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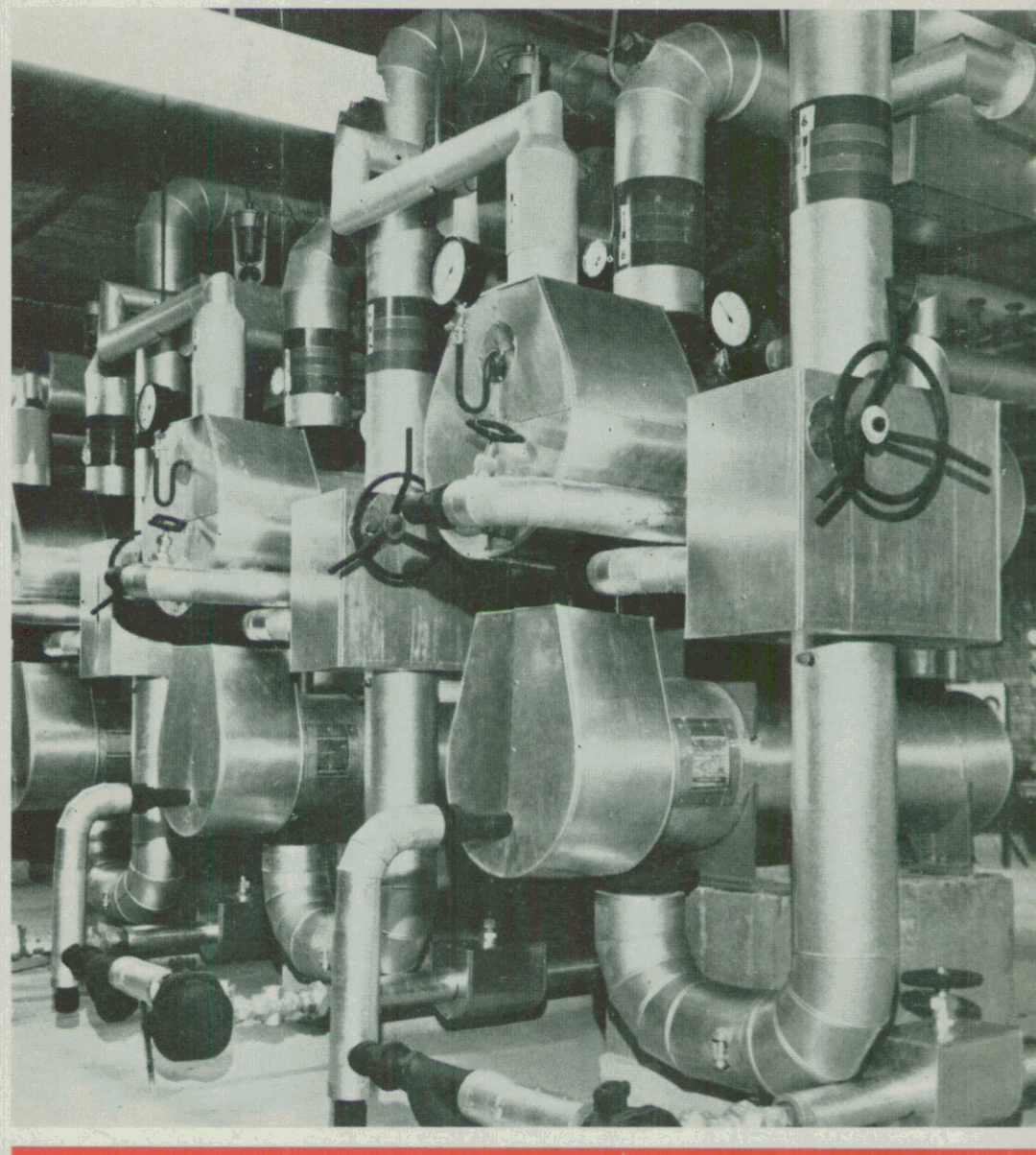
Hospital Engineering

MARCH 1975



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Incorporating 'The Hospital Engineer'

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The Journal of The Institute of Hospital Engineering

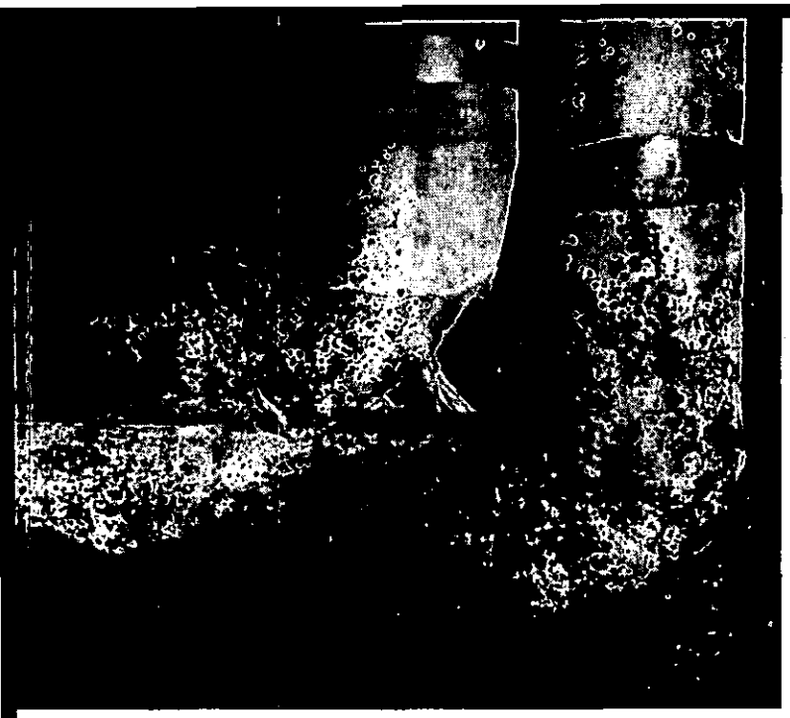
Contents

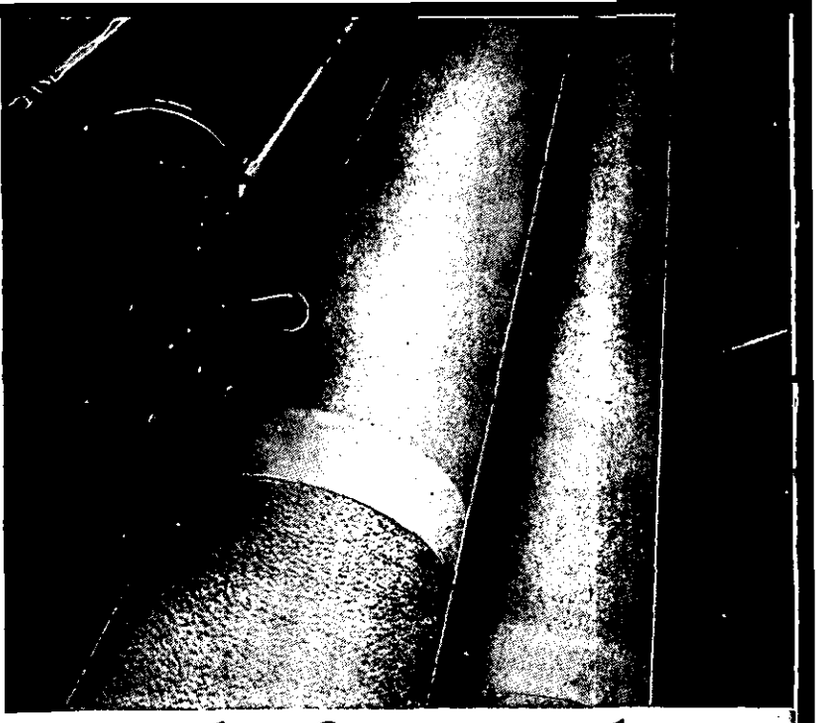
Special features

News features

Departments

Front cover: Heat exchangers incorporating condensate coolers in the phase 2A extension at Kettering General Hospital.
(Photo: Drake & Scull Engineering Ltd.)





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Vol 29
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Training of engineers for senior works posts at area and district levels

Early in 1974 the Council of the Institute recognised the need to provide training for engineers who may be appointed to the senior works posts at area and district levels, and it set up a working party to investigate this need and to make recommendations. The working party's report was accepted by Council in November 1974 and it has been submitted to the Chief Engineer and others at the Department of Health & Social Security and also to the staff-side Secretary of the Whitley Council. It has also been sent to the Secretaries of State for Scotland and Wales. Here is an abridged version of the report.

Foreword

Many members of the Institute of Hospital Engineering are as qualified as most to fill the new posts that have been created in the reorganised Health Service, but some recognise that they will need to gain a wider knowledge of works management than they have had to gain in the past. The Institute was therefore urged by its members to identify the training need and to do what it can to influence the authorities to satisfy the need.

The Institute therefore established a working party to make recommendations. The working party, having met several times and having had discussions with, and contributions from others, now makes its report and recommendations.

Section 1—Introduction

This section of the report deals with the approach to training before reorganisation and the changing need brought about by reorganisation, and is therefore omitted here for brevity.

Section 2

Training engineers in other aspects of the AHA works officer's responsibilities

This section deals with the method by which trained engineers or fully qualified technicians may be given information about other aspects of the work for which a works manager at area or district level would be responsible. It therefore assumes that the man selected for this training will have undergone a recognised course of academic training leading to exemption from the CEI Part II examination or, for staff already established in the health service, one of the qualifications acceptable for the post of group engineer in the hospital management committees prior to the 1st April 1974.

The essential qualities required by that person to receive the recommended further education should be that:

(*a*) His academic standard is such that he can follow the course

(*b*) He would be qualified to occupy one of the works-management posts

(*c*) He is likely to stay in the Health Service and occupy one of the works-management posts.

The working party, while agreeing that plans should be laid as quickly as possible to attract school leavers and to sponsor them on suitable degree courses leading to works management, also recognise that there are a large number of engineers now working in regional

and area health authorities who held middle and senior management posts in various health authorities prior to April 1974 and who, with some further training, have the qualities to hold one of the senior works posts at area or district level.

A man aspiring to the top works posts at area and district levels must be a manager with a great deal of experience in the works function as it applies to hospitals and other Health Service establishments. It must be recognised that few men already in the service have been trained in all aspects of the work and unless training is offered to them they have to rely on the information they may have gained over a number of years of experience.

It is the view of the working party that a works manager would execute his responsibilities with greater efficiency and confidence if his education were extended beyond that acquired in the course of his professional training to embrace good background information about the work of the other disciplines he has to control.

It will take some fifteen years to produce works managers from school leavers and it is unlikely that any scheme to achieve this can be put into operation inside two years; therefore the Health Service has to take the best of the people it now has and to build on their education.

Most of the existing engineering staff in the Service who may aspire to the senior management level at area level will have been educated through the Higher National or City & Guilds courses, while some will have gained their knowledge and competence by other means and may not hold formal certificates of education; there will be a few who have an engineering degree.

An engineer is most likely to have received his education in either mechanical or electrical engineering, but others who may aspire to AHA works-management posts may have been educated through heating-and-ventilating, electronic or marine-engineering courses. The Working Party feels that for an engineer trained in one of these disciplines to be fully competent as a works manager he will need further education and training on estate management, building technology and perhaps another engineering discipline.

The working party had correspondence with universities and colleges to see if all of these could be covered by one college and whether it would be feasible for such a college to devise courses that would give a trained man a fair appreciation of the subjects. These studies resulted in a discussion with principals from the appropriate faculties of the Polytechnic of the South Bank, from which the working party concluded that, in principle, the approach set out in the succeeding paragraphs of this report is feasible and that only the details require further study.

Initially the discussions referred to above led the working party to believe that a course could be devised made up of three separate modules, each, requiring full-time study over about a term. The advantages of having separate modules is that they can be dealt with by the appropriate faculties at the Polytechnic of the South Bank and the officer need not be away from his post for say nine consecutive months, but might elect to take the modules at intervals, thus taking some 18 months before completing the final module if he requires to attend all three. There may be some who have such a good wide working knowledge of all the engineering disciplines and may only need to take two out of the three modules.

The modules on estate management and building technology are broadly self explanatory and only the detailed subjects to be included in them would have to be worked out with the Polytechnic.

The engineering module would have to be reviewed as more is known about the background training of the likely candidates, but initially the working party assumes that the majority will have been trained through mechanical and electrical courses and that, to assist works managers with their involvement in planning and the environmental control of buildings, the first engineering module should be drawn from the Faculty of Environmental Engineering at the Polytechnic.

For the suggested scheme to work there needs to be

(*a*) full support from the Department of Health & Social Security with agreement to sponsor nominated candidates for at least the next ten years in order initially to get a quick return from those in the 35–55 age range and to provide career prospects from those at present in middle management in the 20–35 age range.

