 20s. N

A systematic schedule with an alphabetic subject index for the classification of matter pertaining to public health engineering, i.e., water supply; urban drainage; sewerage and sewage; urban hygiene and refuse; drainage, and sanitary aspects of buildings; indoor climate engineering (air conditioning, heating and ventilating); illuminating engineering. (SBN: 580 00382 5)

B.S. 1679 : Containers for pharmaceutical dispensing.

1679 : Part 7: 1968 Ribbed oval glass bottles. 12 pp. 6s. M

B.S. 4368 : Carbon and stainless steel compression couplings for tubes.

4368 : Part 1: 1968 Metric sizes. 44 pp. 14s. M

Requirements for carbon and stainless steel compression couplings for tubes. Type "A", "B" and "C" for tubes having outside diameters designated in millimetres, in sizes from 6 mm. to 50 mm. (SBN: 580 00358 2)

4368 : Part 2: 1968 Inch sizes. 20 pp. 8s.

Specifies requirements for carbon and stainless steel compression couplings for tubes for use with tubes designated by the outside diameter in sizes from $\frac{1}{4}$ in. to 2 in. (SBN: 580 00383 3)

NEW CODES OF PRACTICE

B.S. CP 1016 : Code of Practice on the use of semiconductor devices

CP 1016 : Part 1: 1968 General considerations. 32 pp. 12s. N

Guidance on the design, construction, use and maintenance of equipment using semiconductors so that optimum performance and life may be secured. (SBN: 580 00365 5)

CP 3007 : 1968 Milking installations. 28 pp. 10s.

General principles of design, testing and maintenance of milking installations. (SBN: 580 00388 4)

REVISED BRITISH STANDARDS

B.S. 2028, 1364 : 1968 Precast concrete blocks. 44 pp. 15s. M

Specifies precast solid, hollow or cellular blocks (including aerated concrete blocks) according to their properties and gives the uses for which they are intended. (SBN: 580 00337 X)

B.S. 3232 : 1968 Safety requirements for medical treatment lamps. 28 pp. 10s. M

Safety requirements for lamps intended for operation on a declared supply voltage not exceeding 250 V. director or alternating r.m.s., which incorporate an ultra-violet, radiant heat or infra-red emitter or combination of two or more of these. (SBN: 580 00373 6)

Index to Advertisers

WANTED — Twenty manufacturers of modern hospital equipment to complete the exhibition.

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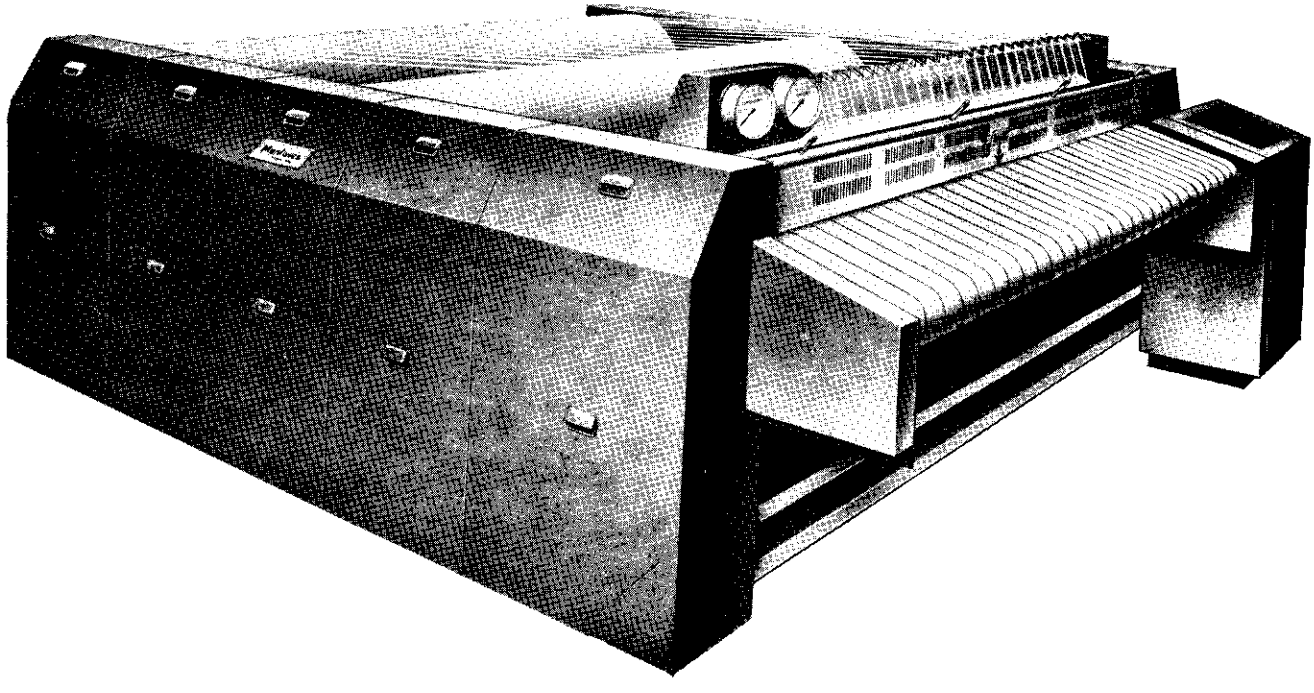

