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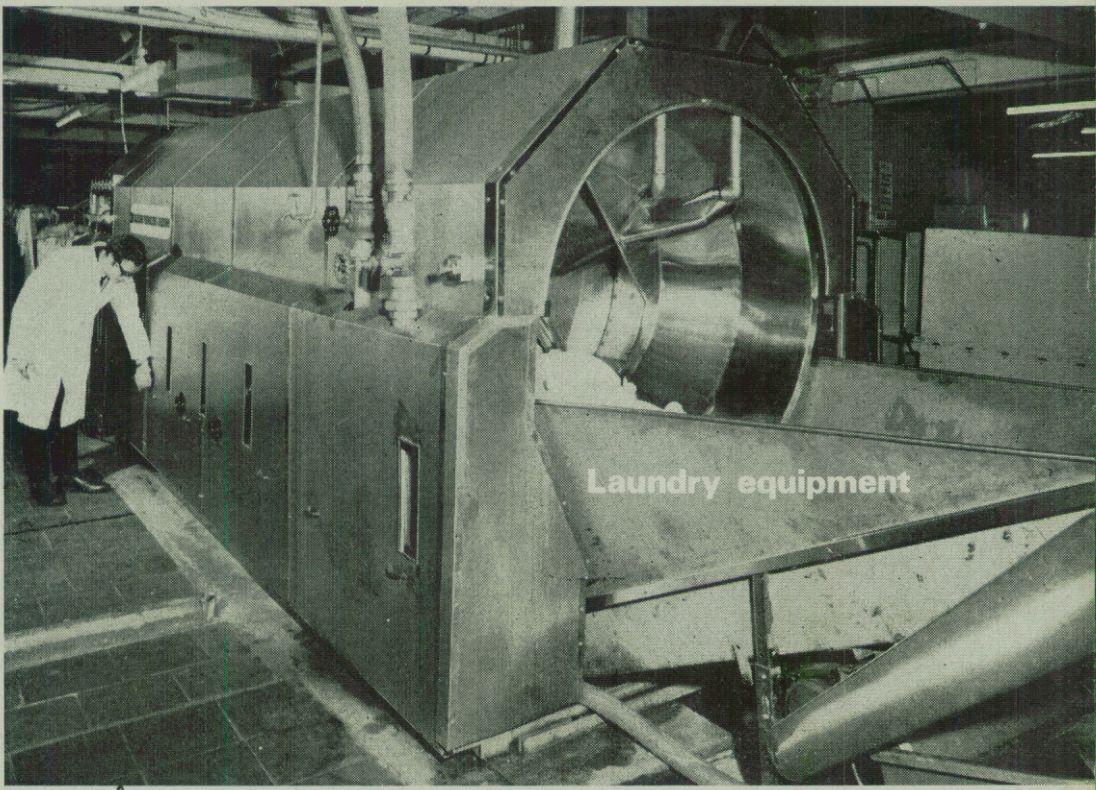
Hospital Engineering

JANUARY/FEBRUARY 1975

INTERNATIONAL FEDERATION ISSUE



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Vol. 29
January/February 1975

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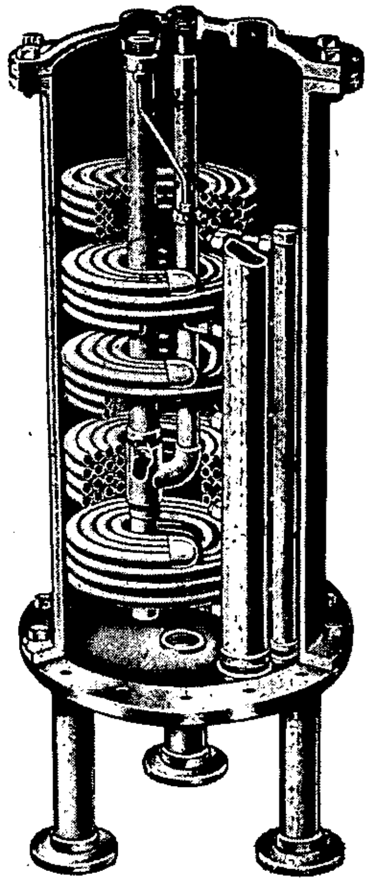
Front cover: A Baker Perkins Jaxons Stream-Line Washer
(Photo: Baker Perkins Holdings Ltd.)

Hong Kong's Princess Margaret Hospital, Lai Chi Kok opens this year
(Photo: Government Information Services, Crown copyright)

the hot water supply calorifier that leaves the more conventional types cold



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Modern development in hospital laundries

M. E. BRYANT

In the last ten years, the advent of large-capacity machines has resulted in a considerable change in the design of hospital laundries. The small local laundry has been replaced by the central laundry, capable of processing up to 100 t of linen per day. Here, recent developments within the field are discussed, especially the processing of linen up to the ironing, pressing or garment-finishing sections.

The advent of machines such as the large capacity continuous, batch continuous washers and washer/extractors has resulted in many relatively small on-site laundries disappearing in favour of the large central laundry or, when combined with the central sterilising service department, the service centre. This has again resulted in a growth in the number of organisations offering a planning service specialising in the construction of the new laundries and the upgrading of existing hospital laundries. Many individual hospital boards have also established their own planning offices; or extended existing facilities to cater for the new concept in laundering. The result of this change in thinking is that planning engineers have adjusted their ideas to include the design of laundries capable of processing up to 100 t of linen per day.

Mr. Bryant is with Polymark Ltd., Jeddo Road, Shepherds Bush, London W12 9EE, England

Manufacturers have responded to the challenge, with developments in the fields of work handling, classifying and washing equipment with integral extraction facilities. Sheet-feeding machines have advanced considerably during this period, especially with regard to the reduction of personnel required to operate the equipment with enhanced quality.

Another important development in laundry planning has been the introduction of flowlines, where various classifications of laundry work follow a specific route through the laundry using, wherever possible, gravity. Specific flowlines can be established for flatwork, large and small, both requiring ironing facilities (preferably in-line), towels, requiring full drying facilities, and garment processing, which is similarly streamlined.

Soiled-work-storage

Until recently it often appeared, when a laundry layout was considered in retrospect, that the planner had succeeded in producing a marvellous operational laundry, but had almost forgotten the very important initial work-handling process.

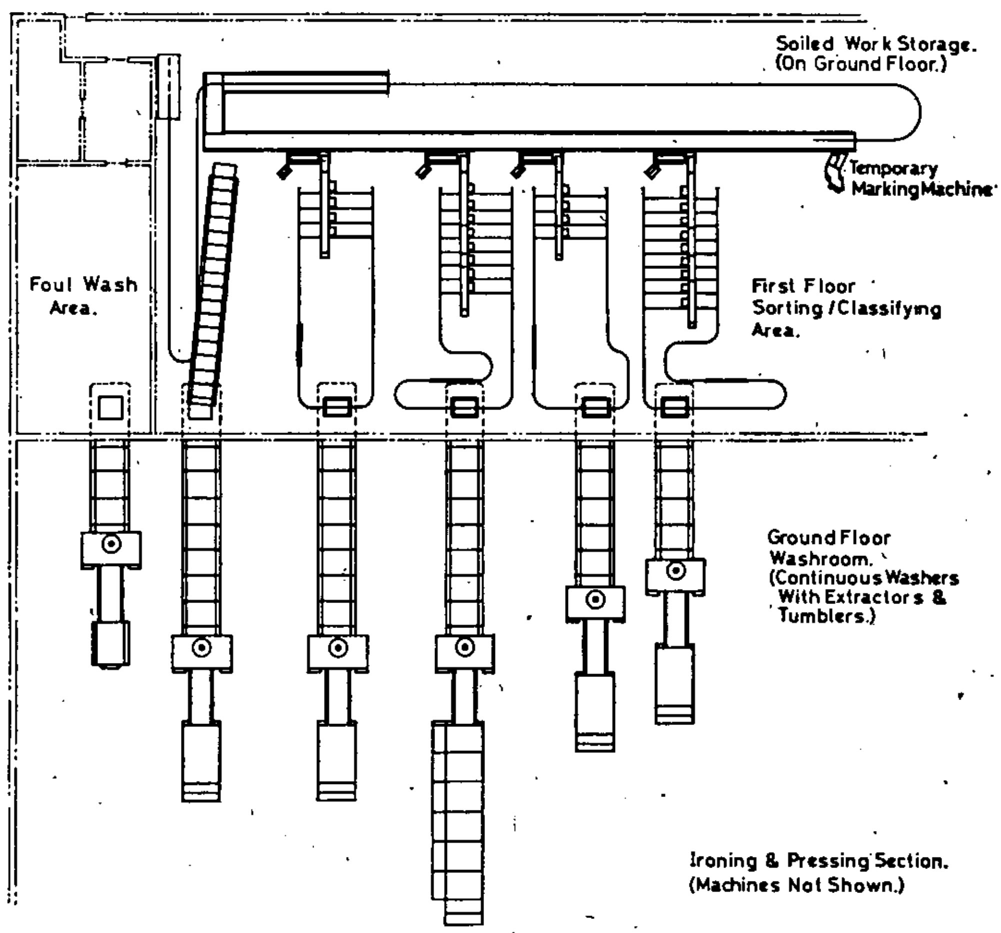
A critical work-path analysis should start at the bed in the ward of the hospital: it is only from this beginning that a truly efficient work-handling and storage system, including transportation, can be devised.

Within the laundry the introduction of various concepts of conveying systems has resulted in the picture undergoing considerable change. These concepts include:

- conventional band conveyors
- enclosed 'airstream' conveyors
- powered and free monorail systems
- mobile and suspended container systems.

Of these the band conveyors need no further elaboration as they are of the type used throughout industry modified to suit laundry application.

Enclosed airstream conveyors offer perhaps the most advanced thinking, provided that the designed project commences in the wards of the hospital, whereby, through enclosed trunking, soiled work can be conveyed, perhaps initially by gravity, to a point where a powered airstream is introduced, or container systems



Hospital laundry layout with continuous washers

take over. For onsite laundering, such systems can be tunnelled direct to the checking and classifying systems, or even directly to the actual commencement of the washing process.

Powered systems are many and various in their concepts. Endless chain or nylon ropes driven by electrically powered motor–gearbox units predominate. These systems usually suffer from the disadvantage of having the 'hangers' or hooks set at predetermined centres, usually approximately 1 m, to allow for bag or container clearance when proceeding up an incline and therefore the system is only able to store a relatively small number of containers in a specific length of rail. Unless fed to a free-running storage-rail system, a further disadvantage is that work to a central laundry invariably arrives by the van load and the system is not flexible to allow the van man to load at one fixed point *x* number of bags, while the bags at the termination of the system in the classifying area are being removed individually at a much lower rate.

'Power and free' systems remove most of the disadvantages of the powered-only systems. These comprise a contained powered chain with an adjacent track in which captive wheels with attached hooks run. The chain drives the wheels at certain points, such as inclines, the bags on the hooks running into 'sidings' where the storage is required. The basic drawback of this system is cost, but many consider it to be the best compromise.

The system with the most intensive development over recent years is the gravity system, where 'Diabolo' wheels run on a rail usually of circular section, forward motion being achieved by the inclination of the rail, and elevation by inclined or vertical hoist. The utilisation of gravity means that these systems invariably prove less expensive to install and operate, and are particularly suitable for multitier storage, as they are compact, and therefore make for maximum utilisation of the storage area available.

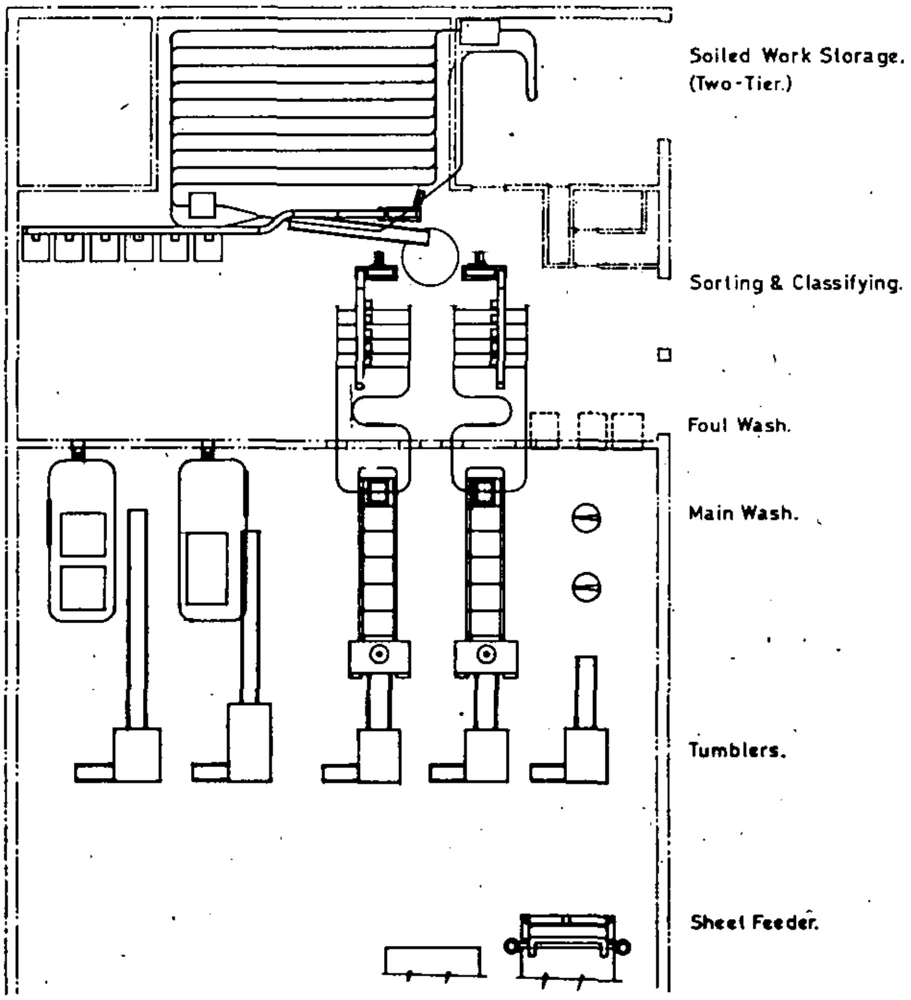
Many sophisticated systems of this type have been installed incorporating advanced pneumatic and/or electronic controls which enable one operator to programme the routing and storing of many hundreds of bags in a relatively short time. From storage the work can be called off for the commencement of processing, as necessary, to maintain productive balance in the laundry or to suit the specific needs of hospitals, or linen-bank stock.