(*b*) willingness on the part of regional and area health authorities to release candidates and pay their salaries and expenses while attending courses and to pay acting-up allowances for subordinate staff who will be expected to take higher responsibilities during the absence of works managers for this purpose.

(*c*) willingness on the part of the Polytechnic of the South Bank to run block-release courses specifically designed to meet the requirements of the Health Service. In discussing (*c*) above it was established that the principals of the Polytechnic see this as feasible, provided that the authorities can release the numbers required to make up the courses.

The demand for these courses is difficult to establish initially because experience of those likely to be appointed to the posts of area and district works officers is not yet known, but it is not unreasonable to assume that, out of the 80 area works officers' posts, over half those appointed would benefit from taking at least two of the proposed modules as quickly as possible and such a demand may well be satisfied by running each module for five of the six terms in the first two years with a review of the frequency thereafter. Each course should have a guaranteed attendance by 15 students and therefore, by dividing, say, the 45 AWOs in three groups, they could attend the courses as indicated for Groups A, B and C in Appendix 4* and at the same time permit other potential AWOs to be introduced as indicated by Groups D, E and F.

The arrangement shown in Appendix 1 of the report allows a break of about six months between the first two modules so permitting the officer time on the job

*The Appendixes to the report are not included here.

to develop his organisation. In the second year he would have a break of three months between modules or, if pressures were too great, he might elect to take his third module in the third year.

The working party emphasises the urgency with which courses of this type should be introduced but could see little point in developing the scheme in greater detail with the Polytechnic of the South Bank until the DHSS has indicated its willingness to support the proposal. The Institute would be willing to develop the scheme once some serious interest has been shown. The working party therefore recommends that the Institute

(*a*) urges the DHSS to adopt the working party's recommendations in principle.

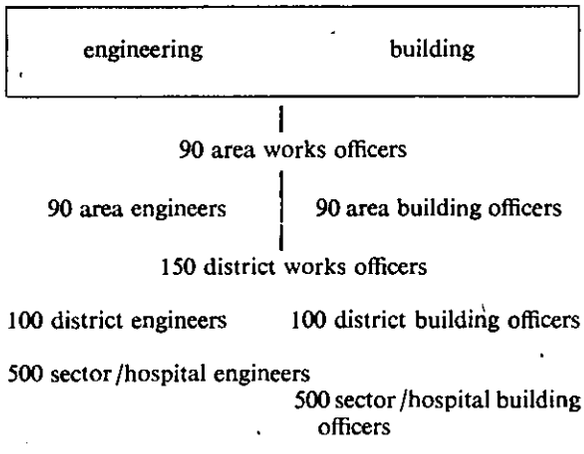
(*b*) offers to develop the modules with the DHSS and the Polytechnic of the South Bank.

Section 3

Training of school leavers for works management at area and district levels

The role specifications prepared by the DHSS propose that the qualification level for the area works officer and area engineer would be equivalent to chartered engineer and therefore at honours-degree level.

It is difficult to assess accurately the total number of management posts likely to be required in the reorganised service, but they could be of the following order.



Of the above numbers it would be reasonable to expect that at least half the AWOs and DWOs will come from the engineering discipline. Therefore the minimum number of engineers employed in management at area and district level is likely to be

area works officers	45	chartered level
area engineers	90	chartered level
district works officers	75	non-chartered level
district engineers	100	non-chartered level
sector engineers / hospital engineers	500	non-chartered level

Therefore about one in every six school leavers recruited for employment at area and district levels for engineering training should be a potential area engineer or area works officer and should be capable of obtaining a degree in engineering in order to become a chartered engineer.

It follows that, if the Health Service requires this standard of education to perform the duties required in the top posts, then a system of sponsorship must be considered as a long-term investment.

Ideally the service would recruit one 'A' level youth for sponsorship to an engineering degree course to every five or six who would have five 'O' levels or equivalent for sponsorship to an engineering diploma/certificate course, now being devised by the Technician Education Council for nonchartered engineers.

In practice it will be found that some who embark upon the degree courses will not complete the course and obtain the degree and they will fall into a lower strata of education, possibly into the diploma/certificate stream. Similarly there will be some who embark upon the diploma/certificate course who will prove themselves capable of being able to complete a degree course. Provision should be made in any training scheme for this kind of movement to take place.

Some research will be necessary to establish the rate at which school leavers will need to be recruited, but the numbers are likely to be large enough to justify running special block-release courses for the degree and diploma students.

There is some difficulty in deciding the type of engineering course most suited for young men being trained for employment at district and area levels. Ideally a course that embraces mechanical, electrical and electronic theory in proportions appropriate to the responsibilities to be covered would be most suitable and, if block release courses were organised, it should be possible to devise a special syllabus that would be acceptable to the Health Service and to the Council of Engineering Institutions. Meanwhile the best use should be made of courses in both mechanical and electrical engineering.

Students succeeding in obtaining a degree or a diploma who subsequently show considerable ability in leadership and management should be selected to attend courses in the estate management and building technology as outlined in section 2 of this report in order that they can be groomed for the area works officer or district works officer posts, respectively.

The Institute should urge the Department of Health & Social Security to take immediate steps towards national sponsorship in both degree and diploma courses beginning in the academic year 1975/76 and draw on engineers employed by the regional and area health authorities to assist in drawing up schemes of practical training in conjunction with the universities and technical colleges or polytechnics. The Institute should be prepared to help in such a venture in any way possible.

The end of a decade

The history and development of the Keele Courses

by MAURICE J. BURKE,
T.Eng., F.I.Hosp.E.

With the advent of the new unified National Health Service it is opportune to reflect on the development of the hospital engineering management courses held twice annually at the University of Keele. Although these courses were first started in 1963, they have their roots deep in the earlier days of engineering training.

Early steps in training

Apart from the occasional study day and isolated course, run by firms or outside bodies (such as Ministry of Fuel & Power etc.), there was little or no attempt at organised training of hospital engineers until 1957, when the Ministry of Health issued a circular to regions suggesting a series of stokers training courses be held to improve efficiency. These courses (under the direction of M. Drury) may be seen as the first steps in organised training for engineers in the hospital service.

By 1960, the success of these courses had created interest in the subject, and the broad field of engineering training, in the hospital sphere, had become a matter for discussion between the ministry and regional engineers. Between 1961 and 1965 there were a number of independent training developments taking place at the ministry, regions and other organisations. Some of these developments are referred to below in so far as they influence the pattern of the Keele Courses.

Mr. Burke, formerly Regional Engineer to the East Anglian Regional Hospital Board, is now seconded to the DHSS on special duties. He has been closely connected with an aspects of engineering training since 1957 and has been involved with the Keele Courses since their conception.

Members of a typical group at work with George Rooley in the background as an observer

Dunford Courses

Early in 1961, the late D. H. Hughes, then Chief Engineer to the Ministry of Health, obtained approval for a series of residential courses for engineering staff of the boards. These courses (organised and run by G. S. Gillard) were designed as post-entry training of staff, arranged in three categories to suit various grades. Over 200 engineers attended the nine courses run. When owing to pressure of other work, they were discontinued, there was a waiting list of over 100 applicants.

Regional Hospital Boards

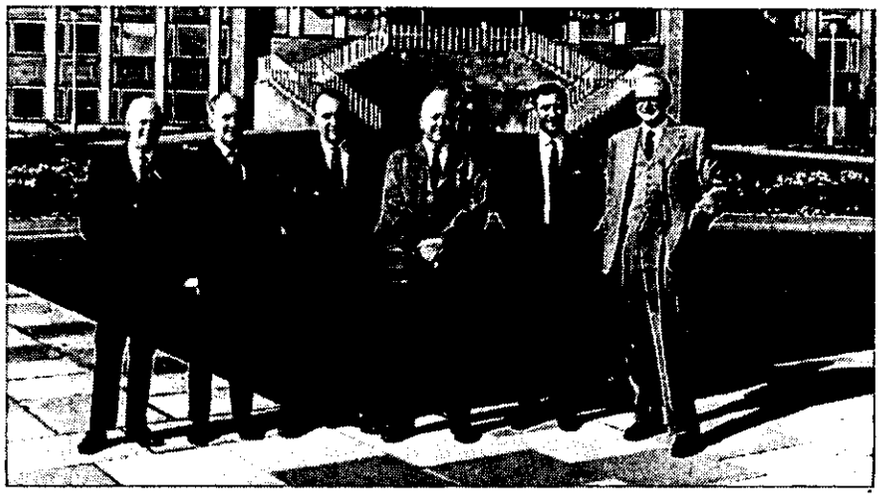
By 1961, some regional engineers had begun training engineering staff from HMC's within their own regions, with study days related to technical subject such as boiler plant, sterilisation, planned maintenance and other matters of interest. In the course of time the day sessions increased in scope and expanded into courses spread over several days. The Boards pioneering this early work were Birmingham, East Anglia, Sheffield, Liverpool and the South West Metropolitan.

Regional Training Officers

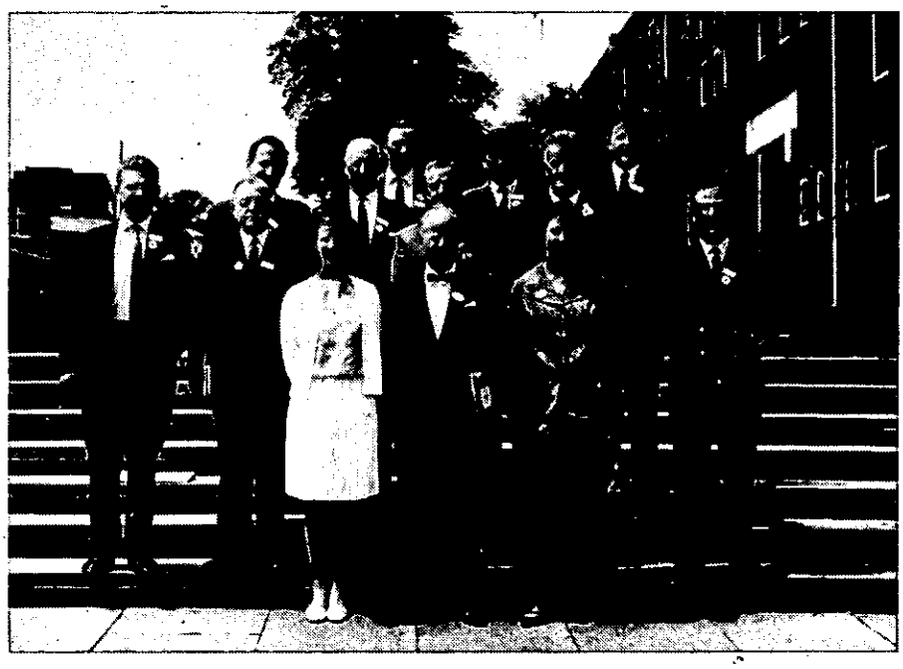
Up to 1961-62, the engineers were ahead of other disciplines in the service in attempting any form of serious or organised training. This year saw the introduction of regional training officers, who were appointed to cover the broad field of training, with particular emphasis for clerical and administrative training. Some regional engineers were quick to make use of their services for the administrative side of engineering training schemes. The training officers had a considerable influence on, and subsequently played a very active part in, the Keele Courses.

In 1964 an engineering steering committee, comprising a number of regional engineers under the chairmanship of G. S. Gillard, was formed to advise the chief engineer on study and training for engineers.

The committee recommended that the training of engineers should be expanded to include practical training for craftsmen and that this could only be satisfactorily carried out at a national centre. These

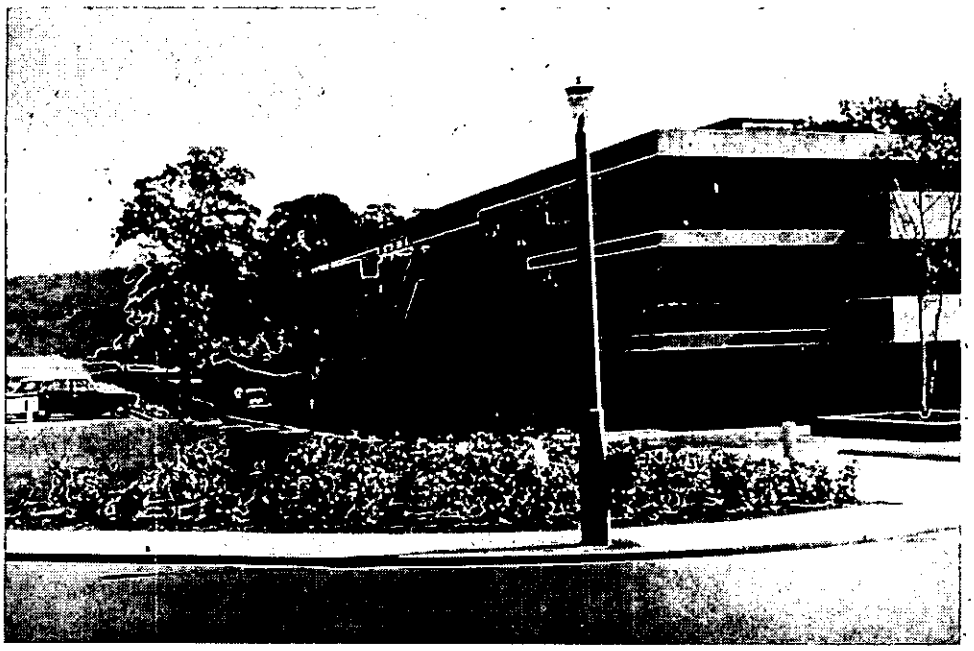


The directorate with some of the speakers and lecturers (left to right) M. J. Burke, G. S. Gillard, J. E. Furness, E. L. Taylor, J. Knipe and R. Manser



1966 Group and Hospital Engineer Course

One of the Dunford Course groups



The Student's Union building at Keele

recommendations led eventually to the establishment of the Hospital Engineering Centre at Falfield.