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SITUATIONS VACANT

EAST BIRMINGHAM HOSPITAL MANAGEMENT COMMITTEE

ASSISTANT ENGINEER

Assistant Engineer required at East Birmingham Hospital to assist the Hospital Engineer in the management and organisation of engineering services, operation and maintenance. Responsibilities involve electrical and mechanical services and the control of Planned Maintenance. Applicants must possess an O.N.C. or O.N.D. in electrical or mechanical engineering or an approved equivalent qualification. Salary commencing £975 p.a. rising to £1,270 p.a. A house may be available to a married applicant at a moderate rental. Apply in writing, stating age, experience and qualifications, with names and addresses of two referees, to the Group Engineer, East Birmingham Hospital Management Committee, Group Administrative Offices, 45, Bordesley Green East, Birmingham, 9.

HOSPITAL ENGINEER

For Brandesburton Hospital, Brandesburton, Nr. Driffield, E. Yorks, 350 beds, and two small hospitals at Hornsea, 64 beds, plus any other commitment as detailed, to be responsible to the Group Engineer for operation and maintenance of all engineering services including steam raising plant. Should have a sound knowledge of boilers of all types, mechanical and electrical equipment, completed an engineering apprenticeship, management experience, preferably previously employed as an Hospital Engineer or Assistant Hospital Engineer at a Psychiatric/Mental Subnormality Hospital with some knowledge of a General Hospital's commitments, and must hold one of the following qualifications or equivalent:—(1) C. & G. Technicians Certificate (Part II) which must include Plant Maintenance and Works Services, (2) C. & G. in Plant Engineering, (3) M.O.T. Certificate of Competency 1st Class which includes an O.N.D. or O.N.C. Applicants must be able to produce the appropriate Certificate to the Interviewing Panel if selected for the official short list.

Salary scale £1,270-£1,500 per annum (five annual increments to reach top scale) plus responsibility allowances.

The post is due to fall vacant early in April, 1969, and the successful applicant will be required to commence at that period.

No married accommodation available. Private accommodation should be within a reasonable distance of Brandesburton Hospital. A Hospital house may be available at a later date if required.

Applications on forms obtainable from the Group Engineer, East Riding Hospital Management Committee, Westwood Hospital, Beverley, E. Yorkshire, stating age, qualifications, experience and the names of two referees of sound standing to be returned to the Hospital Secretary, Brandesburton Hospital, Brandesburton, Nr. Driffield, E. Yorkshire by 17th February, 1969.

BRISTOL

COSSHAM & FRENCHAY HOSPITAL MANAGEMENT COMMITTEE

HOSPITAL ENGINEER

Applications are invited for the above post. The successful candidate will be based on Frenchay Hospital, Bristol and will be directly responsible to the Group Engineer for the engineering services there and for three other smaller hospitals in the Group.