Classifying systems

The classifying of soiled linen presents numerous difficulties, especially when the volume of work handled by a central laundry is considered.

It is not possible to generalise on the subject of foulwork handling, as the ultimate processing procedure must determine the method of presentation.

The problem of moving a weight and volume of linen other than by manual effort has yet to be completely conquered. Considerable effort is directed to this sphere



Hospital laundry layout with continuous washers and washer extractors

of investigation as many existing systems leave much to be desired.

Undoubtedly the simplest of the two systems generally used by laundry planners is a standard-type band conveyor, on to which the contents of the soiled-work containers are emptied, with sorters spaced at intervals along the conveyor selecting specific classifications for placing aside to storage bins or open net bags. This usually involves a large 'walk' element, and low productivity. The containers are sometimes suspended on a conveyor system for conveyance to the washroom, a weighing device being incorporated in some cases. Although this system does reduce labour compared with less automated systems it nevertheless still needs too many operators for an unpleasant and fatiguing task.

A more sophisticated system requiring fewer staff consists of a classifying and conveying unit incorporating a moving belt, on to which articles are placed for injection into an airstream ducting. The work, to its specific classification, is ejected through outlet ports arranged at intervals, as necessary, to bring the work to the work of processing. This can be direct to the feed of a continuous washing plant, to automatic hopper-loaded washers, washer/extractors or monorail.

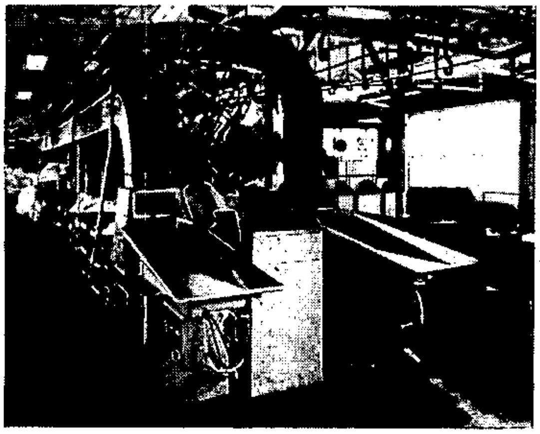
The classifying operator, by use of a control panel, selects the point of discharge. By the introduction of electronic counters to the keyboard of the control panel, work analysis can be established for production control. This system considerably reduces the unpleasant handling of the articles by the operator, decreases fatigue, and can result in three times the output otherwise achievable. By incorporating an automatic weighing device into this classifying system, predetermined modular weights of work can flow by various means direct to washing plant.

Marking systems

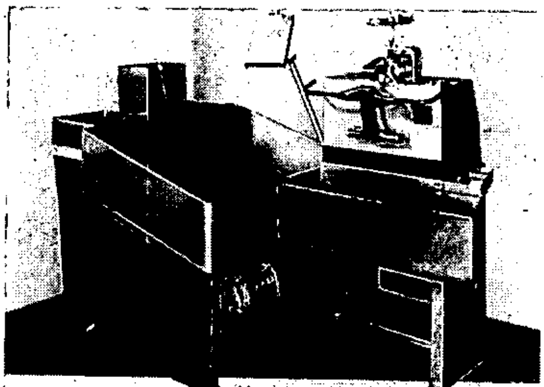
Two basic marking systems are now used in central hospital laundries, these being temporary and permanent article identification. The centralisation of hospital laundering, together with the improved facilities for nursing staff and long-stay patients, has demanded a specialised service within the laundry for the processing of individual bundles from doctors, nurses, general staff, and patients.

The system of temporary marking and 'lot' control introduced into domestic laundries many years ago is now rapidly extending to all hospital laundries. Articles from each bundle are temporarily marked in a simple but strict numerical sequence, lots or batches of bundles being colour coded into predetermined quantities to give visible lot identification at all stages through the laundry. By using the available specialised racking and

General detail of free or gravity-type monorail conveyor



Airstream classifying units with soiled-work conveying system in background

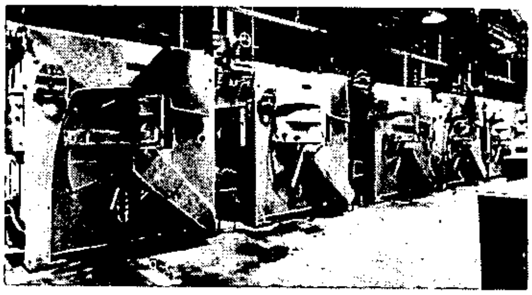


Temporary marking machine with work-reception booth

packing equipment, permanently numbered to the lot control system, all articles can be quickly checked for the correctness of lot and individual bundles.

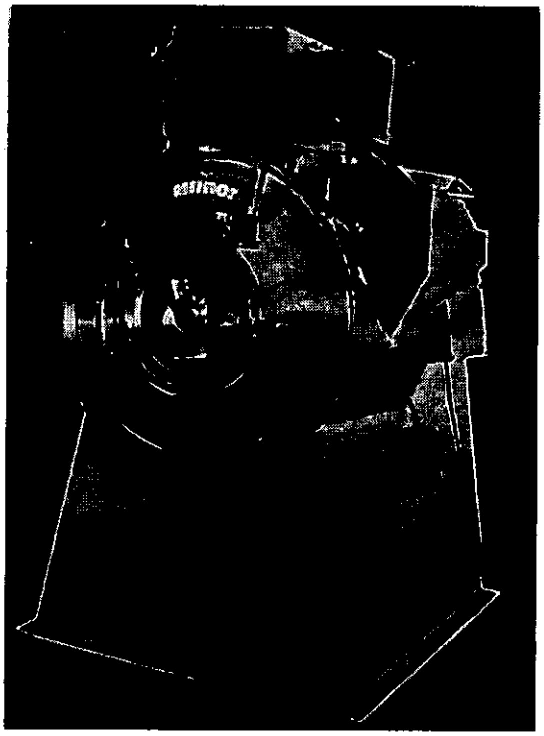
Further benefits of the system are derived from the printed marks, which can read to give the day and week of processing, and the operators are made responsible for checking, marking, racking, and packing. Marks are removed in the packing operation before the bundle is returned.

For the bulk of ward linen, including wearing apparel, temporary marking serves no useful purpose,



Installation of barrier-type washer/extractors shown on loading side

Multiple flowlines of continuous washers with integral extractors and continuous tumblers

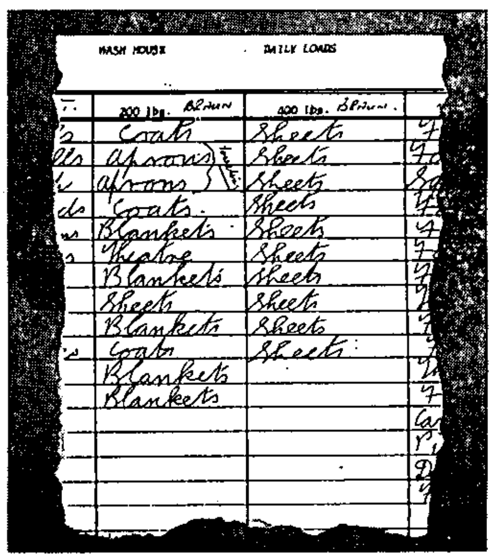


Small washer/extractor of 30 kg dry-weight capacity

and would be costly in application. Therefore a permanent identification suits the needs of most hospitals.

Unsightly black or coloured ink marks have long been superseded by a thermosetting transtat label designed to last for life of the article. This type of permanent label, now predominantly used in British

Frank handles 22 loads a shift with his Cherry Tree Braunex Washer Extractors



At Oxford's Radcliffe Infirmary, Group Laundry Manager Frank Dumbleton has been handling up to 22 loads in an 8-hour day. His Machines? Cherry Tree BUW400 and BUW200 Neutron Washer Extractors. His loads? Mixed hospital work of all kinds, as you can see from one of his typical production schedules.

More and more hospital laundry managers are achieving high production rates—economically—with Cherry Tree machines. Cherry Tree will be glad to show you how.

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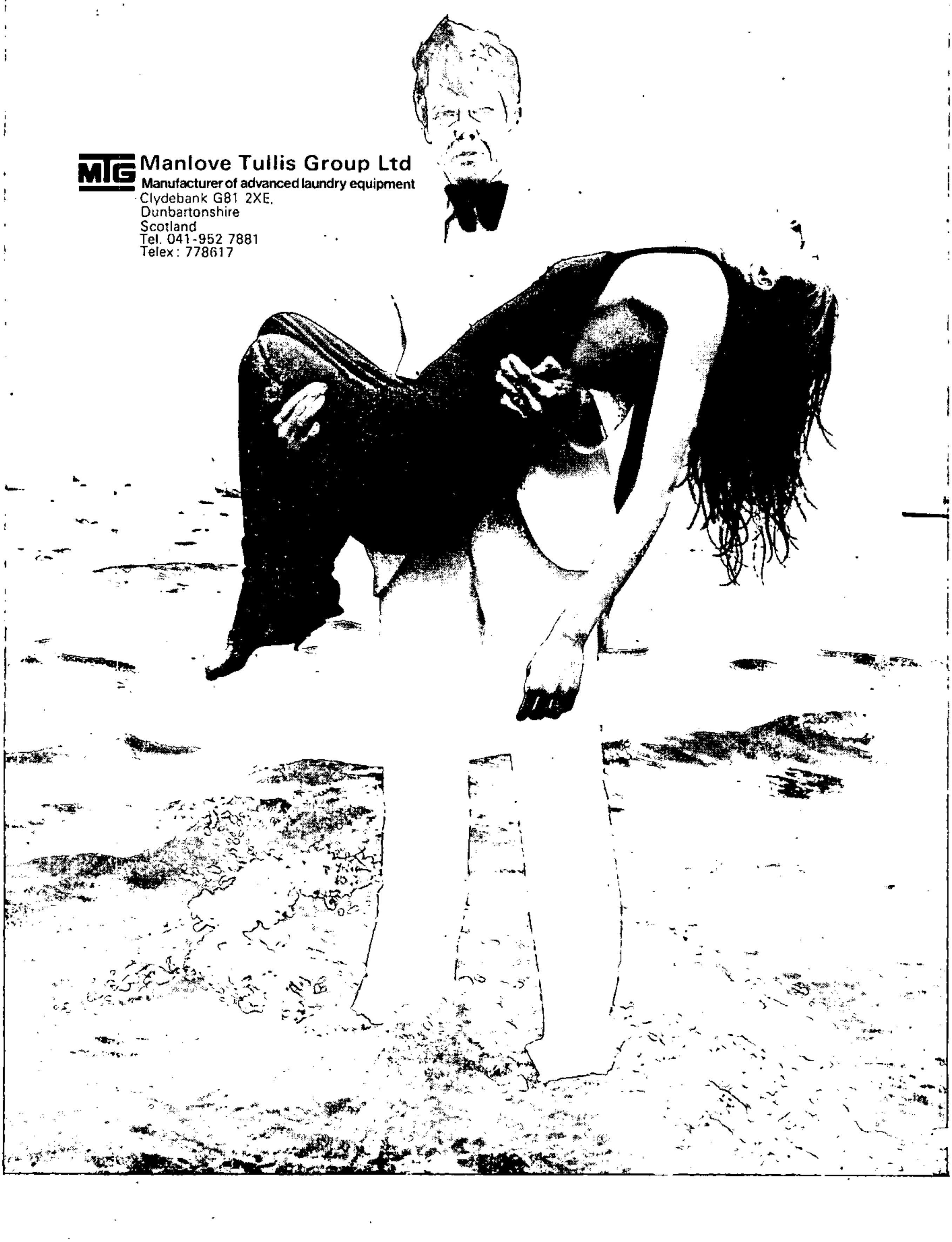
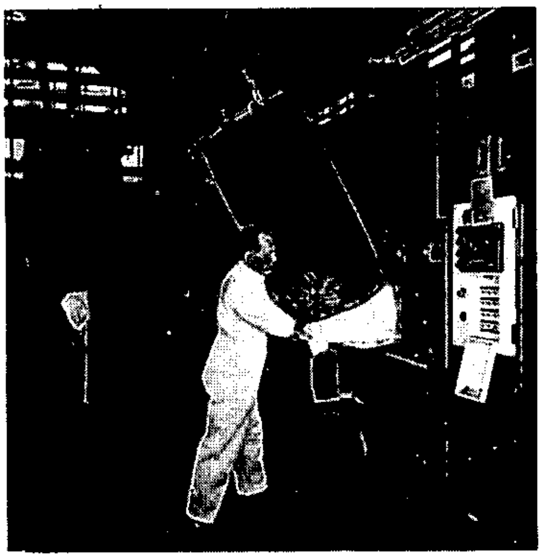
Blackburn, Lancashire. Telephone: Blackburn (0254) 21544. Telex: 668747. *A member of The Weston-Evans Group.*

Power in the Wash....