The Advisory Committee on Hospital Engineering Training was established by the Secretaries of State in 1967 under the chairmanship of the Chief Engineer, D. H. Hughes and later J. Bolton. Amongst other things the committee advised that the work being done at Keele should be integrated with that being done at the Hospital Engineering Centre.

The Tyler Report

Early in 1962, the Tyler Report was published, which highlighted the radical changes taking place in the engineering content of the, modern hospital, the added responsibility this placed on engineering staff, strongly emphasising the need for proper training schemes for staff in post, and gave a much needed impetus to training. Mainly as a result of this report, engineers from the ministry, regions and a number of outside organisations began to apply their thoughts and energies to engineering training. One such organisation was the Institution of Hospital Engineers, who considered there was scope for them in this field.

The work of the Institution

Arising partly from the Tyler Report, the Institution decided that some active part should be taken in the education and training of their members. After considerable discussion and deliberation the germ of an idea was formed that eventually grew into the Keele Courses.

Late in 1962 the Council set up a working party under H. A. Adams to investigate the various schemes and problems relating to training. Discussions took place between the Institution and ministry, from which it was proposed that residential courses should be held each year at a suitable venue, possibly a university. The Insitution was to be responsible for financing, organising and administering the courses, while the ministry would advise and co-operate by giving them their official approval. They would also encourage regional boards to allow their staff to take part and help with the recruitment of students from HMCs.

The Working Party then began establishing the basic requirements for the Courses by gathering ideas from such boards as East Anglia, Sheffield, Birmingham and Liverpool. These boards and others had by now considerable experience of running residential courses which included management subjects. A number of the features were adopted intact for use at Keele.

In 1963, the working party recommended to the Council of the IHE the outlines of a pilot course to be held sometime late in 1964. The Council approved the proposals and instructed the secretary to find a suitable location.

Pilot Course

The University of Keele was chosen as a suitable venue since it appeared to meet most of the requirements necessary for such a course.

Acting for the ministry and on behalf of the working party, Mr. Gillard enlisted the assistance of training officers and senior engineers from a number of regional boards. In November 1963, a committee to organise, plan and run the pilot course was set up comprising the members of the working party with a group of nine training officers and a senior engineer. The committee laid down the aims for the course and a draft programme for achieving them.

The aims were to stimulate discussion about future developments in hospital engineering, to review selected aspects of current good practice and to indicate methods of improving management skills. A large portion of the tuition time was to be spent by students working in groups, with a number of supporting lectures arranged, on both management and tech-

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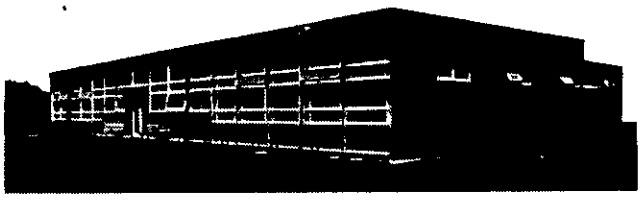

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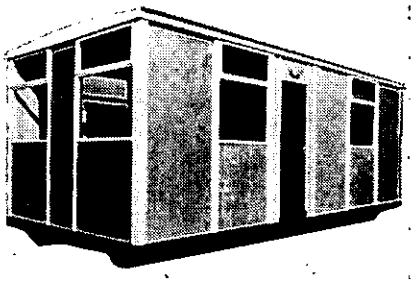

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A member of the Pentos Group

nical subjects. Visiting speakers were drawn from the ministry, boards and a university. 35% of the time was devoted to technical studies and 65% to management.

P. H. Beahan and G. Davison were appointed joint programme directors with M. J. M. Bosley (then Secretary to the IHE) as administrator. The course ran from Sunday teatime and dispersed the following Saturday, for which a course fee of £21 per student was charged. All course activities took place within the student union, accommodation being provided by separate study bedrooms in Horwood Hall with meals served in Horwood Refectory, Keele Hall.

117 students attended the pilot course, which had a fulltime tutorial staff of 12. The students were formed into eight groups, each directed by one tutor and sometimes two. The course was considered to be a great success and a key factor in this was undoubtedly the release of their staff by regional boards for training purposes. Although the experience of the pilot course pointed to changes in programme design, the basic concept was well established.

Following the success of the pilot course, the committee recommended that two courses should be held each year commencing in 1965. This was accepted by the Council of the IHE and the Ministry of Health, so that in 1965 the Keele Courses were firmly established as the regular annual feature that they are today.

The Ten Years of Keele

Joint Keele Course Committee

With the decision to continue with further courses, agreement was reached between the Council of the IHE and the Ministry that the Committee formed to organise the pilot course should be reconstituted as a 'Joint Keele Course Committee', with H. A. Adams as chairman and M. J. M. Bosley Secretary. With changes in conditions and personnel over the years the formation itself tended to change until in 1974 the committee comprised:

G. S. Gillard (Chairman)	Assistant Chief Engineer, DHSS
K. I. Murray	Assistant Chief Engineer, DHSS
K. J. Eatwell	Regional Engineer, South West Thames RHA
C. J. King	Engineer, Oxford RHA
M. J. Burke	Engineer, DHSS
A. Wotherspoon	Assistant Chief Engineer, Scottish Development Department
J. E. Furness (Secretary)	IHE

Aims and purposes of the Courses

The two courses held in 1965 were identical to the pilot course, but in 1966, the aims were amended. Course activities were rearranged to enable course members to table current problems, ideas, information and developments in such a way that these could be discussed and studied in a co-operative and helpful manner.

By 1971-72 the Keele Courses were being affected by a number of factors; such as the increasing build up of HEC, Falfield. For this and other reasons it became necessary to reconsider the aims and purpose for the 1973 course which were laid down as follows:

> To help engineers to appreciate the impact and effect of management on their everyday responsibilities and duties. At the same time it is hoped that not only will the course be of use to them in their present position, but that it will also be of assistance in gaining promotion and in carrying the resultant responsibilities.

A panel of experts being questioned

Tutors at the 1965 Assistant Engineers Course

The course programme was amended to achieve these aims; but retained the main principles of group working and other aspects which had proved successful in the pilot course. In recent years a theme for the course has been adopted, and for the last five years these have been:

1970	Engineering management
1971/72	The Engineer as a manager
1973	The participation of the engineer in management
1974	Organisation in management

As the HEC at Falfield developed technical training for engineers, that portion of technical training at Keele has been dropped and the programme now concentrates on training in the principles of management and administration from a technical approach. Falfield and Keele should be seen as complementary to one another, each having its distinct role to play in the training of engineers.

The course and programme directors

Each course has its course director, who is responsible for organising and running the whole course. It must be said that the courses have been well served by the course directors in the past; it is to their credit that any problems that arise are seldom, if ever, seen by the course members. The first course director was M. J. M. Bosley, who also acted as secretary for the course. In December 1965, Mr. Bosley resigned as Secretary to the IHE and was replaced by C. D. Belton. Mr. Bosley continued to assist at Keele as the course director. In the summer of 1966 Mr. Belton resigned, to be replaced by J. E. Furness who has remained course director up to the present time.

The programme director's responsibility is to design the course programme, within the framework laid down by the committee. He has to ensure that it is a well balanced course which will flow smoothly and to co-ordinate the programme in all respects. He also ensures that the tutorial staff are thoroughly briefed on all aspects of the course and work closely with the course director.

Tutorial staff

Tutors play a very important part in the Keele Courses. They are intended to be a guide and friend to their groups, as well as teacher. Using a combination of experienced training officers and engineers as tutors, the training of engineers has been approached on a wide front

The tutors, with groups of between ten and 12 course members are able to instruct and guide by allowing scope for discussion of problems and projects. Since 1965 the number of volunteer tutors has totalled 63, made up of 25 training officers, 33 engineers, three administrators and two tutors from outside the service. These individuals were drawn from the DHSS, RHBs, HMCs and Universities.

Attendance and course fees

The attendance at Keele has dropped from about 120 to 80 for each course over the ten years. Bearing in mind that, after three of four years of the Keele Courses, the immediate demand had to some extent been met, this reduction was to be expected. The opening of the HEC entailed further demands on HMC's training funds, with the additional problem of sharing the time available to engineers for training between Keele and Falfield

The fee for the Keele Courses has increased several times over the years, from £25 in 1965 to £39 in 1973. These increases have been largely due to the increased charges by Keele University, but the cost per course member is still reasonable by today's standards.

Visitors

Individuals, such as regional engineers, regional training officers or representatives from the DHSS and many others who have an interest in training have been invited for one or two days. They have been given a specific task to perform like taking the chair at sessions, acting as a member of a panel, as a speaker or lecturer. Most regional engineers, and a number of administrators, have by now visited at least one of the courses. The importance of involving Regional Engineers in the Keele Course is twofold:

(*a*) As RHAs have it in their power to encourage hospital authorities to send their staff on engineering management courses, the regional engineers must be satisfied that Keele is doing a worthwhile job and doing it efficiently.

(*b*) Course members are given the opportunity to meet and discuss problems with regional engineers, a factor which does a great deal to improve the outlook and morale of engineers attending courses.

For similar reasons visitors from the DHSS the IHE and other organisations have been invited from time to time.

Lectures

Over 80 lectures, on a great variety of subjects, have been presented at Keele Courses during the ten years. The lecturers have been drawn from a wide range of organisations, and comprised engineers, training officers administrators, treasurers, managers and various branches of the medical profession. Subjects have included:

(*a*) Electrical and mechanical subjects associated with hospitals, designing for capital works, planning, fuels, public-health engineering, maintenance, engineering logic, waste disposal and commissioning.

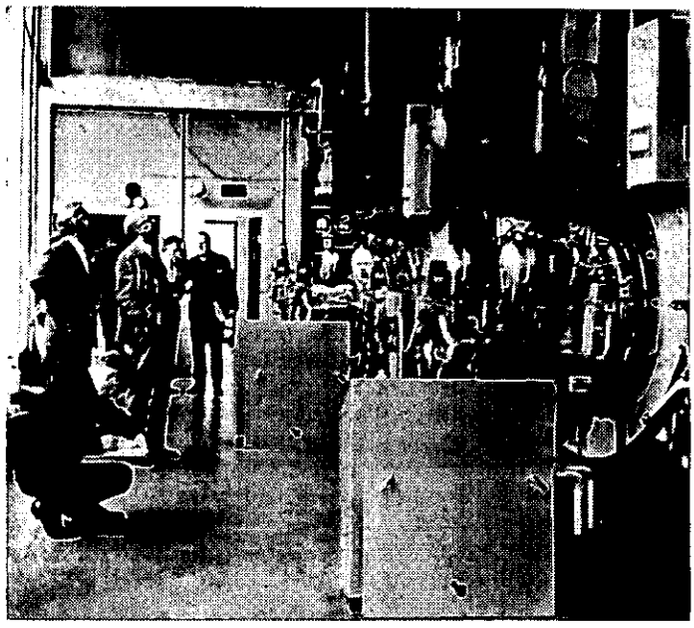
(*b*) All aspects of management and administration, including the theory of management, committee procedure and operation, public speaking, situations and relationships, careers, training, diplomacy and miscellaneous subjects, such as industrial relations and the reoganisation of the health service.

Course members are given group exercises after some lectures which entails a discussion period followed by the presentation of a group report for comment by the speaker.

Group working and exercises

Over the years the operation of the group learning process has been constantly changing. At first, groups discussed a particular subject, such as managing men, report writing etc., but as the courses developed and improved, groups were set exercises on such topics as the in-tray, emergencies, problem solving, the systematic approach etc. These exercises had to be well planned and arranged; which entailed considerable extra work by the tutors. One of the successes of group working has been the way in which it helps to get the course moving quickly and its practical illustration of the meaning of team work.