Applicants must hold one of the following qualifications, or an equivalent qualification approved by the Department of Health or Secretary of State for Scotland:

(i) H.N.C. or H.N.D. in Mechanical Engineering with endorsements in Industrial Organisation and Management and Principles of Electricity or Electro-Technology, if this was not taken as a subject of the course; or

(ii) H.N.C. or H.N.D. in Electrical Engineering with endorsements in Industrial Organisation and Management and including (at S.III or O2 level, or with endorsement in) Applied Heat and Applied Mechanics, provided he has suitable practical experience in mechanical engineering; or

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

Salary scale £1,370-£1,605 per annum, plus £100 special responsibility allowance.

Application forms may be obtained from the Secretary, Frenchay Hospital, Bristol. Closing date for applications 10th February, 1969.

HULL (B) GROUP HOSPITAL MANAGEMENT COMMITTEE

WINESTEAD HALL HOSPITAL (175 BEDS)

On retirement of the present holder, a vacancy will occur from 1st April next for an Assistant Engineer.

This appointment is an excellent starting point for a career as an Engineer in the Hospital Service.

Candidates must hold an Ordinary National Certificate in Engineering or an equivalent approved qualification. Current inclusive salary £975 to £1,270 p.a. Application forms from Group Secretary, De la Pole Hospital, Willerby, Hull, to be returned by 14th February.

CARDIFF HOSPITAL MANAGEMENT COMMITTEE

Applications are invited for the appointment of HOSPITAL ENGINEER to be responsible to the Group Engineer for the engineering services at St. David's Hospital. Salary scale £1,270-£1,500, plus units responsibility allowance at present of £50 per annum.

Applicants must have completed an apprenticeship in Mechanical or Electrical Engineering or have otherwise acquired a thorough practical training as appropriate to the duties and responsibility of the post. Applicants must be in possession of H.N.C. or H.N.D. in Mechanical or Electrical Engineering with endorsements or an equivalent qualification approved by the Ministry of Health. They should also have a sound knowledge of the efficient operation of mechanical fired steam boiler plants and a wide experience of mechanical or electrical services, preferably in the Hospital Service.

Applications giving age, qualifications, apprenticeship, present employment and experience with the names and addresses of two referees to be sent to Group Secretary, Cardiff H.M.C., 44 Cathedral Road, Cardiff.

BRIGHTON & LEWES HOSPITAL MANAGEMENT COMMITTEE

DEPUTY GROUP ENGINEER

Required for newly created post.

The Officer will be given every assistance to attend courses to further himself in the Health Service.

Salary Scale £1,370-£1,605 plus responsibility allowance of £175.

Applicants should hold one of the following qualifications, or an equivalent approved by the Minister of Health:

1. H.N.C. or H.N.D. in (a) Mechanical Engineering with Endorsements in Industrial Organisation and Management and Principles of Electricity or Electro-Technology, or (b) in Electrical Engineering with endorsements in Industrial Organisation and Management, and including (at S.III or O2 level) endorsements in Applied Heat and Applied Mechanics, or
2. City and Guilds Mechanical Engineering Technicians full Technological Certificate (Part III) which must include Plant Maintenance and Works Service.

Job description and Application Forms (returnable by February 17th, 1969) from: The Group Engineer, Brighton General Hospital, Elm Grove, Brighton.

THE HOSPITAL, GRASSINGTON, NEAR SKIPTON, YORKSHIRE

HOSPITAL ENGINEER

The above appointment will become vacant due to the retirement of the present holder early in 1969. His successor will be responsible directly to Group Engineer for the maintenance of engineering services, for day-to-day supervision of building maintenance, and for fire-protection, at this psycho-geriatric hospital of approx. 280 beds.

Applicants must have acquired a thorough practical training as appropriate to the duties and responsibilities of the post and MUST hold one of the following qualifications or an APPROVED equivalent:—

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

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

(iii) Ministry of Transport First Class Certificate of Competency which includes an Ordinary National Diploma or Ordinary National Certificate.

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

The Officer appointed will be required to reside on the Hospital estate and a house is available at moderate rental.

Applications stating age, training, qualifications and experience, naming three referees, to Group Secretary, High Royds Hospital Management Committee, High Royds Hospital, Menston, Ilkley, Yorkshire, by 15th February 1969.