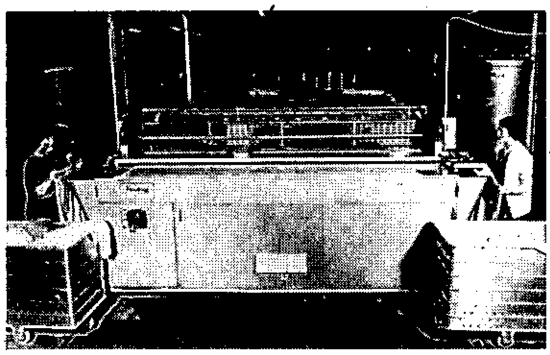




Free or gravity-type monorail conveyor feeding washer/extractors

hospitals, can be so produced as to give information such as:

(*a*) the name of the hospital, or the group in house colours with, if necessary, motif or symbol
(*b*) the specific department within the hospital
(*c*) the date at which the article or garment was first put into use
(*d*) the style and size of a garment for its replacement at the end of useful service



Sheet-feeding machine

(*e*) if necessary, by the use of a special pen, further information can be added to the 'printed' label to indicate the name and/or department of the actual user.

The applicator for these labels has a dual purpose, as it can be used for applying heat-seal patching material for repair services.

Washing machines

Probably the greatest forward movement in the new design of laundry equipment has been the development of the continuous and washer/extractor machines. Individual batch washing machines as such are still available, and certainly cannot be discounted, especially the dumping type, which automatically discharges the processed work, usually onto band conveyors, by tipping the cylinder. Nevertheless, this type of machine presents saturated work from which water has to be extracted by centrifugal force, or compression, requiring additional staff.

One of the first continuous washers to gain popularity was produced in West Germany and consisted of a number of synchronised washing units in line, each unit executing a particular function in the washing process, i.e. prerinse, wash, rinse. The latest version of this machine incorporates an automatic integral extractor.

Of the many other continuous washing machines that have appeared on the market, most are based on the tunnel principle, where the work is fed into a rotating tube to emerge from the other end having been subjected to a full washing process. Tunnel washing, compared with any other form of washing, is still a much debated subject.

The swing now towards batch-type continuous washers will enable the further development of improved methods of water extraction. To date centrifugal extractors have efficiencies far beyond other types of extractors where, to reduce the moisture retention for final finishing, expensive and energy-consuming tumblers of large capacity are required.

Washer/extractors have also increased in size and technically in recent years, and commercial machines range in capacity from 15 kg up to 360 kg dry weight of work processed at any one time. Automation on these machines is now such that work can be automatically loaded into the machine and, once the program has been started, the machine will perform all the functions of washing, sterilisation, rinsing and extraction by a programmed chart. Semiautomatic unloading enables the turn round of the large capacity machines to now be completed in about 30 s.

With the high extraction speeds reached by the latest machines, water-retention figures are very impressive and comparable with the most efficient of the individual centrifugal extractors.

Tumblers

Coincident with the development of large-capacity continuous washers and washer/extractors has been the development of tumblers capable of dealing with the comparable output. The standard type of batch tumbler is now available in capacities of up to and exceeding 100 kg dry weight, and many are available with automatic loading by belt conveyor or transfer hopper and automatic unloading, usually by tilting. As the basic design of these machines has been established for some considerable time, constant research and development has resulted in increases in efficiency and technical sophistication.

A more recent development has been the continuous tumbler, or conditioner, mainly designed for use with continuous washers. These machines range from the relatively small conditioner, in heated or unheated form, to large-capacity machines complementary to the size of the washers.

Sheet-feeding machines

Machines for feeding standard sheets into a conventional ironing machine (mangle) have been under development by laundry-machinery manufacturers for many years and a number of designs have been marketed with varying degrees of success.

The specification of such a machine is to improve operator performance, maintain or improve on ironing and folding-machine utilisation, improve quality and reduce cost. The limited number of different automatic flatwork feeders on the market achieve many of the specification requirements, but not all.

For sheet feeding up to some 600 sheets per hour, the entire specification can be met by at least one manufacturer, but above this figure quality must be sacrificed for quantity.

Basically the operation of these machines involves the clipping of the sheets into grippers which spread the sheet transversely to the axis of the ironer, the sheet then being transferred forward by transfer bars, or feed bands, until it is presented to the feed bands of the ironer, where the normal ironer operation takes over. With one tried and proven machine the leading edge of the sheet is dipped into a suction cabinet and, after transfer of the leading edge onto the ironer-feeder bands, the remainder of the sheet is sucked into the suction cabinet to create tension on the sheet transversely and axially, resulting in high-quality ironing. With other machines the tension in the sheet is usually achieved transversely by rotating spiral brushes.

It was not intended that the established expert on hospital-laundry planning would from this paper solve the problems he may have in the specific areas covered. It is believed that ample food for thought has been provided, even for the hospital engineer. For those unconnected with laundries a better appreciation of the involved problems should be apparent.

All laundry-machinery manufacturers are anxious, for their very existence, to produce the equipment to fill the needs of the progressive hospital-laundry management groups but it is essential that early collaboration between manufacturer and user be established, and that complete laundry planning progresses with speed to ensure that on completion a new hospital laundry is not obsolete before coming into use.

Acknowledgments

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R. W. Gregory & Partners, Penarth
R. W. Gregory & Partners, Newcastle upon Tyne
Futurail, Banbury.

Développements modernes en buanderie d'établissement hospitalier

Au cours des dix dernières années, l'arrivée des machines de grande capacité a résulté en un changement considérable de la conception des buanderies d'hôpitaux. La petite buanderie locale s'est vu remplacée par la buanderie centrale capable de traiter jusqu'à 100 t de linge par jour. Ici, on débat les développements récents dans ce domaine, surtout le traitement du linge jusqu'au repassage, au pressing ou aux sections de finition sur les vêtements.

Moderne Entwicklung in Krankenhauswäschereien

Das Auftauchen von Maschinen mit großem Fassungsvermögen hat zu einer erheblichen Veränderung in der Kanstruktion von Krankenhauswäschereien geführt. Die kleine örtliche Wäscherei wurde durch die zentrale Wäscherei verdrängt, die bis zu 100 t Wäsche pro Tag bearbeiten kann. Hier werden neue Entwicklungen auf diesem Gebiet, besonders die Bearbeitung von Wäsche bis zum Bügeln, Pressen und Finish, erörtert.

Moderno sviluppo nelle lavanderie di ospedali

Nell'ultimo decennio l'avvento delle macchine a grande capacità ha causato considerevoli cambiamenti nella progettazione delle lavanderie da ospedale. La piccola lavanderia locale é stita sostituita da una lavanderia centrale con una capacità di fino a 100 ton. al giorno. I recenti sviluppi in questo campo sono qui discussi, particolarmente il trattamento della biancheria fino ai reparti di pressatura, stiratura e finitura dei capi di abbigliamento.

31st Institute Annual Conference

Institute news

23rd-25th April 1975

The 31st Annual Conference of the Institute will be held at the Postgraduate Medical Centre, Royal Victoria Hospital, Shelley Road, Boscombe, Bournemouth.

Although the conference is arranged primarily for members of the Institute of Hospital Engineering, visitors from other societies and organisations, and from the hospital service, are welcome to attend any of the sessions. In accordance with the authority given in Circular HM(54)55, officers may be granted special leave with pay to attend conferences on work with which they are concerned. Travelling and subsistence allowances at the usual rates may be paid to officers, provided that approval to attend has been obtained from the employing authority.

Special arrangements have been made with the conference hotel, the Palace Court Hotel, Bournemouth, for accommodation for delegates and wives. A special ladies' programme has also been arranged.

Fees

There will be a registration fee of £18 permitting attendance at the entire conference, with a daily fee of £9 allowing attendance at the two sessions on any one day and a sessional fee of £5, which allows attendance at any one session. Lunch is included in these fees.

Further details and an application form can be obtained from the Secretary, Institute of Hospital Engineering, 20 Landport Terrace, Southsea, Hants. PO1 2RG.

Conference programme

Wednesday 23rd April

9.45 a.m. Coffee

10.15 a.m.

Official Opening of the Conference by Dr. B. G. B. Lucas, J.P., F.F.A.R.C.S., C.I.Mech E., Hon. M.I.Hosp E., President, The Institute of Hospital Engineering

10.30 a.m.

The Application of the Fire Precautions Act to Hospital Building and Engineering Design

Speakers: C. Davies, Dip.Arch(Dist), A.R.I.B.A., Assistant Chief Architect, Department of Health & Social Security, and D. I. Sinclair, B.A.(Cantab.), C.Eng., M.I.Mech E., Superintending Engineer, Department of Health & Social Security

Chairman: Colonel Sir Joseph Weld, O.B.E., T.D., Chairman, Wessex Regional Health Authority

'There have been discussions between the DHSS and the Home Office to determine the way in which the Act will be applied to hospitals. Reference will be made to codes of practice and other codes which will "deem to satisfy"'

2.30 p.m.

Medical Engineering Maintenance—The Way Ahead

Speaker: G. K. Alston, B.Sc.(Eng), C.Eng., F.I.E.E., F.I.Nuc.E., Assistant Regional Engineer, Oxford Regional Health Authority

Chairman: B. A. Hermon, C.Eng., M.I.C.E., F.I.Mech E., F.I.H.V.E., F.I.Hosp E., Regional Works Officer, South West Thames Regional Health Authority

6.30 p.m.

Reception given by the Dorset Area Health Authority in the Postgraduate Medical Centre, Royal Victoria Hospital, Boscombe

Thursday 24th April

10 a.m. Coffee

10.30 a.m.

Medical Engineering

Speaker: Dr. S. R. Montgomery, Sc.D., C.Eng., F.I.Mech E., Head of Mechanical Engineering, University College, London

Chairman: Dr. B. G. B. Lucas, J.P., F.F.A.R.C.S., C.I.Mech E., Hon.M.I.Hosp E., President, The Institute of Hospital Engineering

'Aspects of the general problem of integrating engineering with the health services'

2.30 p.m.

What is Technology Doing to the Health Service

Speaker: H. S. Wolff, B.Sc., Head of Bioengineering Division, Clinical Research Centre

Chairman: Dr. B. G. B. Lucas, J.P., F.F.A.R.C.S., C.I.Mech E., Hon.M.I.Hosp E.

'Examples of benefits derived from the application of technology. The position of the hospital engineer relative to the selection and maintenance of technological ventures'

7.30 p.m. for 8 p.m.

Conference Dinner Dance

Palace Court Hotel, Bournemouth

Friday 25th April

10 a.m. Coffee

10.30 a.m.

The Work of the National Staff Committees in the Health Service

Speaker: Dame Isobel Graham Bryce, D.B.E., M.A., Chairman, National Staff Committee for Administrative and Clerical Staff; Chairman, National Staff Committee for Nurses and Midwives formerly Chairman, Oxford Regional Hospital Board

Chairman: The President, The Institute of Hospital Engineering

'The work of these Committees and the achievements of their former counterparts prior to reorganisation'

12.15 p.m.

Conference Closure by The President, The Institute of Hospital Engineering

Product news

Pressure/temperature recorder

The self-contained recorder will monitor pressure and temperature simultaneously on a circular chart 20 cm in diameter. The recorder is mounted directly on a pipe with a pressure connector. The back of the housing contains a bimetal element for ambient temperature measurement. The spring-wound chart drive is available for 8 or 24 h rotation and ranges up to 10·5 and 211 psi kgf/cm^2, can be supplied. Prices are from £124.

Linton Instrumentation, Hysol, Harlow, Essex, England

Door holders

The door holders have no moving parts and operate on the electromagnetic principle. The magnetic field will generate a holding force of 13–45 kgf from four voltages: 12, 24, 48 V direct, or 240 V alternating. Loss of supply voltage will release the door, and so provide a 'fail-safe' facility. An overriding pushbutton is fitted to most models to allow manual operation without affecting any fire-alarm system, which may be controlling the doors. The armature incorporates a wear-resistant antivibration rubber that makes the door holder self aligning.

Wormald Safety Alarm Services, 7 Beeches Ave., Carshalton Beeches, Surrey SM5 3LB, England

Deionisers

A range of deionisers for *in situ* regeneration will produce purified water at rates of up to 28 l/min. Each unit is equipped with a battery-operated conductivity tester which operates as soon as water is passed through the unit. Water purity of between 10–20 MΩ/cm is obtainable.