During the last two years groups have been formed into special committees, each of these having the task of organising and administering some specific part of the course, for which they receive a written brief. Reports on the committees' activities are submitted to the course council at the end of the course.



Out on a visit

Visits

Except for one year, it has been a feature of all courses for assistant engineers to have some form of visit included in the programme. These have included visits to hospitals in the vicinity, such as the North Staffordshire Hospital Centre at Newcastle, Fazakerley DG Hospital and Walton Hospital, Doncaster Royal Infirmary and a tour round the engineering services at Keele University itself.

Brochures covering all aspects of each visit are prepared for each course member; these set out details of the arrangements for groups together with the purpose and aim of the visit. Following the visit the groups prepare reports on various aspects which they present to the course council for comment by a panel of experts.

The 1973 visit was rearranged to make it more of an integral part of the course programme. The changes entailed dividing the eight groups into two syndicates each comprising four groups. The purpose of the visit now became twofold:

(*a*) to study the various aspects of engineering design, installations, organisation, management and administration techniques in modern hospital development

(*b*) as a management exercise.

Groups and syndicates had to plan, organise and co-ordinate approximately two-thirds of the visit arrangements themselves, as part of the management exercise. For this purpose two co-ordinating committees were formed, one for each syndicate. Individual group plans were submitted to their respective co-ordinating committees for agreement and co-ordination. The whole arrangement was checked and approved before leaving Keele. The changes proved to be both useful

and popular, as was shown when the group presented their end of course reports.

A similar visit was arranged for 1974 but this had to be cancelled owing the industrial troubles and was replaced by a rather impromptu, but nevertheless successful, exercise involving Keele University.

Landmarks

By autumn 1965, Keele University was becoming very popular with courses from other organisations, ranging from the National Board to folk-music groups and before the IHE could make the necessary arrangements, Keele had become fully booked for September. It was therefore decided that the group and hospital engineers should move to the University of Nottingham. This was the only occasion the courses have been held away from Keele and paradoxically the 1965 September course has always been known as 'the Nottingham Keele Course'.

The group and hospital engineers course for 1966 was notable for the introduction of two lady tutors, Miss R. Parks and Miss R. M. Shearn. This innovation created some consternation among the male tutors prior to the commencement of the course, but it proved both popular and successful.

Late in 1967 the committee considered the time had come to take stock of what had been achieved so far and to plan for the future. Briefly the conclusions were that:

(*a*) There was still urgent need for such courses both for the individual and for the service, in terms of improved efficiency in the engineering field.

(*b*) A number of engineers in remote groups or hospitals had overcome their sense of isolation after attending a Keele Course.

(*c*) Tutors reported that many course members departed with their self respect improved, with a greater pride in their job as engineers and a feeling of part of a national team working for the good of the patient and the service.

(*d*) Compared with the earlier courses, the type of individual attending in 1967 was considerably younger and on average possessed a higher standard of qualification.

As a result of this review, it was decided to retain the basic structure and to widen the scope of the courses by alteration in detail and programmes. As an example of this process, the 1970 and 1971 courses included sessions on public health engineering, a subject very much under discussion at that time. A greater degree of practical work was also introduced.

1972 was something of a vintage year, bringing in an unusual number of professional speakers from outside the service. The programme included lectures and exercises on employment practices and industrial relations, a very topical subject at the time. This was the first year that RHB staff were officially invited to take part as course members.

For the first time in 1973 a 20 min (optional) church service, conducted by Charles King and George Tuson, was held in the University Chapel, immediately before the opening of the course. The service was much appreciated by all those taking part and has been continued. Both the 1973 courses were arranged so that members were better able to participate in their management by organising various sessions and exercises as mentioned previously. Members were also encouraged to take the chair for selected sessions and in moving votes of thanks to speakers etc.

Conclusion

As the Keele Courses enter their eleventh year, all who have been associated with them, and there have indeed been many, can look back with pride on what has been achieved. It has been ten years of challenge, excitement, progress, companionship and enterprise. Troubles, problems and mistakes have been overcome before disaster occurred, by a team spirit, which has been reflected in the courses themselves.

It is not possible to mention all the individuals who have been involved in the development of the Keele Courses, but acknowledgments must be given for the support and assistance provided by the IHE the DHSS, the training officers, the tutors, the speakers and last but not least the secretary J. E. Furness and his able assistant Mrs. Beryl Furness (who has become the mother to both course members and tutors).

The 1975 programmes are now in course of preparation and they will vary from previous years to take account of the changing conditions within the service. It is with this in mind that the two courses have been renamed to suit the new grading structure and give greater flexibility for those wishing to attend. Details of the courses so far available are:

Intermediate Course: 6th–11th July

This course will be arranged on a broad basis and will be suitable for assistant engineers, newly appointed hospital and sector engineers and foremen who have shown potential for promotion. There will be a limited number of places reserved for RHA, AHA district and hospital staff associated in any way with hospital engineering.

Advanced Course: 14th September

This course will be designed for area district, assistant area, sector and hospital engineers and district works officers. A limited number of places will be reserved for the appropriate RHA and AHA staff associated with hospital engineering.

All inquiries should be made to: the Secretary, Institute of Hospital Engineering, 20 Landport Terrace, Southsea, Hants. PO1 2RG (telephone Portsmouth 23186).

Since 1975 many miles have been travelled along the road of hospital engineering training. The vehicles for the journey have been provided from many sources: the DHSS, RHBs, Dunford, Falfield and the Kings Fund to mention but a few. All have been directed, with Keele, towards the common goal: that of improving the knowledge, skill, efficiency and techniques of all who are engaged in the field of hospital engineering, thereby enabling engineers to provide the high standard of service which is not only a source of satisfaction to themselves in their chosen career, but is so necessary for the comfort and welfare of the staff and most important of all the patients.

Appointments

J. O. Warner, recently the group engineer with Ipswich and District HMC has been appointed area works officer, Cambridgeshire Area Health Authority. Following some 14 years in the Royal Navy, Mr. Warner joined the hospital service in 1957. From 1962 he was on the staff of the East Anglian Regional Hospital Board, where he was engaged on the design of mechanical engineering projects, principally for the Peterborough & District hospital. Later, he had the responsibility for introducing and implementing schemes throughout the region. He returned to Ipswich as group engineer in 1966. Mr. Warner has been Secretary of the East Anglian Branch of the Association for Hospital Group Engineers since its formation.

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Mr. J. A. Parker, C.Eng., F.I.Mar.E., F.I.Hosp.E., has been appointed area works officer to the Norfolk Area Health Authority. After sea-going service, he joined the National Health Service with the North West Durham Hospital Management Committee (HMC) in 1957, becoming superintendent engineer in 1959. From 1962 to 1966, Mr. Parker was technical superintendent (Hospital Installations) to the Hong Kong Government, following which he became group engineer to Peterborough & Stamford HMC and in 1969, Group Engineer to Norwich, Lowestoft and Great Yarmouth HMC. He is Vice-Chairman of the East Anglian Branch of the IHE.

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Gordon Brooke, formerly a senior consultant with PA Management Consultants Ltd., has been appointed Regional Works Officer for the Mersey Regional Health Authority.

Mr. Brooke started his engineering career with Balfour Beatty & Co. Ltd. supervising design teams in the design and construction of projects and public undertakings in the UK and Africa. He later became area manager for John Mowlem and Company Ltd. and was involved in the construction management of building and civil-engineering projects in the North of England. With PA Management Consultants Ltd., Mr. Brooke specialised in project planning and his assignments included work for the World Bank and the United Nations Industrial Development Organisation.

Gwilym Morgan Pratt, formerly Deputy Regional Engineer to the Oxford Regional Hospital Board, has been appointed Regional Engineer to the Oxford Regional Health Authority.

Mr. Pratt joined the Oxford Regional Hospital Board in 1963 as Principal Assistant Engineer, having formerly spent 7½ years with the Atomic Energy Authority Southern Works Organisation at Aldermaston, where he was engaged upon the Authority's capital-works programme in Southern England. He was also with the East Anglian Hospital Board at Cambridge for five years.

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Prior to being appointed as area works officer to the Salford Area Health Authority, Mr. K. Wright was employed as group engineer to the old Salford Hospital Management Committee. Before taking up this position in 1964, he was deputy group engineer to the Birmingham (Selly Oak) HMC, and had previously been employed as an engineering assistant with the Birmingham Regional Hospital Board. Mr. Wright was educated at the Bury Grammar School for Boys, Bury, Lancs., and subsequently studied mechanical engineering at the Rochdale Technical College and the College of Advanced Technology, Birmingham. He joined the IHE in 1958.

Area works officer appointments

The Department of Health & Social Security has circulated to health authorities a questionnaire on the appointments made to the post of area works officer. Out of the replies received up to the 31st December, 1974, of the 84 AWO posts, 72 have been filled.

Distribution of appointments

Details of the designation of the 72 appointed AWOs are as follows:

29 group engineers
3 deputy regional engineers
13 assistant regional engineers
1 principal assistant engineer
1 deputy assistant quantity surveyor
1 principal assistant quantity surveyor
11 assistant regional architects
10 principal assistant architects
3 principal assistant building surveyors.

The Department is also obtaining details regarding the appointments to the posts of district works officer, area engineer, area building officer, district engineer and district building officer.

CONTRACTS

A new surgical block costing nearly £600 000 is to be built at the Children's Hospital, Sheffield, to replace the existing accident and emergency department. The new block, to be built by Shepherd Construction Ltd., will provide two operating theatres, recovery rooms, a resuscitation room and X ray facilities. In each of the two 19-bed wards there will be two mother-and-child suites and two single rooms.

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The new Guildford District General Hospital, under construction by Yl J. Lovell (London) Ltd., for the South West Thames Regional Health Authority was recently topped out. The £4¾ million phase 1 scheme, which began 2 years ago, will provide 350 beds, together with a 10-theatre operating department, an intensive-therapy unit, accident department and X ray department. Services include a kitchen and dining room, stores, mortuary and a separate boilerhouse and workshops complex.

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Balfour Kilpatrick Installations Ltd. has been awarded the £50,000 contract for electrical installation at the University Hospital & Medical School Nottingham, Residences Phase II for the Trent Regional Health Authority. The consulting engineers for this section of the work are Revall Hayward & Partners. The contract includes lighting, power and mains cabling in the residential blocks and flatlets.

The contract will run concurrently with the Phase 1 Hospital & Medical School contract, which is also being carried out by Balfour Kilpatrick Installations Ltd.

Institute news

The Keele Courses Engineering Management Training

The Institute will hold two further courses at the University of Keele during 1975.

The Intermediate Course, to be held from the 6th to 11th July, will be arranged on a broad basis and will be suitable for assistant engineers, newly appointed hospital engineers and foremen who have shown a potential for promotion, with a limited number of places being reserved for the appropriate RHA, AHA, district and hospital staff associated with hospital engineering.

The Advanced Course, from the 14th to 19th September, will be designed for area, district, assistant area, sector and hospital engineers. A limited number of places will be reserved for RHA and AHA staff associated with hospital engineering.

SOUTHERN BRANCH

At a recent meeting of the branch, members enjoyed interesting lectures by Mr. Pearce and Mr. Askew of the British Oxygen Company.

Mr. Pearce described the two methods of producing oxygen: by electrolysis or by the distillation of air. The latter method is used by BOC and was described in detail. A 6-stage compressor first compresses the air which is then passed through a cooler. The carbon dioxide, moisture, oil and dust are removed and then the air is passed through a refrigeration process to a distillation column from which liquid oxygen is produced at a purity of 99·6–99·9%.

Mr. Askew spoke on medical-gas pipeline installations with special reference to HTM22. He also spoke of the planned-maintenance scheme recently introduced by his company.

WEST OF SCOTLAND BRANCH

On the 19th December 1974, the branch met at Stobhill Hospital to hear a talk by A. I. MacDougall on home dialysis. Dr. MacDougall commenced with a short history of the various kidney diseases and blood disorders and then went on to describe dialysis machines from the early stages through to present-day units.

The company then proceeded to Dr. MacDougall's department, where members were shown the units that are used to train people in the use of dialysis machines and the size of the premises required for home dialysis. The tour concluded with a look at the section where the fluids for the machines are produced and the workshops where repairs are carried out.

William Forsyth

'We are most sorry indeed to record the death on the 17th December 1974 of William Forsyth, who was a most active worker for the Yorkshire Branch and for the Institute in general, as a result of which he was made one of the Life Members of the old Institution. He retired in 1959 and went to live near Filey.