NORWICH, LOWESTOFT AND GREAT YARMOUTH HOSPITAL MANAGEMENT COMMITTEE

Applications are invited for the appointment of GROUP ENGINEER to be responsible to the Committee for the organisation and control of engineering services and building maintenance, together with minor capital work delegated by the Regional Hospital Board.

The Group comprises thirteen hospitals, totalling at present 1,956 beds. The Group Headquarters, at which the Group Engineer is based, are at the Norfolk and Norwich Hospital, where Major Redevelopment is in progress.

Current salary scale is £2,050 rising by annual increments to £2,430 per annum, plus a special responsibility allowance of at present £175 per annum.

The post will become vacant on 1st July, 1969, due to the retirement of the present holder.

Applicants must possess one of the following qualifications or an equivalent qualification approved by the Secretary of State for Social Services:—

(i) H.N.C. or H.N.D. in Mechanical Engineering with endorsements in Industrial Organisation and Management and Principles of Electricity or Electro-Technology, if this was not taken as a subject of the course; or

(ii) H.N.C. or H.N.D. in Electrical Engineering with endorsements in Industrial Organisation and Management and including (at S.III or O2 level, or with endorsement in) Applied Heat and Applied Mechanics, provided he has suitable practical experience in mechanical engineering; or

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

Applicants requiring further information regarding the post are invited to write to the Group Secretary, Norwich, Lowestoft and Great Yarmouth Hospital Management Committee, St. Stephens Road, Norwich, Norfolk, NOR 53A, to whom applications should be submitted, giving full details of age, qualifications, experience and names of three referees, not later than 7th February, 1969.

WEST HERTS GROUP HOSPITAL MANAGEMENT COMMITTEE

HOSPITAL ENGINEER

Applications are invited for this post at Shrodells Wing of Watford General Hospital which will become vacant on the retirement of the present Engineer on 1 February, 1969. Shrodells Wing is undergoing major redevelopment and will ultimately have a total of 800 beds. Salary range £1,270—£1,500 with a special responsibility allowance of £50 p.a.

Qualification required is Higher National Certificate in Mechanical, or Electrical, Engineering. Applications stating full particulars and naming two referees should be addressed to the Group Secretary, 9 Rickmansworth Road, Watford.

SOUTH WORCESTERSHIRE HOSPITAL
MANAGEMENT COMMITTEE

HOSPITAL ENGINEER

required for a new post covering a sub group of three hospitals in Evesham and Pershore, with responsibilty to the Group Engineer for all engineering and building maintenance in these units.

Salary scale from £1,270 by 5 increments to £1,500 per annum.

A two-bedroomed flat could be made available at a very reasonable rental.

Further particulars, including qualifications desirable, and application forms from the Hospital Secretary, Evesham General Hospital (Avonside Branch), Evesham, Worcestershire.

CARDIFF HOSPITAL MANAGEMENT COMMITTEE
ST. DAVID'S HOSPITAL, CARDIFF

ASSISTANT ENGINEER required. Post will provide good experience for young man seeking to enter the Hospital Engineering Services. Applicants must have completed an apprenticeship in Mechanical or Electrical Engineering and hold an Ordinary National Certificate. Salary £975-£1,270 per annum. Applications stating age, qualifications, experience and naming two referees to Acting Group Secretary, 44 Cathedral Road, Cardiff, CFI 9XP.

HOSPITAL ENGINEER
TOOTING BEC HOSPITAL, S.W.17.
(1800 beds)

Whitley Council Conditions of Service. Salary scale £1,370-£1,605 p.a. plus £90 London Weighting Allowance and £50 Special Responsibility Allowance for H.N.C. (Mech.E.) or equivalent.

Application forms from Group Secretary, Battersea, Putney & Tooting Group Hospital Management Committee, Tooting Bec Hospital, Tooting Bec Road, London, S.W.17, to be returned not later than 1st March, 1969.

HOSPITAL ENGINEER

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

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

Full details of the post and qualifications required will be sent on application to the Group Secretary, Coventry Hospital Management Committee, The Birches, Tamworth Road, Keresley, Coventry CV7 8JJ by 12th February.