Stuart Scientific Co., Zodiac House, 163 London Rd., Croydon, Surrey, England

Fire alarm

The BA 11/1 will monitor up to 20 smoke detectors and power up to 15 bells in the event of a fire. The integral battery is kept at peak efficiency by an automatic charger. Up to 20 smoke detectors, 15 bells and any number of break-glass call

points or heat detectors can be monitored with a 24 h standby/0·5 h alarm capability. For a 48 h standby duration, 10 smoke detectors and 5 bells may be incorporated into the system. The BA 11/1 can initiate fire-prevention equipment including emergency lighting and fire-door release units.

Chloride Bardic Ltd., William St., Southampton, Hants. SO1 1QH, England

Stroboscope-tachometer

The Strobette is a combined stroboscope and tachometer in a portable, high-impact plastics case. The stroboscopic flash rate is 200–6000 flashes/min and the tachometer speed rate is 2000–6000 rev/min. The Strobette has a solid-state circuit, a plastics lens and mirror-type reflector. Accuracy is within ± 3% or better, and flash duration is about 10–25 μs. It has a xenon white 6500 K daylight light, and the flash energy is 40 J. The price is £49·50.

Electronic Brokers Ltd., 49/53 Pancras Rd, London NW1, England

Master control unit

The MFC is an electronic data unit that controls and co-ordinates the M100 intercom system speech and selection functions, and operates as a processor for all additional functions in the M100 system. The control unit is constructed in a modular form, the station capacity being decided by the number of cards employed. A single section card has four speech channels and a nominal capacity of 60 stations. There is a series of basic units handling 200–5000 intercom units.

Pye Business Communications Ltd., Cromwell Rd., Cambridge, England

Area works officers

The following have been appointed area works officers in the West Midland Region:

AHA	*Name*	*Previous post*
Birmingham	W. Howarth	Group Engineer, South Birmingham District
Coventry	F. J. Williams	Group Engineer, Coventry
Dudley	A. L. Towle	Group Engineer, Dudley
Hereford / Worcester	R. W. Chapman	Assistant Regional Engineer, West Midlands RHA
Salop	E. F. Austin	Group Engineer, South Warwickshire District
Sandwell	H. R. Martin	Chief Engineer, Central Birmingham District (T)
Solihull	K. W. Ashton	Group Engineer, Solihull
Staffordshire	B. J. Dunn	Assistant Regional Architect, West Midlands RHA
Walsall	C. F. Robson	Assistant Regional Engineer, West Midlands RHA
Warwickshire	E. L. Galloway	Principal Assistant Building Surveyor, West Midlands RHA
Wolverhampton	R. G. Smith	Group Engineer, West Birmingham District

Heat-transfer fluid heating of laundry ironing machines

P. EDEN, C.Eng., M.I.Mar.E.

In an era when all hospital engineers need to look at the total energy concept of laundries, it is essential to examine briefly a method of assessing the performance of existing steam-heated machines and to look at their future possible development.

Ironing-machine performance

Heat used in drying the moisture from linen has been defined in the past as that heat required to heat the article and its contained moisture to 100°C plus the latent heat of the water:

Heat used = $(t_2 - t_1)(s + a) + aL$ per unit of material
where t_1 = temperature of work into an ironer
t_2 = temperature of work at exit from ironer
s = specific heat of clothes (generally taken as 0·3 for cotton)
a = contained moisture weight per unit weight of material
L = Latent heat of water at atmospheric pressure.

The largest part of this expression is aL, the heat to turn water into steam.

The fallacy here is that total latent heat is necessary to evaporate the water. A true expression would be qaL, where q is an unknown dryness fraction for the water vapour escaping from the process material. Some authorities say that the amount of latent heat used is of the order of 80%, but this suggests an overall figure of 0·8 for q. To my knowledge, no research has been done to arrive at this figure and it is of purely academic interest at this stage.

Secondly, in any thermal efficiency calculation we *must define heat supplied.*

This a much more easily established figure and is, in a steam-heated machine, merely a matter of establishing the quantity of steam used per unit weight of process material throughout and multiplying this figure by the difference between steam and condensate heat content. Where dry saturated steam conditions apply on the supply side and accurate steam and condensate pressures are known, any experimental error is of reduced significance in an efficiency calculation.

Mr. Eden is with the Manlove Tullis Group Ltd.

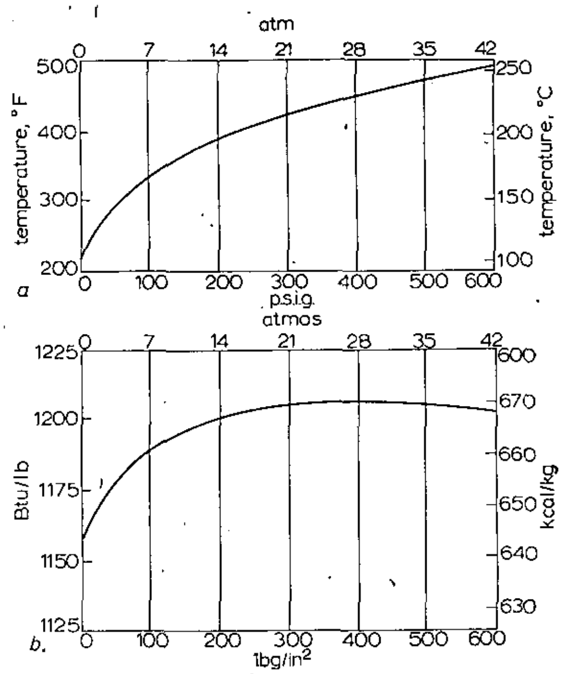

Fig. 1a Steam pressure against temperature
b Steam pressure against total heat

In an oil-heated machine, the figure for heat supplied is even more easily established. It is the product of oil flowing in terms of weight multiplied by the difference in inlet and outlet temperature multipled by the specific heat of the fluid at mean operating temperature.

Design of high-performance ironers

To state the obvious, heat is transferred through an ironer bed and airing gap from the heating medium to the process material more quickly with increasing temperature difference across the intervening material and in inverse proportion to the thickness of the conducting material.

To maintain this condition, the temperature of the heating media side of the heat-exchanger material should not decrease significantly as the work proceeds on the colder side.

Let us assume that the decision is made to increase the temperature of steam. This automatically means that pressure is increased and (Fig. 1*a*) it is seen that the

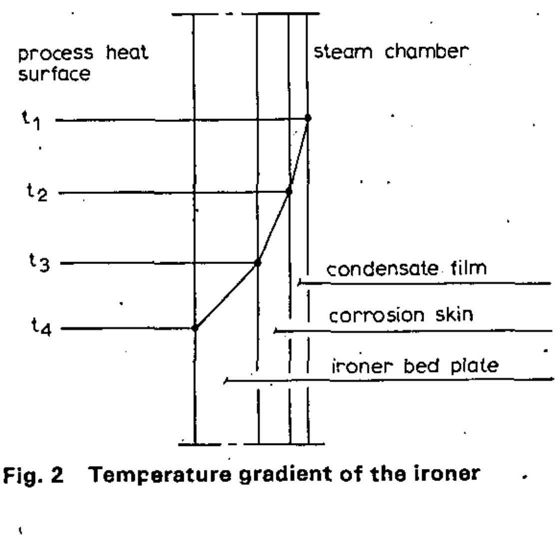

Fig. 2 Temperature gradient of the ironer

curve controlling this condition increases pressure at an increasing rate for small increments of temperature.

Fig. 1*b* shows that the total heat available per pound of steam increases very gradually with increasing pressure until, after about 450 lbf/in², the actual heat content per unit weight falls increasingly with increasing pressure.

It is evident from these curves that one is chasing steam consumption above, say, 150 to 200 lbf/in², which, as pressure rises to take advantage of slowly rising temperature, creates compounded problems for the designer, the user and the maintenance engineer.

From the decision to increase steam temperature, there are several major problems that have to be solved before the ironer performance is increased:

- the pressure vessel becomes increasingly stressed or the material thickness must be increased, which reduces heat transfer rates
- as the higher temperature steam has to surrender its heat at a greater rate, the heated surface condenses greater quantities of water, and, as the water film increases in thickness, the heat-transfer rate through it reduces because the very method by which steam surrenders its heat creates a further temperature step in the heat-transfer process
- as the ironer ages, corrosion also helps to defeat the designer's purpose by creating more resistance to heat flow (Fig. 2).

From the foregoing brief summary of the problems of advancing the performance of steam ironers, the designer of these machines has to try to arrive at a system, within the heat-exchanger 'hot' channels, passes or steam ways, that reduces the effects of the condensate blanket. He can do little, without adding enormous costs, to prevent corrosion or decrease material thickness with rising pressure.

The alternative fluid under consideration is basically an oil. This material prevents corrosion in the heat-exchanger passes and, as it operates only at pumping pressures of, usually, about 35 lbf/in², the problems of material thickness are minimised.

The problem of condensate blanket on the heat exchanging surface is nonexistent, but, for the unwary designer, there is an equivalent. This is, of course, the near static film of oil that can appear in the passages under the wrong flow conditions.

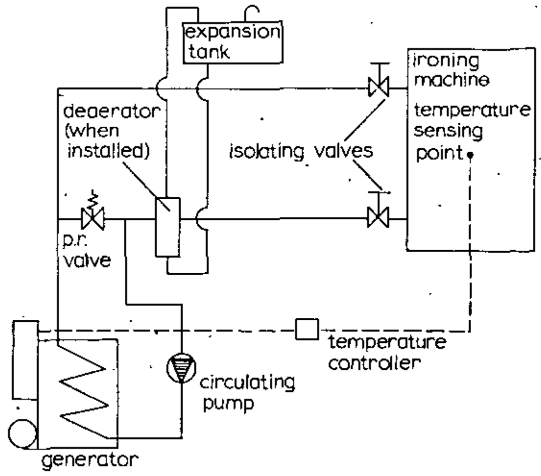

Fig. 3 Primary circuit

Heat transfer from any heating medium to process work in a laundry ironing machine can be reduced or made totally ineffective by incorrect design of the heating side of the heat-exchanging surface. Work will stop and roll up on an area that cools rapidly as the process material absorbs the available heat.

The oil passes, therefore, have to be designed primarily to give good conditions for the transfer of heat from the fluid to the whole surface drying the work material. The flow conditions in the oil have to be ensured in the design stage and required work done examined against flow quantity and pressure losses.

To increase heat-transfer rates, higher temperatures and higher flow rates are required.

Pumping losses increase with both increases of flow quantity and resistance to flow. This, in the limit, could mean maximisation of heat transfer by unacceptable power absorption at the pump motor and, therefore,

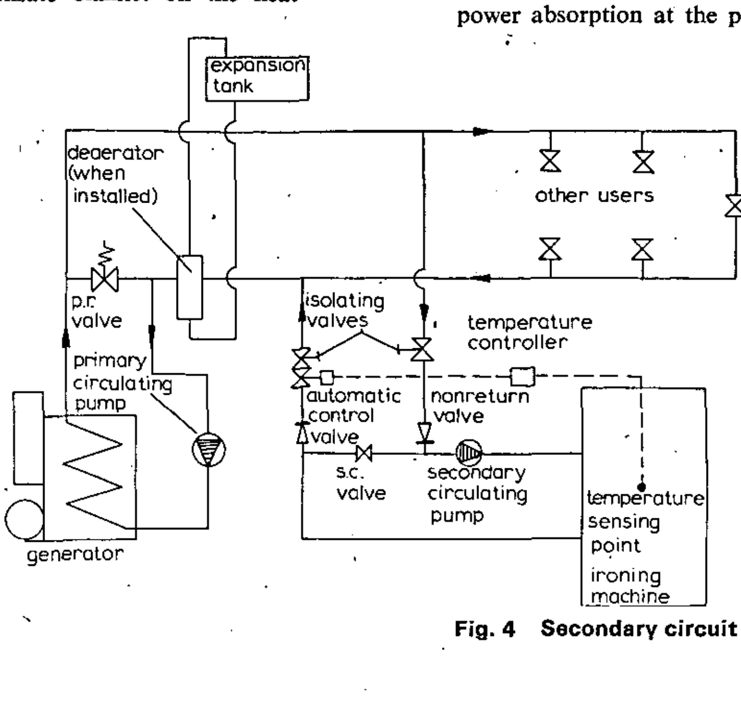

Fig. 4 Secondary circuit

increasing the cost per unit of work.

Before discussing the detail of ironer design, within the limits of reasonable commercial security, it would be as well to briefly describe the two common alternative types of fluid heat circuitry.

Primary circuits

The simplest system of oil flow circuitry is shown in Fig. 3. The whole system must be filled and an expansion tank caters for the change in volume with rising fluid temperature.

Fluid is pumped through the generator coils, passages (absorbing heat from a burning fuel) and via steel piping to the ironer. It returns to the suction side of the pump where a minimum pressure is maintained to prevent cavitation by the fluid level in the expansion tank and its height above the pump centre line.

Some authorities recommend that a deaerator is installed in the oil return line to ensure the removal of all air and any vapours released from the oil because of its temperature.

A pressure controlled bypass round the heater ensures that the flow of oil through the coils etc. is not interrupted. This is essential to prevent coil overheating and consequent damage to the material.

In a simple circuit of this type, it is normal, and has the advantage of simplicity, to control oil temperature at the heater unit. This is done by automatic control of the firing rate at the burner and; though a modulating type of burner is ideal, it is quite adequate for present-day machines to control on a high/low/off firing system.