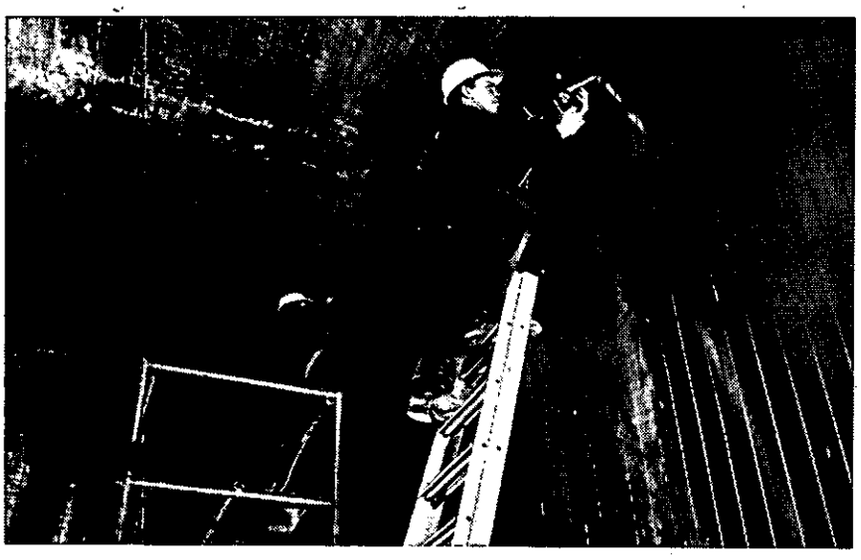
He will be long remembered by all those colleagues with whom he worked so hard in the early days of the Institution.'

John Carnachan

The West of Scotland Branch has lost a valued member and friend in the death of John Carnachan at the early age of 52.

John joined the former Western Regional Hospital Board in April 1963 as a clerk of works. He was later promoted to Site Engineer II, which position he held with the now reorganised Common Services Agency, Building Division.

A 1st-class practical man with a basic training as a heating and ventilating engineer John carried out his duties conscientiously and well. He served his apprenticeship with Taylor & Fraser Ltd. of Glasgow, followed by 10 years as a chargehand with Brightside Engineering Ltd. and by a further 5 years as a contract supervisor with Hugh Twaddle Ltd. A very fair man in his dealings with contractors, John made his points accompanied by a pawkish sense of humour. All who met him will be saddened by this loss and our sympathies go to his widow and two sons.



Plant rooms

Designed to accommodate air-treatment plant from heating to full air conditioning, this prefabricated system is based on square-section framework. Standard wall and ceiling panels are used. The plant rooms are available to handle up to 47 m^3/s and are pressure tested to 2000 Nm^2. The illustration shows sealing of the panels to ensure air tightness.

Bahco Ventilation Ltd., Ullswater Crescent, Coulsdon, Surrey

Nonpercussive methods of cutting and drilling

PAUL PHILLIPS

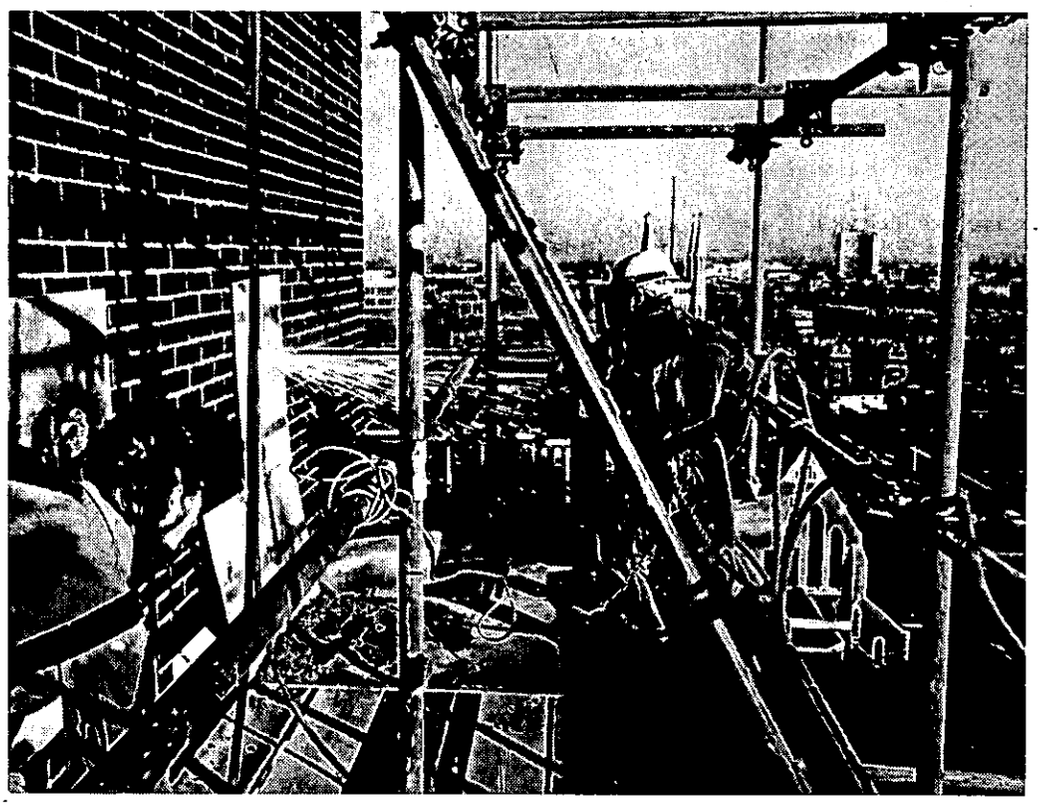
Loud persistent noise is one of the least desirable environmental conditions in a hospital. However the machines used in repairing or modifying the engineering services or the building often impose a great deal of noise upon patients and staff. In recent years, a number of non-percussive methods of cutting apertures and drilling holes have been developed that can considerably alleviate this noise-pollution problem.

Mr. Phillips is with The British Oxygen Company Ltd. PO Box 17, Brentford Works, Great West Road, Brentford, Middx. TW8 9AL.

The installation of mechanical services in hospitals often requires that holes are cut for ducts and pipes, and sometimes lift shafts must be formed or more drastic modifications incorporated. When the need for such work arises, the hospital engineer and staff face a difficult time mitigating the effects and maintaining business as usual. This is not an easy task, because the fabric of most buildings acts as an excellent conductor of sound, and it seems that, no matter what precautions are taken, the vibration and noise from a percussive process will manifest itself somewhere and cause distress and disturbance.

Thermic lancing

The process of thermic lancing can frequently be applied to eliminate the problem of noise and at the same time give some further benefits. It is a quiet



Thermic lancing at high level to provide fixing points on the exterior face of an office building

process in itself, but, because there is no impact or vibration applied to the structure, what little noise there is, is confined to the immediate work area.

The application of thermic lancing to the problems of the building and construction industry is a comparatively new development. The process was devised originally in the iron and steel industry for opening the tap holes in blast furnaces and developed into a routine method for piercing or severing heavy masses of iron and steel. Used in this form, the lance simply served as a useful way of introducing oxygen at a point where rapid oxidation was already taking place. Later development of the lance extended the range of materials upon which it could be used and work is continuing to improve the flexibility and effectiveness of the process.

A thermic lance consists of a length (usually about 3 m) of mild steel tube which is packed with a number of small diameter steel rods. The tube is open at one end and at the other is fitted with a combined handle and oxygen control valve. The design of the lance ensures that there is an adequate unobstructed area to allow the oxygen to pass down the tube and at the same time optimises the exposed surface area of the rods and their sheath.

The principle of the process is extremely simple. The point of the lance is preheated by means of an oxyacetylene torch or some other method until a suitable temperature is reached; oxygen is then fed into the lance, promoting fusion at the lance end. Temperatures at this point are between 2500 and 3000°C and, when the lance end is applied to the surface to be penetrated, the intense heat fuses both the lance and the surface touched, the resultant slag flowing easily away, assisted by the molten metal from the lance.

The technique is primarily intended for boring holes, but skilled operators can produce cuts equally effectively, using a large-diameter lance and a washing action. Alternatively a series of holes may be bored and the structure cracked along the fault line produced, using hydraulic bursting devices.

Thermic lancing can be used for boring or cutting concrete, either simple or reinforced, granite, or any stone containing silica. The steel reinforcement often found in structural concrete presents no problems, but positively aids the process by adding to the heat of fusion. The speed of penetration is in the order of 15 cm/min during which time 2 m of lance would be consumed.

Cost and advantages

It is obvious from the rate of lance consumption that the cost will be higher than a hammer-and-chisel method when used on a straightforward job. However, the advantages of thermic lancing, allied to its ability to tackle reinforcement without calling in additional equipment, can frequently bring real cost savings which vary from situation to situation and are difficult to quantify.

The obvious advantages for using thermic lancing over hammer and chisel methods are:

(*a*) The equipment is noiseless and free from vibration, thus having no harmful effects on the surrounding structure.

Boring vertical holes with a thermic lance

(*b*) The equipment is highly mobile and no compressor or cumbersome plant is required.

(*c*) The speed of penetration cuts down labour costs and minimises the duration of any disturbance.

Alternative processes

As a cutting tool, thermic lancing on its own can be expensive and comparatively slow where long lengths of cut are required, and it is inferior to other methods when accurate, straight cuts are demanded. In some circumstances the fire risk and fumes generated impose limitations on the application of the technique and other ways must be found to do the job.

Diamond drilling and sawing

The alternative to thermic lancing is often to diamond drill or saw and there is a wide variety of machinery available to tackle just about every specialised aspect of cutting for the construction industry. There are wall saws, floor saws and drilling rigs capable of being set up to cut or drill with extreme accuracy in any location or angle. The internal-combustion engines of power saws can be converted to run on propane, which makes the exhaust pollution free.

The diamond drills used for boring through concrete or stone are of the type called 'barrel' or tube drills and remove a neat core when they are withdrawn after the hole is drilled. The hole itself is generally smoothly finished, requires no making good, and there is no damage to any surrounding concrete or brickwork.

Diamond sawing capacity up to a thickness of 35 cm is available and, as with drilling, can be used on all types of concrete including cutting through the reinforcement.

An interesting application of the large floor sawing machines is in the cutting of road or path surfaces before trenching operations. Not only is the noise of breaking up the surface avoided, but the surface is much more readily restored after the trench has been filled.

Summary

Reduction in noise and general disturbance within the hospital is an attractive goal but hospital engineers have to consider many other implications of their decisions, amongst which cost and safety must rank fairly high.

The use of specialist techniques such as described here cannot appear at first sight as cheap as the alternative of hammer and chisel. However, these methods can offer significant advantages:

(*a*) They minimise the disturbance to the building and reduce the cost of making good afterwards.
(*b*) They are quieter than percussive processes.
(*c*) They are often much faster.

Cutting massive concrete structure at Southampton Docks

'Engineering with rubber' is a documentary film from the Malaysian Rubber Bureau showing how detailed knowledge of the basic properties of rubber and its behaviour, is applied to solve diverse engineering problems.

The properties examined include: stiffness, elastic recovery, tensile, compression and shear strength. The use of modern compounding techniques to help combat thermal degradation, lengthen fatigue life, reduce 'creep' and the effects of temperature and frequency is explained. Rubber to metal bonding is discussed and its use in modifying performance behaviour. Examples of the use of natural rubber in different branches of engineering are depicted and a number of key applications are studied in detail.

The 30 min film is available on loan or for sale from the Malaysian Rubber Bureau (London), 19 Buckingham Street, London WC2N 6EJ and from film libraries.

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The council of gas detection equipment manufacturers, has been formed by the British manufacturers of equipment for the detection of all gases. It will represent their interests to Government and industry, both at home and overseas.

The Council has been formed to provide for the efficient organisation and development of the gas-detection industry; to establish, in conjunction with Government departments and the British Standards Institution, acceptable standards and codes of practice; and to assist in the improvement of service by members to their customers by the maintenance of improvements in design and methods of production.

All inquiries for further information should be addressed to The Secretaries, Peat, Marwick, Mitchell & Co., 301 Glossop Road, Sheffield S10 2HN.

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To enable operators of Manlove Tullis laundry machinery to obtain optimum results, the company holds quarterly machinery maintenance and training courses at its Clydebank factory.

The courses cover most aspects of onsite servicing on machines ranging from individual washers to tunnel washers, small to large tumblers and the range of ironing machines. Future developments, including completely fluidheated laundries, are also discussed.

The next course is planned for April 1975, and further information on this can be obtained from A. Peebles, Contracts Manager, Manlove Tullis Group Ltd., Clydebank G81 2XE, Scotland

HE Technical news

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During February and March, the King's Fund Centre is holding several information days on mental handicap. Organised jointly by the King's Fund Centre, the Institute of Mental Subnormality and the Association of Professions for the Mentally Handicapped the sessions will include films and talks setting out the special problems of the mentally handicapped.