APPOINTMENT OF ASSISTANT ENGINEER

Applications are invited for the appointment of Assistant Engineer to be responsible to the Group Engineer for the engineering services at LENHAM CHEST HOSPITAL, Near MAIDSTONE; a three bedroomed house is available within the hospital grounds at a reasonable rent.

Applicants must have completed an apprenticeship in mechanical engineering or have otherwise acquired a thorough practical training and should hold an Ordinary National Certificate in Engineering or an equivalent qualification approved by the Department of Health and Social Security.

Salary within the scale £975 to £1,270 a year.

Applications stating age, details of training and qualifications and details of experience together with the names and addresses of three referees to be sent to: The Group Secretary, Central Kent Hospital Management Committee, 103, Tonbridge Road, MAIDSTONE, Kent, by 1st February, 1969, or as soon as possible thereafter.

ROYAL WESTERN COUNTIES HOSPITAL GROUP
ASSISTANT ENGINEER

to be based at the Langdon Hospital, Nr. Dawlish, Devon.

Applicants must have completed an apprenticeship in mechanical or electrical engineering, and must hold the Ordinary National Certificate in Engineering or similar approved qualification. The person appointed will be responsible to the Hospital Engineer for the operation and maintenance of the services and building fabric.

Salary Scale £975 or £1,045 (entry point depending upon experience since completion of practical training), rising to £1,270 per annum.

Applications in detail, giving age, education, qualifications and experience, together with the names of two referees, one of whom should be the present or immediate past employer, to Group Secretary, Royal Western Counties H.M.C., Starcross, Nr. Exeter, Devon, as soon as possible.

COLINDALE HOSPITAL
Colindale Avenue, N.W.9

HOSPITAL ENGINEER

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

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

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

Salary scale £1,270-£1,500 plus £90 London Weighting Allowance plus £50 R.A.

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

CHARING CROSS GROUP OF HOSPITALS
DEPUTY GROUP ENGINEER

This is a new post in a Group of Teaching Hospitals with the impending development of a new 950 bed hospital.

The successful applicant will be required to deputise for the Group Engineer, who is based at Fulham Hospital, over the whole range of his engineering duties which include responsibility for the satisfactory operation, maintenance and co-ordination of all engineering services, also preparation of maintenance estimates, specifications and drawings.

Applicants must have completed an apprenticeship in electrical plant, particularly on a planned basis.

Applicants must hold the following qualifications or an equivalent approved by the Department of Health and Social Security:—

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 experience in mechanical engineering.

Salary within the scale £1,370 x 5 inc. to £1,605 plus £125 special responsibility allowance and £90 London Weighting.

Unfurnished rented accommodation may be made available to the successful applicant if required.

Applications stating qualifications, age and experience with names and addresses of 2 referees (1 technical) to the Establishment Officer, Charing Cross Hospital, Strand, London, W.C.2 as soon as possible.

QUEEN VICTORIA HOSPITAL, EAST GRINSTEAD, SUSSEX
HOSPITAL ENGINEER

required at the above Hospital, which is a modern complex, having a wide range of plant and equipment, with the emphasis on complicated electrical equipment. There are automatic oil-fired boilers and a fully air-conditioned Burns Unit, with a 50,000 c.f.m. air conditioning plant. These would afford valuable experience to an engineer wishing to progress in the Service.

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

(a) H.N.C. or H.N.D. in Mechanical Engineering, with endorsement in Electro-Technology;

(b) H.N.C. in Electrical Engineering with endorsement in Heat Engines;

(c) C. & G. Mechanical Engineering Technician's Full Technological Certificate (Part III) which must include Plant Maintenance and Works Service.

Salary: £1,270-£1,500 p.a. plus £75 p.a. special responsibility allowance. Salary to be abated by £150 p.a. if not in possession of approved qualifications.

Application form, job description and further details from Group Secretary, Tunbridge Wells Group Hospital Management Committee, Sherwood Park, Pembury Road, Tunbridge Wells, Kent. Completed forms to be returned by 15th February.

Intending applicants are invited to visit the hospital.

MISCELLANEOUS