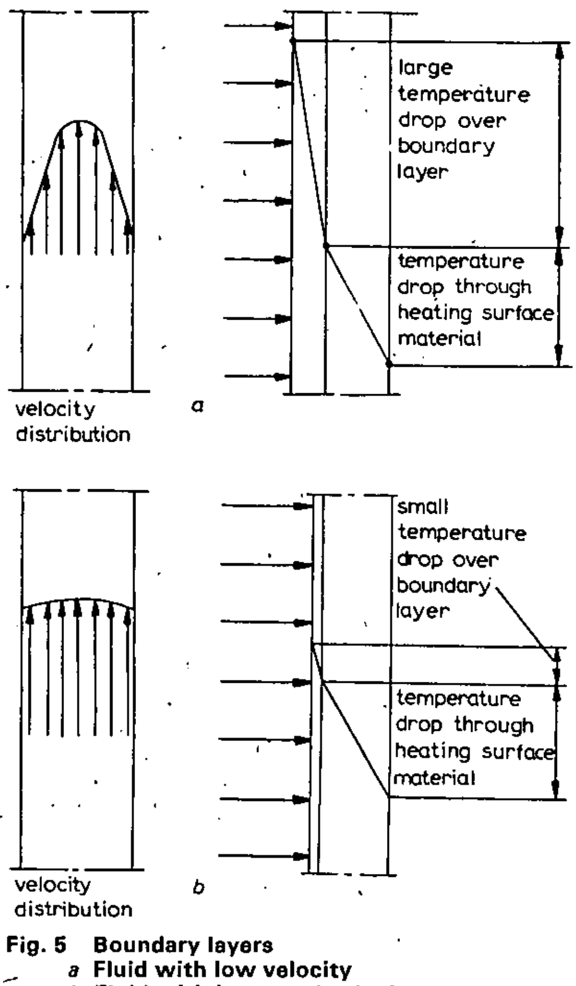

Fig. 5 Boundary layers
a **Fluid with low velocity**
b **Fluid with increased velocity**

Secondary circuits

Fig. 4 shows an ironer working in a simple secondary oil-flow circuit. The heat-transfer fluid is circulated by the primary circulating pump round a ring main that returns the fluid to the pump section. The ring-main temperature is controlled by the generator thermostat and is limited only by the temperature capacity of the fluid or by any 'primary' user drawing heat on a simple flow system.

The ironing machine in this case is working on a secondary circuit; i.e. it has a simple pumped circuit of its own, and oil flows through the ironer and returns to the pump suction. The circuit remains stable in this state until heat is lost by the fluid in the machine; its temperature drop is sensed by the control valve senser, which opens the control valve letting out cooled fluid to the ring-main return leg. This fluid is automatically replaced by oil from the flow leg of the ring main, which restores the secondary system temperature and its circuit stability as the control valve closes.

The setting of the secondary-circuit temperature controller establishes the circuit stability temperature, which may be any figure below that of the ring-main fluid temperature.

The chief advantages of this system are that the secondary circuit is independent for temperature control and its thermal capacity is small, so that the inertia effect is minimised when changing its temperature in either direction below the ring-main limiting condition.

Thermal-fluid heated ironers

In designing the heat-transfer surfaces of a fluid-heat ironer, one has first to specify the rate at which heat is to be absorbed in drying the process material and the temperature range over which it is required (or possible) to accept heat from a heated surface. For instance, it may be possible to operate on cotton fabrics at a temperature of, say, 260°C providing the material retains some small moisture content on completion of the operation, but perhaps the same high operating temperature for polyester materials may be impossible, owing to the different method this material has for retaining moisture.

Nevertheless, it is possible to specify the material weight to be processed per unit time, and its density and required moisture content change over the process. From this, one arrives at the total heat required per unit time at a particular temperature, and, in doing so, one has to make an assumption for the value of q in qL.

Heat has to be transferred from the bed surface at temperature t_s to the process work in contact with it at temperature t_w. The quantity Q of heat transferred in given time through a surface A is proportional to the temperature difference $t_s - t_w$.

$$Q \propto A(t_s - t_w)$$
$$\text{or } Q = hA(t_s - t_w)$$

where h is the coefficient of heat transfer through a single material.

The overall coefficient U depends on the more complex condition for an ironer or almost any other heat exchanging surface. On simplifying, it is made up of h_1 for the boundary layer of fluid on the hot side, h_2 for the heat transferring wall and h_3 for the boundary layer of steam generated between the transferring wall surface and the sheet. h_3 is also affected by waxes and other antifriction materials that are deposited on the metal surface of the bed.

The coefficient of heat transfer for steel plate is known at approximately 300 Btu/h/ft²/in/°F, and Q varies inversely with the thickness of material through which heat flows.

On the hot-oil side of the bed material are channels designed to give minimum boundary-layer thickness within the ruling parameters of fluid flow velocity,

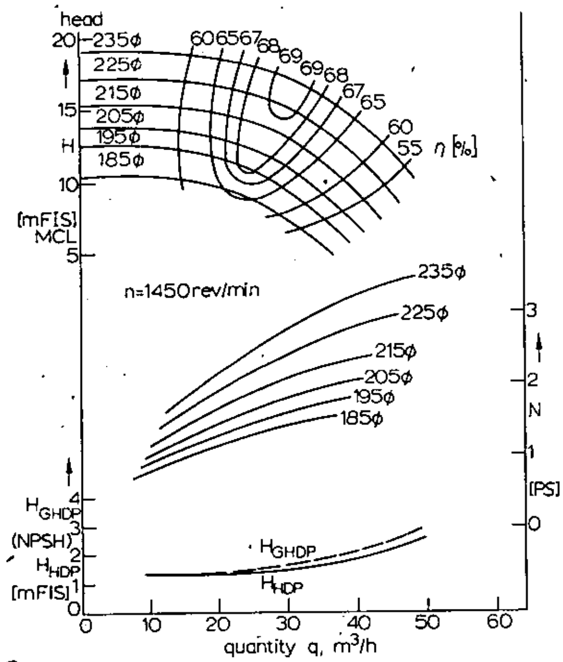

Fig. 6 Typical pump characteristics

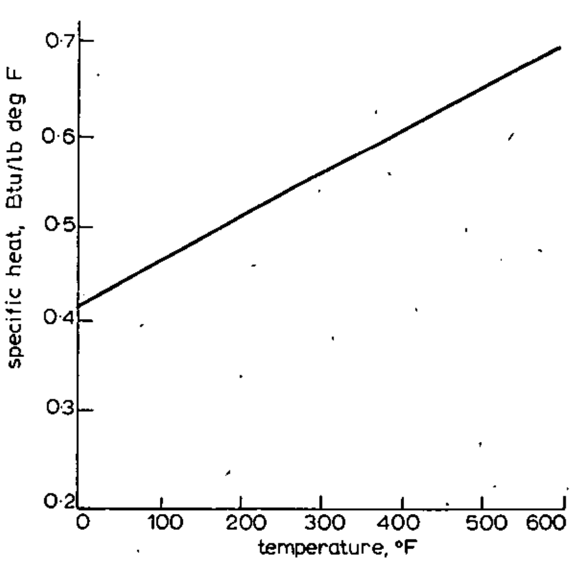

Fig. 7 Specific heat against temperature

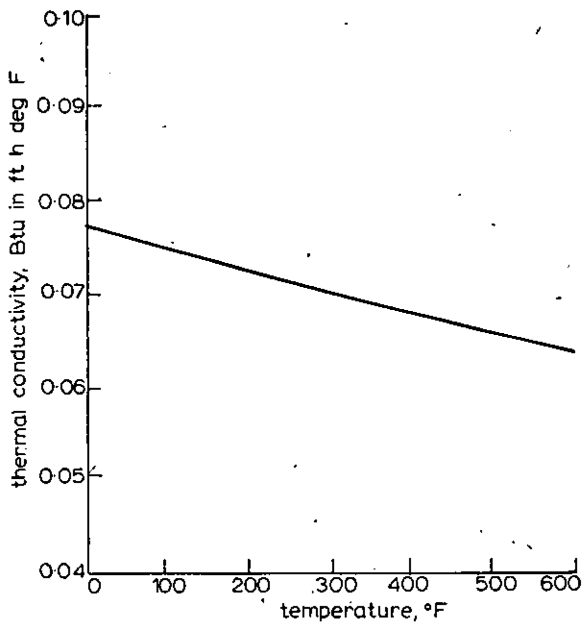

Fig. 8 Thermal conductivity against temperature

pumping losses and fluid temperature drop between bed inlet and outlet.

In a pipe or duct, the flow condition changes from streamline to turbulent with increasing fluid velocity, and Figs. 5*a* and *b* show the boundary layer effect of the change from streamline to turbulent flow.

The similar boundary-layer condition on the process-material side of the heat-transferring material has to be minimised by removing the steam as quickly as possible as it forms, and keeping the wax layer as a thin film.

The balance of energy used in drying the process material to energy supplied has to be designed into the system. As fluid velocity increases, pumping losses increase. As fluid flow quantity increases, pumping losses increase.

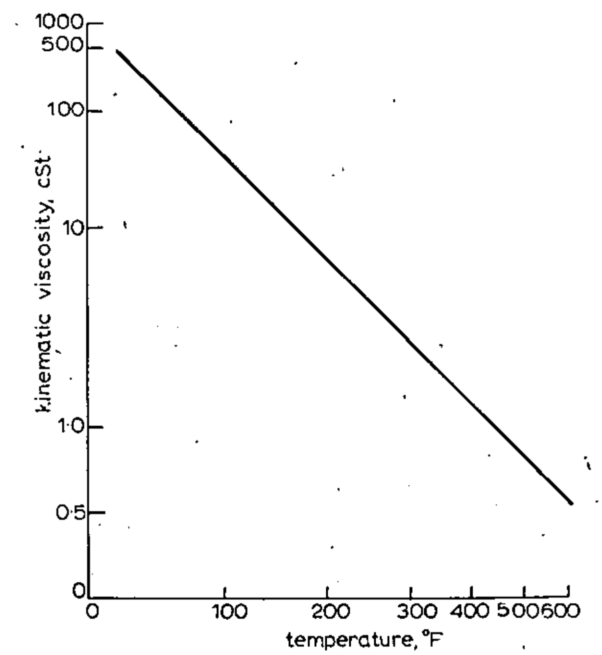

Fig. 9 Viscosity against temperature

These losses must be kept down to a minimum or the overall thermal efficiency of the machine decreases (Fig. 6).

These pump curves are only intended to indicate the problem and not my company's solution.

The oil used in the system requires high thermal and oxidation stability, high specific heat and thermal conductivity, low vapour pressure and viscosity, low pour point and fire risk among other qualities, e.g. being non-corrosive to the metals it contacts, nontoxic and not injurious to human skin.

Figs. 7–10 are self explanatory and illustrate the qualities of good thermal transfer fluids.

In Britain, the original design and development work on thermal-fluid heated ironers was carried out by the British Launderers Research Association (BLRA), in conjunction with the author's company and, with the expected problems, plus a bonus of the unexpected, the first operational 2-roll machine was installed in the BLRA laundry, where it has been operating now for over 5 years.

Since that time there have been ironers, increasing in sophistication, installed in linen hire and contract laundries, in normal commercial laundries, including two in use on continuous towels and another in a hospital laundry.

One 3-roll unit (Fig. 11) drying continuous towels is operating at 218°C and drying towels which have an input moisture content of greater than 60% at 22 to 25 m/min. This performance compares with a 5-roll steam ironer of similar size operating at 120 lbf/in^2, and, after more than 30 oil-heated-ironer operating years, the maintenance, spares requirement and breakdown time, to the writer's knowledge, is minimal at this time.