Four identical sessions are being held on successive Fridays from the 14th February to the 7th March. The proceedings will last from 10·30 a.m. to 4 p.m. and the fee, including coffee, lunch and tea is £3. Those interested should contact the King's Fund Centre, 24 Nutford Place, London W1H 6AN.

Automatic blowdown equipment

A. W. SCHAFFEL, T.Eng., M.I.Hosp.E.

In the last few years the type of Boiler plant in use in the Hospital Service has undergone a radical change. The coal-fired Lancashire boiler plant has been superseded by the package boiler, using liquid or gaseous fuel, and in many cases a combination of both. Staffing requirements have also changed, with the full-time stoker replaced by shift or stand-by tradesmen. These tradesmen have other duties outside the boiler house but, to comply with AOTC regulations, regular visits must be made to the boiler house to check level controls, water gauges, pumps and alarm systems. These duties fall fairly easily into an 8 h shift or standby pattern. However, the problem of boiler blowdown is not so easily overcome.

The modern package boiler, unlike the Lancashire boiler, needs frequent and regular blowdown to maintain an acceptable level of dissolved solids (2500–3000 parts in 10^6). To employ standby or shift tradesmen to carry out this task is both uneconomic and wasteful of a skilled man's time. It is obviously desirable therefore to have a reliable and uncomplicated system of automatically controlling the dissolved solids in a package boiler.

This problem was foremost in our minds when we took the decision to operate the boiler plant at Billinge Hospital on an unmanned basis. This plant consists mainly of three wetback, 3-pass economic boilers rated at 4500 kg/h, fitted with Saacke dual-fuel burners. The feedwater system includes two steam-driven Weir pumps and Trist automatic level control units.

Mr. Schaffel is with the Wigan Area Health Authority, The Elms, Wigan Lane, Wigan WN1 2NP.

An investigation of the market in automatic blowdown equipment revealed two largely acceptable methods of approach:

(*a*) automatic opening of a solenoid or pneumatic valve at predetermined intervals, and sometimes linked with a dissolved solids monitoring device.

(7) continuous blowdown valves using a variable orifice to control the flow, and often linked with heat recovery.

After looking at both these systems we decided that the continuous blowdown valve offered a relatively cheap (approximately £75) way of testing the practibility of a blowdown system. The next problem was to find a suitable position on the boiler from which the water could be taken.

There appears to be little practical knowledge about the position of the take-off point for automatic blowdown valves, and it would seem to be very much a question of trial and error. There are, however, two positions that are used most by boiler blowdown manufacturers. First, from the traditional point at the front and bottom of the boiler and secondly, from a point approximately two-thirds along the boiler shell and at mid position relative to the water line.

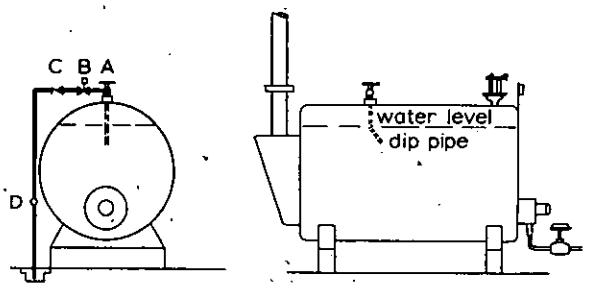


Fig. 1 Fitting of system
A 'V-reg' valve
B solenoid valve
C nonreturn valve
D sight glass

The first position is excellent for the manual type of blowdown valve with a large valve chamber, but the small orifices used in continuous blowdown valves quickly become blocked. It can also cause problems when maintenance of the valve is needed. The second position is much better suited to continuous or automatic systems with their small-bore pipes and valves.

The main problem is that older boilers may need to have a take-off point fitted, and this can increase the cost of the installation. However, if there is a spare mounting flange on top of the boiler shell, a dip pipe can be fitted and the correct position obtained. This was the case at Billinge, and we fitted the continuous blowdown at this point (Fig. 1). The valve had a wide range of openings and the initial setting was set at the rate of 45 kg/h. The results were very favourable and the correct level of dissolved solids was maintained. However, after two to three days

the valve blocked. The setting was increased to allow 90 kg/h to pass through the valve. This improved matters, but the valve still became blocked, especially over weekends. A further increase to 180 kg/h seemed to cure the blocking problem but the flow did diminish considerably after some days use. Frequent blowing down of the valve chamber greatly improved the situation but it left the main problem of requiring frequent attention by a skilled craftsman.

It became clear that a different approach was needed if we were to achieve a fully automated system requiring minimum maintenance. With the experience we had gained during this exercise we designed and built our own automatic blowdown system, using a steam-rated solenoid and a sequencing timer arrangement to open and close a solenoid valve at predetermined intervals. The basis of the whole system was the sequence timer unit, which had to be simple, robust and, above all, reliable.

For this unit we use two SIAA* repeat cycle timers which gives an extremely wide choice of timed interval ranging from 12 s to 12 h. This wide range is achieved by altering the speed of the timer motor simply by turning a small slotted peg on the timer fascia. The timers themselves have eight connections, two being the feed into the timer and the other six giving various switching arrangements, i.e. normally closed when timer is at zero, normally open when timer is at zero, and a reset position. These are connected as shown in Fig. 2 to give both a variable cycle time and variable blowdown time and to repeat the operation until reset. The solenoid valve is an Alcon ½ in. (1·25 cm) ACP 4X.† A ¾ in. (2 cm) V-reg valve‡ is mounted on the boiler and heavy duty rolled steam pipes§ with an 8 s.w.g. thick wall are used throughout.

This above-average thickness is thought to be desirable to withstand the scouring action of the hot water and steam. Each boiler has the blowdown fed separately to the blowdown pit through the main blowdown drain pipe. The timer unit relies for its operating sequence on the fact that each timer can have the switching controls normally open or normally closed when the timer is at zero. In this particular arrangement we bring the mains supply through the cycle timer A and use this timer to control the sequence. The initial setting of timer A is the required cycle time. Using a 'normally-closed-at-zero' contact (1) the mains supply is thus simply driving clock A to zero. At zero, 1 becomes closed and a feed is transmitted to the resetting contact on timer B, whose initial position was zero, thus desengaging the clutch and allowing the timer to commence the blowdown time. As timer B resets, contacts 2 and 3 become closed thus performing two operations:

(*a*) the solenoid valve is opened (4)
(*b*) timer A is reset by disengagement of the clutch mechanism.

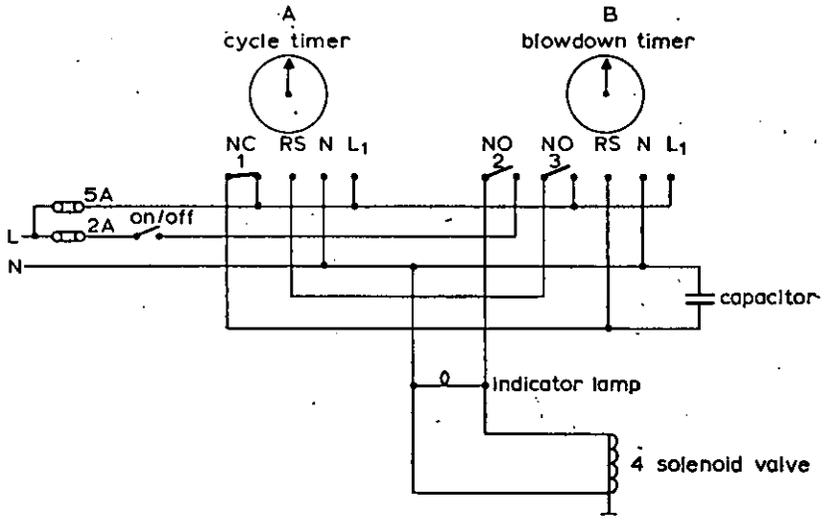


Fig. 2 Circuit
L live
N neutral
RS resetting contact
NO normally open contact
NC normally closed contact

As timer A is reset, contact 1 becomes open and removes the supply from the resetting contact on B which allows it to drive down to zero. At zero the contacts 2 and 3 open, removing the feed from the solenoid and 2 removing the feed from the reset of timer A, allowing A to drive down to zero thus repeating the cycle. The capacitor across the reset contacts on B is to smooth the resetting voltages and to give a slightly longer time for A to reset.

The blowdown unit as a whole can be built by any reasonably equipped hospital workshop at a cost of approximately £80 per boiler, but this can be reduced by using one pair of timers to control two or more boilers. This does not achieve the same level of control but may be satisfactory where two boilers share the same load. The unit described has been working for six months and an internal examination of the boiler indicates satisfactory operation.

*Landys, Gyr & Billman Ltd.
†Alexandre Controls Ltd.
‡British Steam Specialities Ltd.
§Englands Tubes Ltd.

A boilerhouse alarm system

J. E. BURTON, T.Eng., M.I.Hosp.E.

At night and over the weekend, the boilerhouse stoker is divorced from other hospital activity and there is normally no check kept on his well-being. The alarm system described here was developed at the Royal Albert Edward Infirmary, Wigan, to protect the stoker during these hours.

The system is in two units, one situated in a convenient position in the boilerhouse, and the other in a constantly manned location by the telephone switchboard operator.

The boilerhouse unit contains two time clocks and two variable timers. During the night and at weekends this unit is arranged to ring a bell, situated in the boilerhouse, at a predetermined frequency, and a reset button is incorporated in the timer unit, which will cancel the bell. Should the bell not be cancelled within a set period, a warning signal is transmitted to the second unit which contains an audible warning device. At this stage the alarm has been raised and the onus is then placed on the switchboard operator, to initiate an arranged procedure.

Mr. Burton is with the Wigan Area Health Authority, The Elms, Wigan Lane, Wigan WN1 2NP.

Operation

The operation of the alarm is as follows:

The time clock T_1 (set to make between 5 p.m. and 8 a.m., 7 days per week), or time clock T_2 (set to make between 7 a.m. and 6 p.m. on Saturdays and Sundays only) will pass a feed on to the process timer P. After a set time, the contacts of timer P will make, with the result that the local bell will ring and timer *t* will start. When the contacts of *t* make, the audible warning device is energised.

Switch S_1 was added so that Bank Holidays could be incorporated into the system without re-adjusting T_2. S_2 and S_3 were added to facilitate bell and line testing. The time delay switch D allows the alarm to be muted for short periods.

Normally when the bell rings, the system will be reset by the stoker pressing the red button on the process timer.

Construction

The unit was built in a 30 × 30 × 10 cm black adaptable box with a Perspex panel in front of the two clocks, enabling their accuracy to be checked without removing the box lid. While the lid was being screwed into position, it was fitted with a lock to prevent unauthorised adjustments. Timer P was sunk into the box so that only the reset button was flush with the face plate.

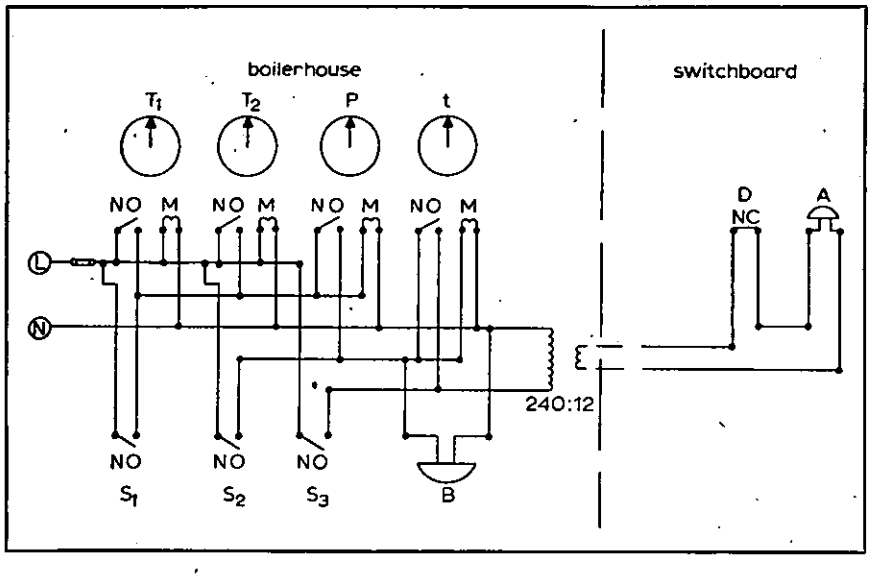


Fig. 1 Components of the system

T_1 and T_2	4-pin time switch, 7-day cycle with day omitting device (Sangamo)	S_2 and S_3	Push-to-make switch, 240 V
P	Process timer, 0-60 min (Venner)	D	Time lag switch (Felix)
t	Autoclave type cam timer, 0-5 min	T	Bell transformer 240 : 12 (Friedland)
B	240 V bell (Gents)	A	Audible Warning Device (RS Components Ltd.)
S_1	Key switch (RS Components Ltd.)		

For our own application, P was set to 60 min, t to 2 min. and the time delay switch was adjusted to 1 min. Owing to the distance between the boilerhouse and the switchboard, where the alarm sounded, only 10 V a.c. was received from the transformer, but this was sufficient to produce an effective sound from the automatic warning device.

While the alarm will not make the lone worker any safer, nor signal immediately the occurrence of an untoward event, it does check his well-being on a regular basis. The system is designed to operate only outside normal working hours, as at other times the stoker is usually in frequent contact with other staff. The system employs components which should be found in many hospital engineering stores; and if they are not in the stores they are readily available.

The system has been in operation at Wigan for four months and has proved reliable and satisfactory in all respects. It was readily accepted by all boilerhouse stokers when the reason for its introduction was explained. A procedure has been arranged with telephonists and porters so that in the event of the alarm sounding, prompt action will result.

The Engineering Design Guides reviewed by R. G. Smith

The Design Council, the British Standards Institution and the Council of Engineering Institutions recently introduced a series of design guides published by the Oxford University Press. The first four books in the series are reviewed here.

Introduction to fastening systems by D. H. Chaddock, 20pp., 80p

The scope of this guide covers traditional nuts and bolts, rivets, other nonthreaded fasteners and adhesive bonding. The choice of a permanent or demountable fastener is clearly shown to be a subject requiring considerable thought. Subsequent design selection of the fastener is discussed, including choice of thread form, effects of environmental conditions and prestressing required to deal with fluctuating loads. Equally as important is the joint stiffness in determining the overall joint performance, although as explained it is much harder to assess than the fastener stiffness.

Stress in fasteners is discussed with particular reference to head failure, position of nut relative to thread runout and stress distribution in threaded fasteners. Various locking methods for securing fasteners are evaluated, and practical applications are described.

Useful comment is made in the last section of this guide on the effect of temperature changes including differential-thermal-expansion problems, reduction in strength, and oxidation and corrosion.

Miscellaneous fasteners by F. M. Keeley, 24pp., £1·00

This guide covers more than adequately the large variety of nonthreaded fasteners, many of which are highly ingenious and very efficient. Many have a cost advantage over the threaded type of fastener and can be assembled at greater speed.

The most common form of fastener, the rivet, is dealt with in depth. The methods of deciding which rivet to use for a certain job are outlined together with the advantages of that particular fastener.

In choosing a fastener the reader can see that the prime factors for consideration are its functions, properties and perhaps what is fast becoming the most important factor, the cost (in-place).

HE Book news

Adhesive bonding by J. Shields, 24pp., £1·00

Mr. Shields explains in this excellent guide all there is to know in regard to existing adhesive materials and their industrial use. He outlines the basic concepts of adhesive bonding, including the physical and chemical properties of adhesive materials, and gives several examples of the use of existing adhesives. The usefulness of the guide is enhanced by a bibliography of recent publications and lists of the sources and organisations offering advice on adhesives technology.

This guide seeks to introduce, in particular, the designer to the scope and applications of adhesive materials and processes, bearing in mind that their effective use presupposes familiarity with their advantages and limitations and involves new concepts in design and production.

Rolling Bearings by T. S. Nisbet, 44pp., £1·80

This is a most comprehensive book, covering aspects of bearing-design choice, application and maintenance and will be especially useful to the machine design engineer who will benefit from the numerous illustrations and well tabulated information included.

For the engineer involved in maintenance there is an understanding of why specific bearings are used and information on how these should be mounted. The section on calculation of bearing loads makes a point of the importance of accuracy in selection, although at the same time acknowledging that most bearing manufacturers publish details of load calculations with examples in their catalogues. However, while it is essential to estimate the maximum load acting on a bearing, selection on this basis alone could lead to the use of bearings which are larger and more costly than necessary. The normal loading and duty cycle must be considered, and the author proceeds to cover this area of selection in considerable depth.

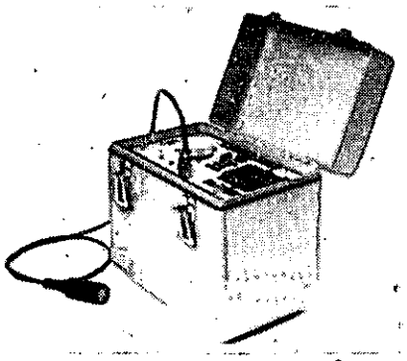
Lubrication and service life are dealt with at length and highlight the importance of the correct design choice being made to obtain long life with reduced maintenance.

This book by its nature must generalise to some extent by virtue of the large number of bearings and applications. In this way however, it loses none of its considerable interest to the hospital engineer.

HE Product news

Thermesthesiometer

The Thermatouch determines burn-injury hazard by measuring the skin-contact temperature that would result when a moderately heated surface is touched. Constructed in accordance with the US National Bureau of Standards technical note 816, the Thermatouch includes a probe and a



small portable console containing a power supply, control circuitry, a digital temperature display and provision for a probe calibration.

TEM Sales Ltd., Gatwick Road, Crawley, Sussex

Lifts brochure

List 105 is an 8-page brochure detailing the advantages of electro-hydraulic lifts. It includes the technical specifications and data needed for choosing a car and doors from the range offered by Becker.

Becker Equipment & Lifts., Ealing Road, Wembley, Middx. HA0 4PA

Heart monitor

The Memo OEC-2512 permits both real-time and memorised monitoring of cardiac patients in recovery rooms, ambulances or operating theatres. Traces are paraded first for 4 s in the upper channel and then for 4 s in the lower channel, where the waveform can be stored for more detailed analysis.

Nihon Kohden Kogyo Co. Ltd., 31-4 Nishiochiai 1-chome, Shinjuku-ku, Tokyo, 161 Japan

Wallchart

An A2-size wallchart giving brief details of the Edwards range of vacuum gauges and gauge heads is available from Edwards High Vacuum (publication 07850). It covers 21 products with pressure ranges from atmospheric to 10^{-10} torr and is designed to make selection of the correct instrument as easy as possible.

Edwards High Vacuum, Manor Royal, Crawley, West Sussex RH10 2LW

Film on flammability tests

The manufacturers of Timonox paints have produced a film that describes the two methods of testing flame-retardant paints set out in BS476 Parts 6 and 7. The film suggests that, when class O materials are being decorated, two questions have to be answered:

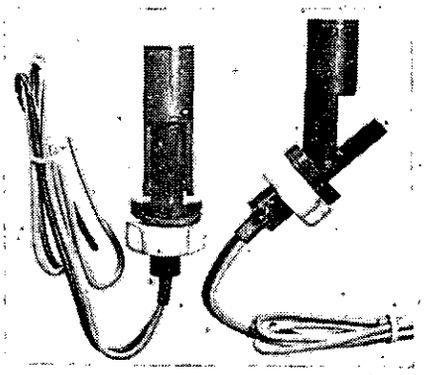
(a) Has class 1 spread of flame been achieved?

(b) Are the requirements for class O met?

Associated Lead Manufacturers Ltd., Clements House 12 Gresham Street, London, ECV2 7AT

Fluid-level detector switch

The Type FH 4A-00 detector switch incorporates a hermetically sealed reed switch and will measure fluid levels through an operating-temperature range of −30°C to 110°C in environments of low shock and low vibration. The switch is constructed from glass-filled nylon and has a high chemical resistance to a wide range of liquids, such as alkalis, alcohols,

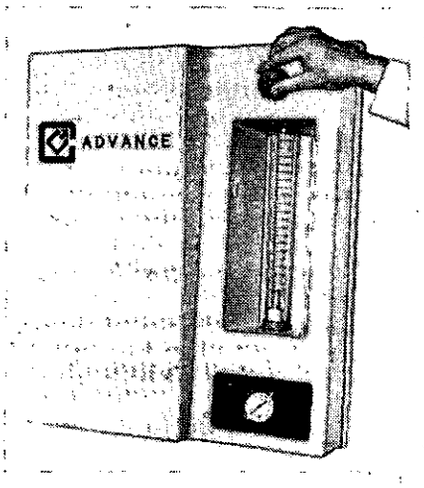


dilute mineral acids, ketones, greases and aromatic hydrocarbons. Either the high or the low level of a liquid can be monitored. A series of switches is available with ratings up to 100 VA and the maximum contact rating for an estimated life of five million operations is 15 W.

B & R Relays Ltd., Temple Fields, Harlow, Essex

Gas chlorinators

The Advance series 820 wall-mounted gas chlorinator has a maximum feeding capacity of 900 kg of chlorine per day for the high-capacity treatment of potable water and effluents. The system is constructed from modules which can be individually tested, repaired or replaced without disassembling the entire unit. The system is designed to eliminate gas pressure lines within the treatment plant. The vacuum regulator and safety shutoff



valve may be located at the chlorine supply and storage area, thereby maintaining the chlorine gas in operating and control areas in vacuum piping.

Capitals Controls, Division of Dart Industries Ltd., 20 Greens End, Woolwich, London SE18 6JY

Step controllers

Designed for modulating sequential control, but also useful for proportional-feedback control, types TSL2 and TSH2 step controllers comprise a number of adjustable cam-operated switches, which are actuated in sequence by a modulating motor to provide a progressive increase or decrease in supply to balance variations in demand. The TSL2 is a light-duty skeleton-type controller with from two to 24 switches located individually in pockets. The standard switch in the TSL2 range is rated

at 10A 250 V a.c., but a 15 A 250 V a.c. switch is available on request. The TSH2 is a heavy-duty controller with from three to eight or nine to 16 switches connected to a numbered terminal board and enclosed in a sheet-steel wall-mounted case. The standard TSH2 is rated at 20 A, 250/480 V a.c. resistive, 15 A, 250 V a.c. inductive; the heavy-duty version at 25 A, 250 V a.c. resistive; and the differential switch at 15 A, 250 V a.c. resistive and inductive.
Appliance Components Ltd., Cordwallis Street, Maidenhead, Berks., SL6 7BQ

Gas monitors

The B/3007, BZ/3007 and C/3007 gas monitors have passed all relevant tests to SFA3007, SFA3009 and SFA3012 for intrinsic safety and have been allocated BASEEFA certification numbers 74185 and 74186/B. The monitors use a Pellistor catalytic sensor for the selective detection of most flammable hydrocarbon gases. A pulse mode of operation is used and audible and visual warning is given when the level of gas exceeds a preset value. The B/3007 is a portable monitor powered by rechargable batteries; the BZ/3007 is also portable but powered by HP2 cells; and the C/3007 is a fixed-installation monitor, for use with a 12 V d.c. intrinsically safe power supply.
Neotronics Ltd., Building 102, FSTS Site, Stanstead Airport, Stanstead, Essex CM24 8QX

Thermometers

The range of contact-action thermometers consists of six different models of the indicating instrument and a selection of contact probes. Temperatures in the range from −80 to +1200 deg C are covered, and direct-reading measurements are indicated within 2–10 s from the time the contact probe touches the point to be measured. Accuracy, depending on the measuring range and the model used, is from within

HE Product news

±0·5 to within ±2·5 deg C. The very-high-temperature model has an accuracy of within ±5 to within ±10 deg C. The probes tip contain miniature electronic sensing elements whose resistance varies in proportion to temperature and so provides direct-reading temperature indications via the circuitry within the meter unit. The range of probes available includes elements for gas and air, liquids, metal surfaces, soft plastics, very high or very low temperatures etc. The indicating instruments all contain class 1, 1% fullscale deflection moving-coil movements and modified Wheatstone-bridge circuitry energised by a small battery housed within the case.
Perfection Parts Ltd., Cross Lances Rd., Hounslow, Middx., England

Prefabrication of mechanical services

A system of prefabricating complex laboratory pipework to speed installation and overcome onsite problems has been developed by Shepherd Engineering Services.

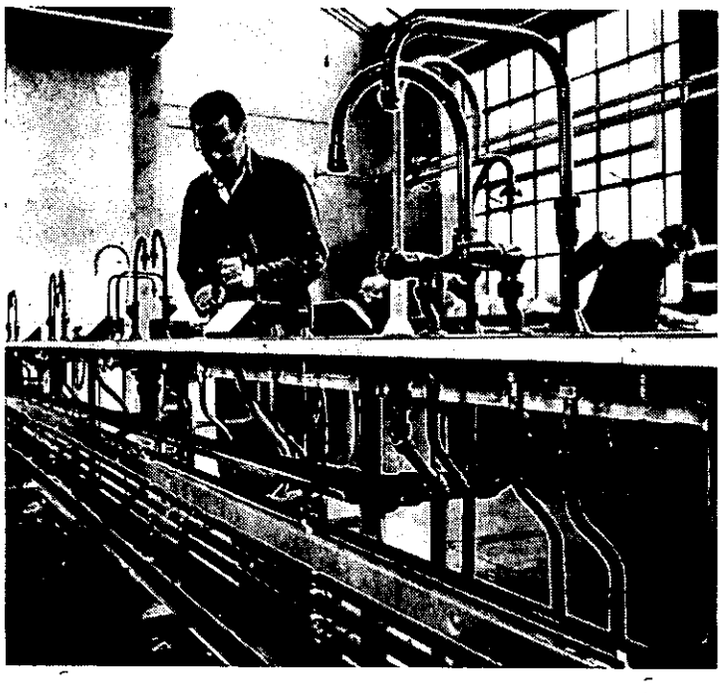
The system has been successfully employed at the Babraham Institute, Cambridge, where the company was awarded a £70,000 mechanical-services-installation contract for a new biochemistry laboratory. By prefabricating 80% of the complicated pipework at their works, Shepherd estimate savings of 30% in onsite time and labour.