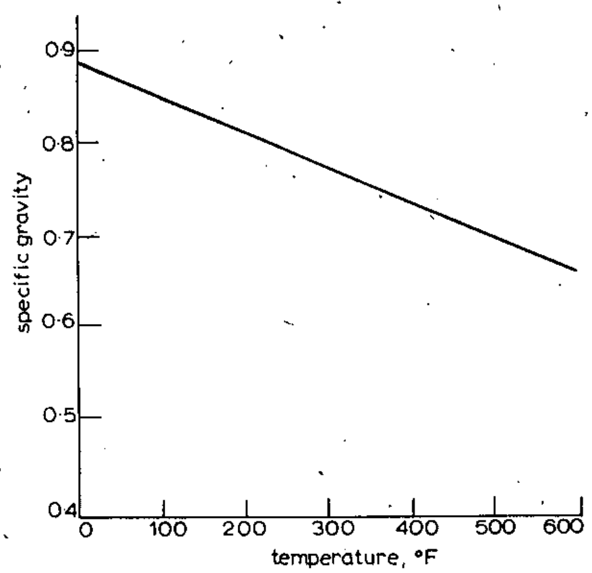

Fig. 10 Specific gravity against temperature

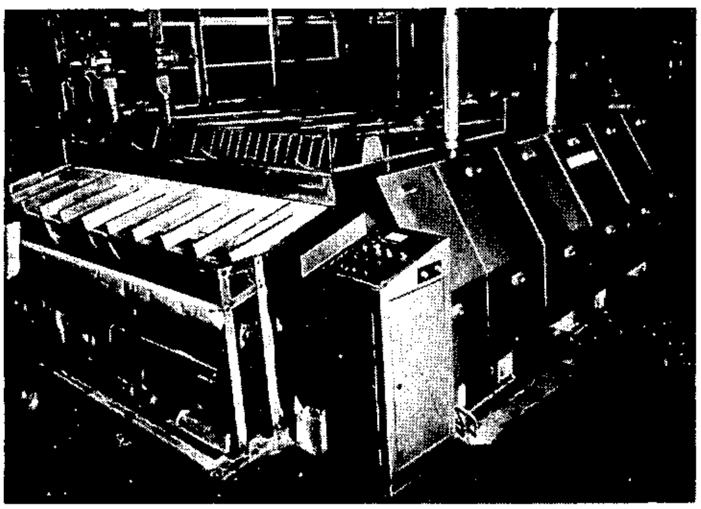

Fig. 11 Fluidheat ironer drying continuous towels
[Photo: Manlove Tullis Group Ltd., by courtesy of Co-operative Laundry, Birmingham]

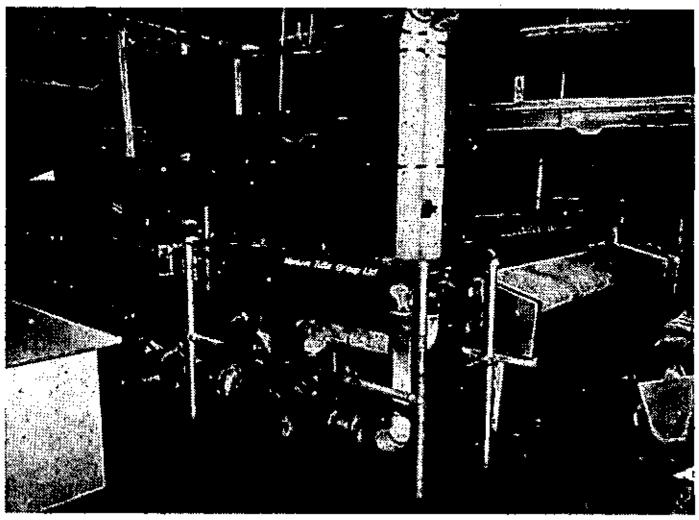

Fig. 12 Fluidheat ironer installed in Springfield Hospital laundry, Manchester
[Photo: Manlove Tullis Group Ltd.]

Another 3-roll machine is now operating in the Manchester Regional Board's hospital laundry at Springfield (Fig. 12), where it is processing 750 sheets/h direct from washer extractors with an input moisture content of 55 to 60% (nearly the equivalent of a 5-roll machine at 120 lbf/in^2). The thermal-fluid temperature is being controlled at 210°C.

BLRA are carrying out trials for the UK Department of Health & Social Security to compare the performance of a 3-roll fluid-heat machine with that of a 4-roll steam-heated machine. The object of the tests is to give comparative production performance and running costs of the two machines.

Indications from the trials to date show savings in energy costs varying between 30 and 35% over similar production output machines operating with steam heating at 130 lbf/in^2.

Typical fluid heaters are shown in Figs. 13, 14 and 15, and against each is quoted the maker's rated output of the unit.

These unit outputs compare with those of boiler installations many times their size and especially this is so when one includes all the necessary boiler ancillary equipment, e.g. hotwells, feed-water treatment plants

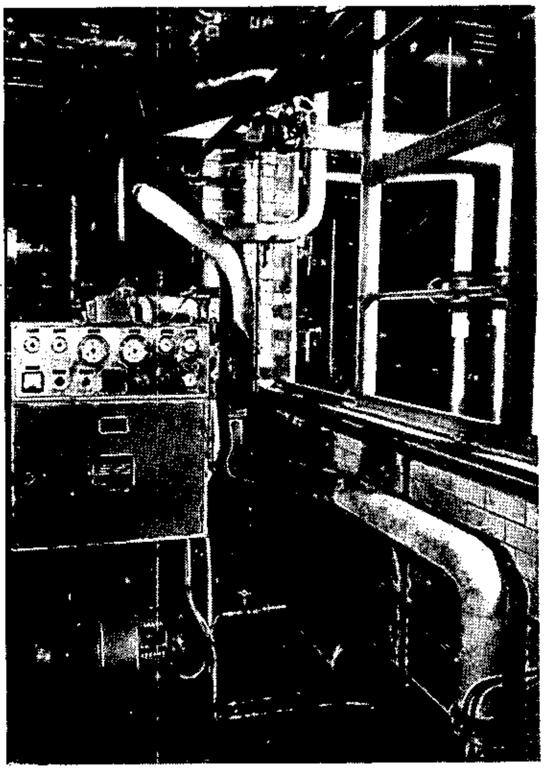

Fig. 13 Vertical downfired heater unit installed to power ironer in Fig. 11. This unit is rated at 1·6 M Btu/h [equivalent to an approximate boiler system rating of 1800 lb/h at 100 lbf/in² (gauge)]
[Photo: Wanson Ltd.]

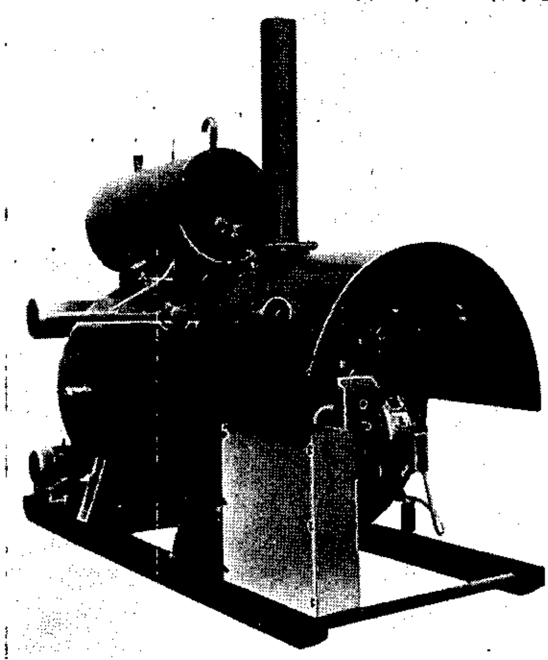

Fig. 14 Typical 200 series horizontal packaged unit. Rated at 2 M Btu/h (equivalent to an approximate boiler system rating of 2300 lb/h at 100 lbf/in² (gauge)
[Photo: Beverley Chemical Engineering Co.]

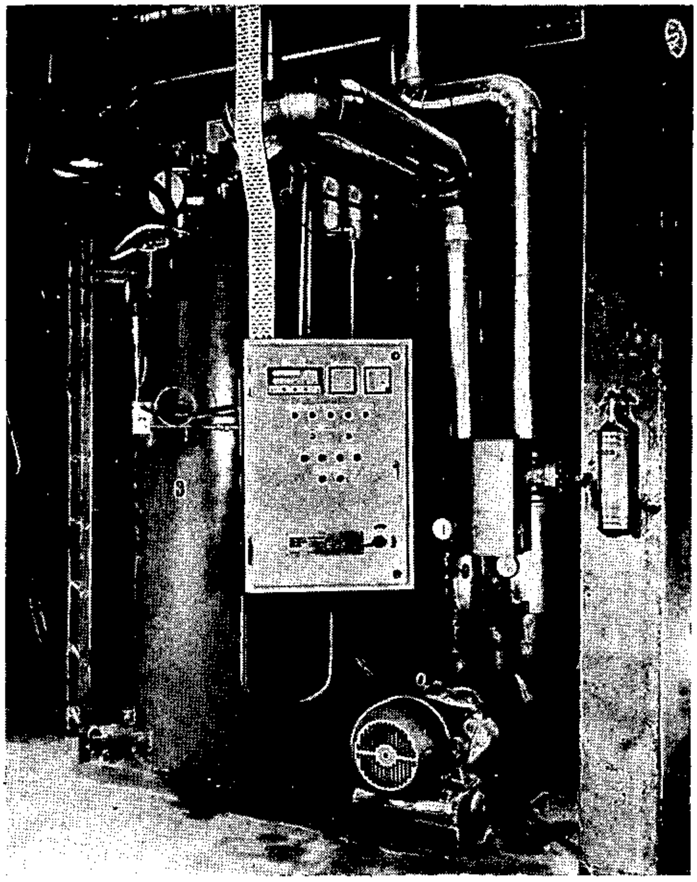

Fig. 15 Vertical downfired packaged heater unit rated at 2 M Btu/h [equivalent to an approximate boiler system rating of 2300 lb/h at 100 lbf/in² (gauge)]
[Photo: Hygrotherm Engineering Ltd.]

etc. The units are totally automatic in operation and do not require the attentions of a boilerman.

In conclusion, it may be as well to summarise some of the known advantages of thermal-fluid heated ironers over their steam forefathers:

- reduced size: 3-roll units will operate at up to 5-roll output rates with present limitations
- extremely low maintenance
- heat losses through leaks; none known to date
- no corrosion of wrought ferrous materials
- temperature and operating speed of machine variable to suit material being processed
- low thermal inertia, especially of secondary circuit machines
- no 'pressure vessel' insurance
- increased, system thermal efficiency saves energy costs
- no condensate losses
- no boilerman required and the heat-generating equipment is much smaller than the equivalently rated boiler plant.
- no hazard of frozen pipes in winter
- no lime deposits or scale and no sophisticated feed treatment.

Chauffage par fluide de transfert thermique pour les machines à repasser de buanderie

A une époque où dans les hôpitaux tous les ingénieurs ont à se pencher sur le concept de l'énergie totale utilisée en buanderie, il est essentiel d'examiner brièvement une méthode pouvant permettre d'évaluer le rendement des machines en usage, chauffées à la vapeur et de prévoir les possibilités de leurs développements futurs.

Flüssigkeitsheizung von Bügelmaschinen durch Wärmeübertragung

In einer Zeit, in der der Gesamtenergiebedarf der Wäschereien für alle Krankenhausingenieure von ausschlaggebender Bedeutung ist, muß man auch kurz eine Methode zur Beurteilung der Leistungsfähigkeit der bestehenden dampfbeheizten Maschinen untersuchen und auf ihre zukünftigen Entwicklungsmöglichkeiten näher eingehen.

Riscaldamento delle macchine stiratrici da lavanderia a mezzo di fluido a trasferimento di calore

In un'era nella quale i tecnici ospedalieri devono esaminare il concetto di energia totale delle lavanderie, è essenziale studiare brevemente un metodo per valutare la produttività delle esistenti macchine riscaldate a vapore e di cercare un loro possibile futuro sviluppo.

Institute news

WELSH BRANCH SOUTH-WESTERN BRANCH

A joint meeting of the two branches was held on the 23rd October 1974 at the St Lawrence Hospital, Chepstow, where R. G. Kensett presented a paper entitled 'An introduction to computers'. Mr. Kensett described the history of computers and the effect that the introduction of transistors had had on computer design. He covered the role of computers in the National Health Service and concluded with a look at possible future developments.

A short meeting of committee members followed the main meeting.

SOUTHERN BRANCH

Twenty members were present at Odstock Hospital recently when Dr. D. Fry, Consultant Anaesthetist, gave a talk associated with Anaesthetics and equipment.

Dr. Fry began his talk by giving some of the history of anaesthetics and told the meeting how the American dentist, Horace Wells, in 1845, gave nitrous oxide via an animal bladder and a wooden pipe, to a patient in order to carry out a tooth extraction

In this country, Dr. John Snow began dealing with anaesthetics and it is said that Queen Victoria was given an anaesthetic when giving birth to one of her babies. Anaesthetics revolutionised surgery by lengthening the time during which major surgery could be undertaken, but the practice of using ether and a rag continued for almost 50 years.

Dr. Fry spoke of the various anaesthetic gases now in existence and in normal use, but was concerned about the dangers of the expiration of these gases by the patients and the effect on the health of the theatre staff, even with the modern air-conditioning equipment now installed in theatre suites.

MID-SCOTLAND BRANCH

A party of eighteen members visited Ninewells Hospital on the 26th October 1974. Members assembled at the main entrance to the hospital at 11 a.m. where they were met by Mr. J. Webster, project engineer; Mr. S. Fleming, hospital engineer and Mr. N. McLean, assistant engineer.

The party divided into groups of 6 and were taken on an extensive tour of the hospital. The visit was in two parts with a break for lunch in the hospital dining room.

WEST OF SCOTLAND BRANCH

The branch met on the 28th November 1974 to hear a lecture on environmental lead pollution from Dr. Moore, who is a research fellow with Stobhill Hospital, Glasgow. The lecture started with a short history of lead use and the effect of the metal on the various organs and bone structures of the body. He explained the effects of lead piping and lead-lined tanks in older property and described the various research carried out in different areas of Glasgow in both old and new dwellings.

YORKSHIRE BRANCH

The following meetings are proposed for 1975:

8th February
  Bradford Royal Infirmary
8th March
  Seacroft Hospital
12th April
  Pontefract General Infirmary
10th May
  Visit to Harrogate General Hospital
14th June
  Clifton Hospital, York
July
  Visit to a factory
August—No meeting
13th September
  High Royds Hospital, Menston
11th October
  York County Hospital
1st November
  Leeds General Infirmary
6th December
  St. James's (University) Hospital
January 1976
  Huddersfield

The Annual Dinner Dance will be held on the 8th November 1975.

Members are advised to await the monthly agendas for the finalised details.

Hospital sites

by E. CAETANO

Little attention has been paid to hospital sites; they are usually referred to almost accidentally and always superficially in articles dealing with hospitals. The hospital site is very important, but there is little technical literature on the subject. With a big hospital that is to be located in a large city, or an average-size district hospital in a small town in, for example, France, the Netherlands, Portugal or Argentina, the conditions and technical parameters that have to be fulfilled are alike, with the exception of the hospital-site cost. Further, most hospital-site parameters are valid for all countries, no matter what social, economical and political differences exist.

It is not enough to know that a planning department wants a given hospital in region X, zone Y or town Z, since it is necessary to position it.

In Portugal, urbanists reserve certain areas for hospital sites in their major 'director' plans, unfortunately, in most cases, without the assistance of specialists from the Portuguese Ministry of Health. Evidently, these reserved areas for hospitals will be valid only when they are able to satisfy a certain number of requisites. Furthermore, a certain terrain may be good for a pediatric hospital and bad for a psychiatric or a teaching hospital.

Hospital siting in a large city is usually a controversial subject. Some people want new hospitals to be both in the periphery and the city centre. Others prefer the periphery and suburbs. Yet others would not mind seeing new hospitals sited far from the centre of the city.

Although a new hospital sited in a city centre would have the great advantage of being right in the middle of a densely populated area, there would be many disadvantages: the terrain would be prohibitively expensive, if it was available at all; the environment would be bad; there would be inadequate parking facilities; the site would be in a heavily congested traffic area and there would be no protection zone. To serve these thickly populated central areas it is necessary to preserve the old hospital sites and remodel or build new hospitals.

Hospital sites far from city centres offer many advantages (plenty of large locations, cheap costs and a good unpolluted and quiet environment), but they have a big disadvantage: the distance from the city centre keeps both patients and personnel away. In fact, experience tells us that hospital personnel, always difficult to find, do not like to live far from a city centre, and so it is difficult to attract them.

The solution seems to be to site the hospital in the periphery and the immediate suburbs. There will be no difficulty in finding a choice of terrain with an adequate area; prices will be reasonable; the site will not be far from the city centre, and usually will be satisfactorily served by the city transport system; the existing site accesses are normally good or can be made good; the immediate neighbourhood can be selected; the environment can be chosen or 'adapted' and, most important, staff requirements can be satisfied. Hospital sites must be located in the immediate attraction zones of the increasing demographic vectors. Fig. 1 shows the main four demographic development vectors in Greater Lisbon (north of the Tagus region). Hospital sites must be located in A, B, C and D.

Accessibility

The existence of easy and speedy access is a basic condition in choosing the terrain for a hospital site. It is well known that when dealing with poisoning, traumatic accidents and certain cardiac conditions an easy and speedy access is vital.

At least two good means of access are needed, so that one can provide for traffic when the other is blocked. There should be an internal connection between them, even though some administrators may order the connection closed all the time (except in emergency as mentioned above).

Although some hospital specialists prefer just one hospital site entrance for reasons of better control and greater economy, it is advisable to establish two means of access, so that one can be used for patients and visitors, and the other can be used for services and personnel; furthermore there will be no crossing between the incoming patient and the outgoing dead.

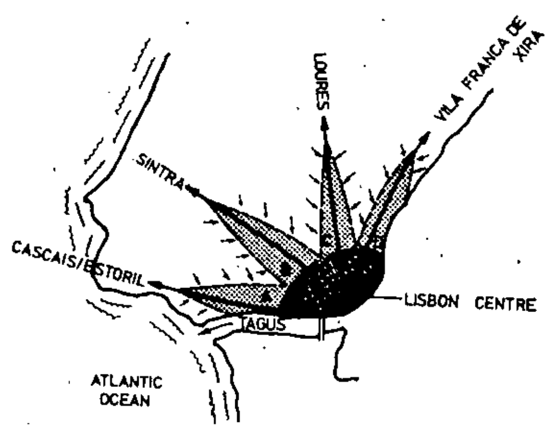

Fig. 1 Greater Lisbon demographic development

This article is based upon a lecture given by Mr. Caetano at the 3rd International Congress of Hospital Engineering, Athens, May 1974.

Hospital environment

The nature of the terrain must not be unhealthy as it is when the terrain is wet, marshy or swampy, in spite of man's present technical ability.

A good hospital site must allow adjacent parking, service, wooded, garden and grass zones. Fig. 2 shows

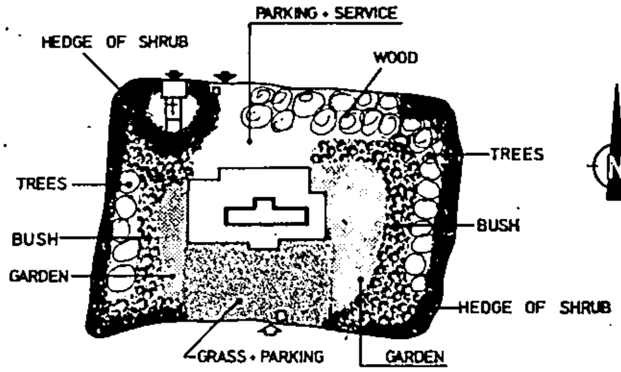

Fig. 2 Hospital site arrangement

a suggested arrangement for the primary environment of the hospital site itself. It is rather ironic that, although Portugal has many days when patients could be outside, Portuguese doctors seldom send them out. However, patients in other countries get out whenever the weather is fine.

It is well known that a beautiful or even pleasant hospital site is good for patients, at least psychologically.

The immediate environment, next to the hospital site, can be man made or 'arranged' to look nice when patients see it.

Let us hope that legislation ruling out 'non edificandi' and 'previous approval required for construction' protection zones will soon be in force to help patients to get better environments.

Neighbourhood

When choosing a hospital site, it is necessary to take into account the existing neighbourhood—those sites already planned and approved and those included in the urbanisation plan of the area.

Neighbourhood may be classified as good, satisfactory and bad:

Good neighbourhood
- gardens
- parks
- woods
- agricultural terrains
- private-house residential areas

Satisfactory neighbourhood
- residential areas
- playgrounds
- service zones (when the density of traffic is reasonable)

Bad neighbourhood
- Cemeteries. There must not be any direct view of a cemetery from any point of the hospital accessible to patients
- marshes or swamps are sources of mosquitoes and other insects, and bad smells
- industrial areas originate smoke, bad smells, noise and dust
- airports are sources of pollution, noise and vibration
- manure and litter places cause bad smells, insects, and are a potential sanitary danger
- heavily used traffic junctions produce pollution and noise.

Some or even one of these bad neighbourhoods should be enough to prevent a site intended for a hospital site from being used.

It will not be easy to find a perfect hospital site that is completely free of any bad neighbourhood, even in the suburbs of a large city.

Winds

The winds help to keep the hospital environment healthy. However, if the prevailing winds are too strong or carry toxic gases, dust, bad smells or pathogenic organisms, a hospital site located in their path must not be chosen. The prevailing winds are polluted in this way when they, for example, pass through oil refineries, certain chemical factories, cellulose factories, manure and litter discharge places or cement and steel mills.

If the hospital already exists, these industries must not be allowed in the hospital neighbourhood, or in the path of the prevailing wind (unless they will be located as far away as necessary to become unharmful).

Areas

The area of a hospital site should be adequate for a given programme, and also should be able to allow future expansion and meet other unpredictable needs. It is well known that a progressive hospital is always increasing its equipment and extending its buildings. Beyond the undisputable 'minimum minimorum', the hospital site area is a function of several variables: location, type of the hospital, architectural design and centralisation of hospital services.

Location

Although it is almost impossible to find new hospital sites in the centre of cities, apart from the enormous price per unit of land, it will be easier and easier when one gets farther away. Therefore, with the same amount of money previously allocated for a given hospital site, the possible site area increases in direct proportion to the distance from the centre.

Hospital type

The minimum area-per-bed values vary if the hospital is a specialised or general, a district or central, a teaching or nonteaching hospital.

Areas per bed increase from district to central to teaching hospitals; not only the actual area built, but also the area of terrain needed as reserve increases.

Architectural design

Obviously, if the architectural design of a given hospital follows the horizontal pattern, as is the case of the new British hospitals at Frimley and Bury St. Edmunds, it will need more area per bed than if it followed the vertical model design, like the new Guy's Hospital tower or even the new Charing Cross Hospital in London.

If a new 1200 bed teaching hospital would be built strictly to the horizontal principle, i.e. just in one floor, the building area would be about 140 000 m^2 and the hospital site would need at least 42 ha. It seems that the horizontal principle should not be followed very strictly.

Centralisation of hospital services
Nowadays there is a tendency to centralise several services, e.g. laundry, computers, preventive maintenance, CSSD, pharmacy and blood services, in a separate building. Some hospital experts go even further and include the laboratory and the kitchen. It is evident that, if one or more services are centralised in a building other than the hospital building, its area per bed decreases accordingly.

There are no universally accepted figures for the amount of bed space required. They even vary in the same country. However, one may recommend the following values for new hospitals in Portugal:

- district hospitals (350–700 beds)—120–140 m^2/bed
- central hospitals (750–1200 beds)—140–180 m^2/bed
- teaching hospitals (1200–1800 beds)—180–250 m^2/bed.

The ratio of building area to hospital site area is also a function of several variables, but mainly the amount, form and topography of the site area, the hospital type and the architectural design, and some of these interrelate. The ratio may vary from one (in the centre of the city) to 1/10 or more when the site is in the suburbs. However, an average ratio of from 1/5 to 1/6 would be about right.

Forms

A good site may be put aside if its form or topography are not appropriate for a hospital (Fig. 3). When the topography of the terrain means expensive building operations, makes future extensions difficult or impossible, or requires inconvenient alterations in the design of the hospital, as it would in the cases shown in Fig. 4, it would not be advisable to use the site for a hospital.

Although some hospital specialists do not think that it is important to orientate patient wards and rooms in a preferred direction or directions so that round or square buildings having patient beds all around their peripheries are justified, others think it is very important and necessary. If it is necessary, the hospital site must allow building in which all patient beds face the preferential direction. In Portugal, the weather conditions (cold in winter, hot in summer, prevailing winds etc.) impose a preferential orientation that is South–South/East, although this orientation varies with the latitude.

The hospital site must allow future extensions following the main axes of the principal building as well as new buildings easily interconnected with it.

Besides the buildings, the hospital site must permit adequate areas of gardens, grass parkings and service parks.

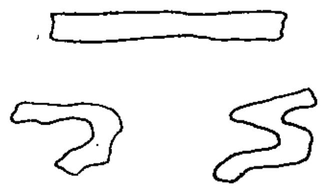

Fig. 3 Inadequate sites

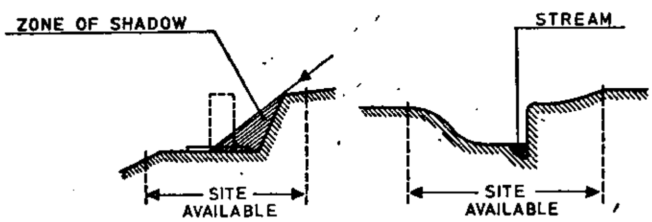

Fig. 4 Unadvisable site topographies

Hospital site costs

The cost per square metre of land decreases the further the site is from the city or town centre.

In some countries, like Portugal, it is possible to obtain legally propriety for public use, to build e.g. hospitals by compulsory purchase. Obviously, it would be preferable to avoid the long and boring court procedures and a friendly agreement should always be sought first.

Since a new hospital, even a district hospital, is a reasonable pole of development, the land around the new hospital site increases in value. Sometimes a municipality, eager to get a new hospital, offers the hospital site. Sometimes it is the 'Misericordia' that wants its old hospital replaced by a new one. Occasionally it is a land developer that offers a hospital site as bait for the complete urbanisation of the area. One must be careful when dealing with these 'generosities'. For example, in several countries, as Portugal, a building belongs to the owner of the land where it was built. That is why the Portuguese state always prefers to buy for a reasonable price or even a symbolic price such offers.

There are some who advocate buying a very small 'nucleus' of land to establish legally a 'non edificandi' zone around the site followed by another zone of conditioned building; others prefer to buy an oversized site, so that the excess can be sold at a much better price to offset the initial cost. Both methods must be avoided whenever possible, at least for public hospitals, since the state should not have commercial interests.

Occasionally, an inventor has a brilliant idea: use the money obtained by selling all the old hospitals in the city centre to build new hospitals in the suburbs. This apparently easy and seductive idea must be avoided. The idea has been applied to a very old institution named the Lisbon Civil Hospitals (HCL), which integrates seven old hospitals built in the central area of Lisbon.