New boiler

The 2-storey biochemistry department contains 192 m of laboratory benches with 120 sinks, each connected to five different services: hot and cold water, gas, compressed air and distilled water, in addition to waste pipes.

The contract also included the installation of a new boiler and external mains from the existing boiler house, distilled-water plant, air conditioning, refrigeration equipment and general plumbing and drainage down to d.p.c.

The system of ventilation had to be of sufficient intensity to alleviate



the problems caused by the close proximity of animal pens inside the building to administrative offices.

Approximately 90m² (5%) of the laboratory area is operated under low-temperature conditions and includes a cold store, maintained at −15°C, and a laboratory area at− 2°C.

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To place an advertisement in this section, please write or telephone:
Classified Advertisement Department, *HOSPITAL ENGINEERING*
Peter Peregrinus Ltd.
Station House, Nightingale Road,
Hitchin, Herts. SG5 1RJ, England
Telephone: Hitchin (s.t.d. 0462) 53331, ext. 276

APPOINTMENTS AND SITUATIONS VACANT

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Opportunities are available for suitably experienced technicians to join a team in a developing Medical Engineering Department based at Solihull Hospital. The work involves maintenance, repair and calibration of electro-medical laboratory and instrumentation equipment for a wide range of specialist applications. Applicants should have proven experience in this field or in a similar activity involving fault diagnosis, calibration and repair of electronic or electro-mechanical apparatus.

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(Electronics and Mechanical Engineering)
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Applicants should hold OND/C or equivalent City and Guilds Certificates in Mechanical, Electrical or Electronics Engineering.

For full details and an application form contact:
The Personnel Officer, Solihull Area Health Authority, Clarendon House, 78b High Street, Solihull, West Midlands B91 3QP.

Solihull
Area Health Authority

ASSISTANT ENGINEERS

Assistant Engineers are required for managerial duties associated with the installation, maintenance and operation of engineering services both mechanical and electrical. Duties will include the implementation of Planned Preventive Maintenance Schemes, together with the maintenance of specialised hospital equipment.

Applicants should have served a recognised apprenticeship in mechanical or electrical engineering and have obtained O.N.C. or equivalent qualifications. Previous management experience would be an advantage.

Basic Salary £2270–£2600 per annum.

An additional 9% of the basic salary has been paid to the previous holder of this post on account of extra hours worked.

Write for application form and job description to: Assistant Group Engineer, East Birmingham Hospital, General Branch, East Birmingham Health District, 45 Bordesley Green East, Birmingham B9 5ST of telephone 021 772 4311 Ext. 215/301.

East Birmingham
Health District
Birmingham Area Health Authority (Teaching)

LANCASHIRE AREA HEALTH AUTHORITY
BLACKPOOL HEALTH DISTRICT

HOSPITAL ENGINEER—VICTORIA HOSPITAL BLACKPOOL

We are looking for an experienced Engineer to further develop maintenance services including p.p.m. at the Victoria Hospital, Blackpool which has 770 beds with a wide range of specialities diagnostic and therapeutic departments.

A sound practical background in mechanical or electrical engineering is required. Salary £2751—£3150 plus £183 p.a. responsibility allowance. Approval is being sought to a special allowance for involvement in Incentive Bonus Scheme. This is a challenging post at a hospital undergoing further developments.

A Job Description and application form can be obtained from District Administrator, District Offices, Victoria Hospital, Blackpool FY3 8NR to whom it must be returned by the 20th March 1975.

Classified advertisements for the next issue of

HOSPITAL ENGINEERING

published 4th April, should be received not later than Friday, 21st March.

APPOINTMENTS AND SITUATIONS VACANT

PROJECT MANAGERS, ENGINEERS AND ARCHITECTS

are required for long term assignments in the Middle East to be engaged in the technical management and supervision of substantial hospital projects.

Applicants must have had several years' experience in their respective fields.

Full details to Box HE 101

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EAST BIRMINGHAM HEALTH DISTRICT

BIRMINGHAM AREA HEALTH AUTHORITY
EAST BIRMINGHAM DISTRICT

CHIEF TECHNICIAN

Medical Engineering Department

Applications are invited for the post of Chief Technician (Medical Engineering Department), who will be required to supervise and organise the work of a team of electronics and engineering technicians providing a maintenance, repair and calibration service for electro-medical, laboratory and instrumentation equipment in a wide variety of general and specialist applications. Excellent workshop and laboratory facilities are provided. The Chief Technician will be required to maintain close liaison with medical, nursing, engineering and other professional staff and must have the ability to manage people and organise a specialist department. Applicants must be qualified electronics or electrical engineers to at least H.N.D./H.N.C. standard with proven experience in a similar related field of work. The present salary for the post commences at £3303 rising to £3894 p.a. and is currently subject to 10% plusage for additional hours of duty. A car user allowance is also applicable, plus Threshold.

Write for application form and further details to:

The Area Works Officer, Birmingham Area Health Authority, Alpha Tower, Suffolk Street, Queensway, Birmingham B1 1TP.

REGULATIONS FOR THE ELECTRICAL EQUIPMENT FOR BUILDINGS

These regulations (formerly the 'Wiring rules'), which have been published by the IEE since 1882, are effectively the UK national code for the safety of electrical installations, specially from fire and shock, in and around building generally.

They are recognised in the statutory Electricity Supply Regulations 1937, as fulfilling the requirements of these regulations for consumers' installations. They supplement these and other statutory regulations by prescribing, in detail, methods (not necessarily the only methods) of complying with the statutory regulations.

14th edition 1966, reprinted in metric units incorporating amendments 1974, £2

Inquiries, orders and remittances should be sent to:

Publication Sales Department, IEE, Station House, Nightingale Road, Hitchin, Herts. SG5 1RJ, England

LONDON BOROUGH OF BROMLEY
Walnuts Sports Centre

CHARGE ENGINEERS

(TWO POSTS)

£2356–£2677 and 12% Shift allowance

Charge engineers are required to maintain effective and efficient day to day operation of all engineering services at the new Walnuts Sports Centre and the Central Boiler House at Orpington.

Applicants should have served an indentured apprenticeship and have at least three years postqualification experience.

A brand new 3-bedroomed flat on service tenancy basis is attached to one of the posts.

In certain cases assistance may be given towards legal expenses up to £200, disturbance allowance up to £100, and reasonable removal expenses.

Full details and application forms available on request to the Head of Personnel Services, Town Hall, Bromley BR1 1SB, or telephone 01-464 3333, Ext. 318. Quoting ref. N.33.

Closing date: 17th March 1975.

IEE medical electronics volume 2: monographs 7-12

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

Contents:
Microelectrodes and input amplifiers, *C. Guld.* **Fundamental properties of physiological electrodes,** *W. Greatbatch.* **Instrumentation for electroencephalography,** *C. D. Binnie.* **Cardiac pacemakers,** *J. Kenny.* **Evoked-response audiometry,** *J. R. Roberts and B. W. Watson.* **Myoelectric control,** *R. N. Scott, P. A. Parker and V. A. Dunfield*

Medical electronics continues to find an increasing acceptance in a wide variety of medical disciplines, both in the development of specific instrumentation and in clinical applications. Each year, a more detailed understanding is emerging of how electronic techniques for diagnosis, therapy and data reduction can play a significant part in both routine medical services and research.

This second volume in the IEE Medical Electronics Monographs series provides a valuable source of reference material for departments in hospitals, medical schools and pharmacological-, physiological- and psychological-research laboratories. Subjects covered range from the design of implanted cardiac pacemakers and microelectrodes, and their associated amplifiers for use in electrophysiological investigations, to techniques for use in evoked-response audiometry and the use of myoelectric control systems in aids for the handicapped. The book will be of great value to *medical doctors, life scientists, engineers and physicists who* wish to add to their knowledge of useful techniques.

Orders, with remittances, should be sent to:
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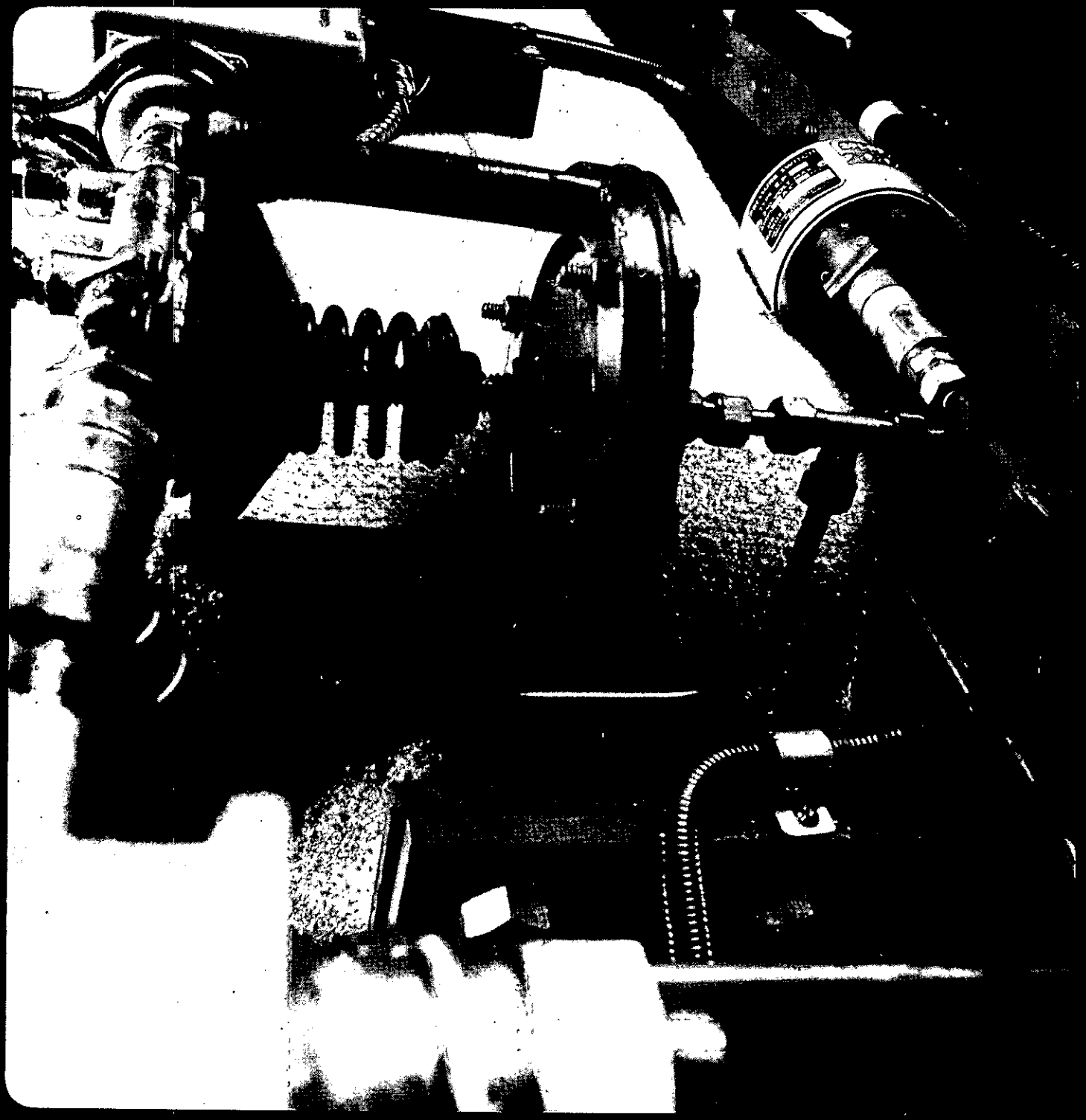

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Inside you'll find an electro-mechanical programme controller, vacuum pipe work screwed and soldered, a unique partial pressure air detector, cam operated valve assembly, the unique pressure sealed autoclam® sliding door and other precision engineered parts.

All models are designed for easy maintenance and simple operation.

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