The following reasons are enough to justify not selling the old hospitals:

- the sale of the old hospitals would be enough to pay for just a small percentage of the existing beds. Some years ago, a study showed that only about one-seventh of the beds could be replaced
- the Municipality of Lisbon would take advantage of the situation to use a large portion of green belt for roads, community needs etc. so reducing substantially the land available for sale
- the Municipality had no effective plans for the land the old hospitals stood on, and constraints like the nature and type of authorised buildings, maximum height allowed etc., had not been formulated,

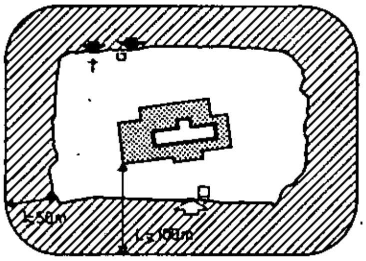

Fig. 5 Hospital sites in the city centre

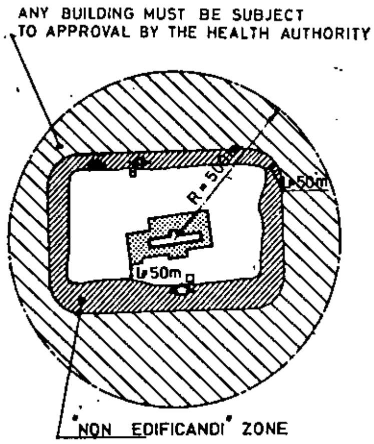

Fig. 6 Hospital zones for a site in the periphery of the city

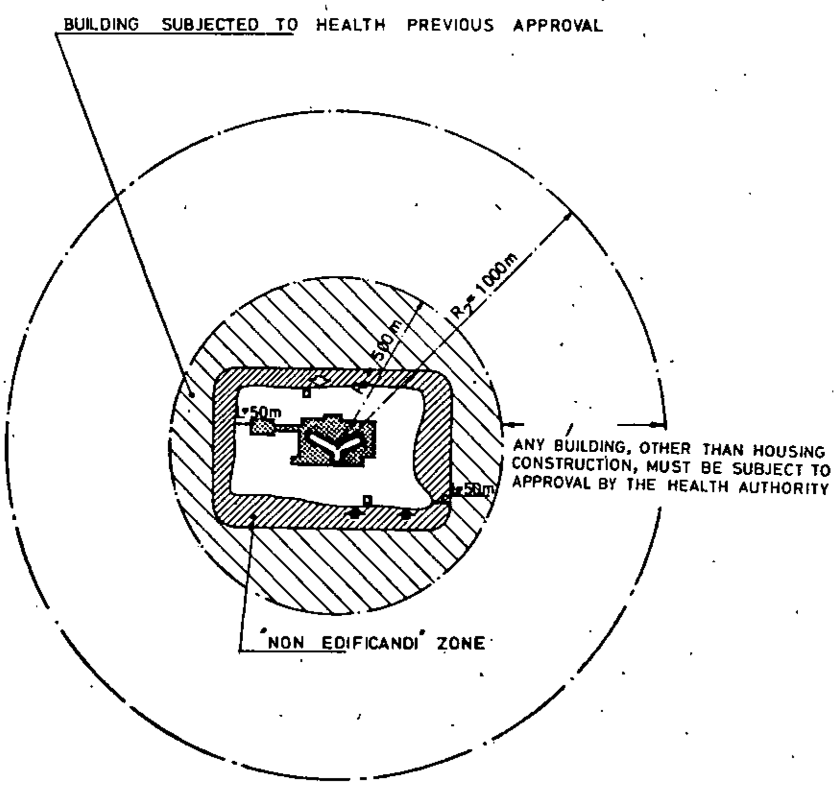

Fig. 7 Hospital zones of a site in a nonurbanisation area

leaving potential investors without basic data necessary for any economic study

- it would not be possible to pull down the old hospitals without replacing the beds first. How much money would be necessary to replace the beds? Where could it come from? How long would it take?
- although there is a continuous migration from the city centre to the periphery and suburbs in cities everywhere, the truth is that the zones now served by the old hospitals continue to be and will be, at least in the near future, densely populated. Therefore hospitals are needed to serve the people who live or work there.

In conclusion, old hospitals in the central areas of cities should not be sold. There are some rare exceptions, duly justified, like the Hospital de Arroios in Lisbon.

Many hospital engineering specialists oppose remodelling old hospitals which they do not consider 'clean work'. However, it seems advisable to establish individual plans for remodelling each old hospital according to an integrated master plan of the ensemble. By remodelling, I mean not only work in old buildings, but also extensions and new buildings.

Protection zones

Unfortunately, there is no specific legislation on hospital protection zones in most countries. However, in some, including Portugal, there are protection zones legally established for prisons, barracks and fire stations for example!

Patients must be protected not only from smoke, dust, smells, noise, vibrations and other pollution, but also from outside interference to privacy.

The first protection zone of a hospital is its own site; hence it must be large enough and trees must be planted to screen unwanted sights or surrounds. The following recommendations will be a contribution to the study of this problem:

(*a*) Hospitals in city blocks: the protection zone must be at least one block wide around the hospital. Any construction in this area must be previously approved by the health authority.

(*b*) Hospital sites in the central area: when the hospital site is big enough, a strip around the site with a minimum width of 50 m (Fig. 5) will constitute a fair protection zone. However, the minimum distance from the hospital building to the external border of the protection strip should not be less than 100 m.

(*c*) Hospital sites in the city periphery: if the hospital site is located in the periphery and the land around it is free although urbanised (Fig. 6), a 'non edificandi' strip should be established around the site with a minimum 50 m width. No construction must be allowed, unless approved by the health authority, in the zone that extends from the 50 m width to a circle of 500 m radius with its centre at the main hospital building.

(*d*) Hospital sites in a nonurbanisation area: in this case (Fig. 7), further to what is proposed in (*c*), another zone must be established between circumferences with 500 m and 1000 m radius, where no construction must be allowed without a previous approval by the health authority with the exception that the construction is for housing. However, buildings must not be tall enough to produce shadows in the hospital site.

Emplacements d'hôpitaux

Peu d'attention a été portée à l'emplacement des hôpitaux, ce sujet est en général abordé presque par accident et toujours de façon superficielle. En fait, les articles traitant d'hôpitaux ne mentionnent que leur situation et leur superficie. L'emplacement d'un hôpital est très important mais très peu d'écrits techniques existent sur ce sujet. Un grand nombre de problèmes se rapportant à la situation des hôpitaux sont les mêmes dans les pays ayant des structures sociales similaires. Ainsi dans le cas d'un grand hôpital qui doit être construit dans une grande ville ou dans celui d'un hôpital régional moyen dans une petite ville de France; de Hollande, du Portugal ou d'Argentine, les conditions et les paramètres techniques à remplir sont les mêmes à part le coût du terrain. En outre, on peut dire que la plupart des paramètres techniques concernant l'emplacement de l'hôpital sont valables pour tous les pays, quelles que soient leurs différences sociale, économique et politique. Nous invitons donc les études et les articles sur l'emplacement des hôpitaux afin de permettre les débats sur ce problème et venir ainsi en aide aux malades, ceci étant l'objet principal de nos travaux.

Das Krankenhausgelände

Dem Krankenhausgelände wurde bisher nur sehr wenig Beahtung geschenkt. Es wird im allgemeinen fast nur beiläufig und immer nur flüchtig erwähnt. In Artikeln über Krankenhäuser werden nur die Lage und die Fläche des Geländes genannt. Das Krankenhausgelände ist jedoch sehr wichtig, und trotzdem gibt es über dieses Thema nur sehr wenig technische Literatur. Länder, die eine ähnliche Gesellschaftsstruktur aufweisen, haben auch veile der mit Krankenhausgeländen zusammenhängenden Probleme gemeinsam. So sind zum Beispiel bei einem großen Krankenhaus, das in einer Großstadt gebaut werden soll, oder bei einem Bezirkskrankenhaus durchschnittlicher Größe in einer kleinen Stadt in Frankreich, den Niederlanden, Portugal oder Argentinien die zu erfüllenden Bedingungen und technischen Parameter genau gleich, mit Ausnahme der Grundstückskosten für das Krankenhaus. Man kann außerdem sagen, daß die meisten technischen Parameter, die sich auf das Krankenhausgelände beziehen, für alle Länder gelten, ohne Rücksicht auf die gesellschaftlichen, wirtschaftlichen oder politischen Unterschiede. Untersuchungen und Abhandlungen über Krankenhausgelände sind daher sehr willkommen, damit über diese Probleme diskutiert und dem Patienten geholfen werden kann, was immerhin der Hauptgrund für unsere Arbeit ist.

Ubicazione degli Ospedali

L'ubicazione degli ospedali ha ricevuto ben poca attenzione; essa viene menzionata quasi accidentalmente e sempre superficialmente. Infatti, in articoli che trattano di ospedali, solo la località e la zona in cui essi sono ubicati sono menzionate. L'ubicazione di un ospedale è assai importante, ma vi sono poche pubblicazioni tecniche in materia. Molti problemi collegati all'ubicazione degli ospedali sono gli stessi in Paesi con simili strutture sociali. Infatti, nel caso di un ospedale per una grande città o di un ospedale provinciale di medie dimensioni per una piccola città sia essa in Francia, Olanda, Portogallo o Argentina, le condizioni e i requisiti tecnici che devono essere soddisfatti sono simili, ad eccezione del costo dell'area ospedaliera. Inoltre, si può dire che la maggior parte dei requisiti tecnici per l'ubicazione di un ospedale valgono pet tutti i Paesi, non importa quali siano le differenze sociali, economiche e politiche. Studi e saggi sull'ubicazione di ospedali sono pertanto benvenuti, così da poter discutere questo problema ed aiutare i pazienti che è lo scopo principale del nostro lavoro.

Valves go metric

The members of the British Valve Manufacturers Association (BVMA) have agreed to begin a phased change from imperial to metric production, for which a manufacturers' availability time scale programme has been established.

The BVMA has prepared two publications designed to assist in comparing the new metric standards with the imperial standards they supersede. One publication deals with copper alloy valves and the other with iron and steel valves. The publications are entitled 'An introduction to British Standard Specifications for metric general purpose valves', part 1: copper alloy valves, and part 2: iron and steel valves—gate, globe check, butterfly, parallel slide, ball, plug and diaphragm.

Each publication has the following content:

- an introductory section covering the relevant standards and the BVMA manufacturers' availability programme for metric valves.
- the subject of the publication, with sections dealing with design parameters and interchangeability
- a summary of the new metric standards covering the relevant sections, e.g. scope, body ends, materials, testing and inspection, marking etc.
- comparison tables of pressure/temperature ratings.

The publication provides a useful and simple guide to the similarities and differences between the old and new; and they explain what will be done to simplify the changeover period, which may run until mid or late 1976.

Purchasers and users of general purpose industrial valves who wish to obtain either publication should contact their normal valve supplier. Copies are obtainable from the Association at a prepaid nominal contribution of £1 per copy per publication (postage paid in the UK) or £1·50 for delivery by sea mail overseas (postage paid). Inquiries to British Valve Manufacturers Association, 3 Buckingham Gate, London SWIE 6JH, England.

Meetings of the Portugese Association

The Portuguese Association of Hospital Engineering's calendar of activities for 1975 is:

11 *Mar.*
Hospital boiler house by Espinheira Rio

13 *May*
Circulations in the hospital by Augusto Galvão, António Afonso and Luis Bronze

8 *July*
Role of the engineering personnel in the starting of a hospital by António Carvalho, Espinheira Rio and José Torrão

14 *Oct.*
Hospital laboratory by M. Ferraz da Costa and Alberto Camacho

9 *Dec.*
Hospital maintenance by Alberto Rola and Silva Carvalho
Moderator: Eduardo Caetano

All meetings will be held in Lisbon except that of the 8th of July which will take place in Oporto.

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Applications are invited for the post of Assistant Engineer to assist the Hospital Engineer in the operation and maintenance of St. Leonard's and Metropolitan Hospitals which form part of the above District.

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Salary scale £2271–£2601 plus £126 London weighting allowance (increase pending) and Threshold Payment of £19·14 per month. Applications giving full details and quoting two referees to be forwarded to The Group Engineer, Administrative Offices, 273 Bancroft Road, London E1 4DF or telephone 01-980 4855 ext. 284.

KENSINGTON & CHELSEA & WESTMINSTER AREA HEALTH AUTHORITY

South District
Westminster Hospital

ASSISTANT ENGINEER

required at Westminster Hospital. Candidates must have served an Engineering Apprenticeship, have appropriate General Engineering Services experience, and hold an ONC or equivalent approved qualification. Salary starting at £2271, plus £312 London Weighting, plus £229 Threshold Allowance.

Applications within 14 days of this advertisement to: Deputy Group Engineer, Westminster Hospital, Page Street Wing, London SW1 Telephone: 01-828 9811 ext. 2481.

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Applicants must have completed a Higher National Certificate in Mechanical Engineering, Electrical Engineering or Engineering or an equivalent City & Guilds qualification.

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For further details and application form please contact the Personnel Department, Edgware General Hospital, Edgware, Middx. HA8 0AD. Tel.: 01-952 2381, Ext. 208.

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Applications from Director of Public Health Engineering, HE/AE/CMC, (01-633 4383), 10 Great George Street, London, S.W.1, returnable by the 7th March 1975.

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Job description and application form obtainable from District Administrator, PO Box 2, St. Martin's House, Princess Street, Chester CH1 2BA.

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Peace Memorial Wing
Rickmansworth Road,
Watford, Herts.

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ASSISTANT ENGINEER to be responsible to the Group Engineer for the introduction of Planned Preventive Maintenance and to assist the Hospital Engineer over the whole range of duties.

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Application form and job description from the Group Engineer. Tel: Hitchin 730123 Ext. 4.

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edited by Dr. D. W. Hill and Dr. B. W. Watson

172 pp., hard covers, six papers, 230 × 150 mm, letterpress, ISBN 0 901223 51 4, published 21st January 1974, £6.50

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