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Editorial

WHATEVER anyone may say, and there will be some who will disagree with this view, it should not be a necessary duty for the Institution of Hospital Engineers to have to concern itself with the salaries of its members, and less still this JOURNAL. This is not to imply criticism of the management of the Institution as to which particular interests of the members it decides to support but to condemn absolutely the prolonged circumstances which make this a necessity. There are so many much more vital things to be done if once Council could rid itself of this need. It is even more tragic when, as a correspondent suggests so forcefully in this issue, if the Ministry does not shut the stable door very soon the horse will have bolted. How long can it take for a Whitehall penny to drop?

We are sure that there is not one Engineer in the Hospital Service who was not shaken to the very roots by the recent salary award. If there is, then let him read again the correspondence that has appeared in these pages over the last two months, not to mention that in the newspapers. It savours of the tired hopelessness of reasonable men, many of whom have devoted the best part of their adult lives to the service.

Perhaps more shattering than any individual complaint is an admission in the daily press, not incidentally confined to any particular hue, that the Engineering Department of a particular Regional Board was so depleted of staff, owing to the stronger attractions of industry in regard to reward, that it was finding it extremely difficult to fulfil its technical commitments. Furthermore, if the expected increase in capital expenditure materialised it could not hope to discharge the additional work involved. With hospital buildings and services in the deplorable condition that so many of them are today, could anything be more fantastic?

The blatant truth is that Whitleyism does not work satisfactorily these days. It is too slow and there are too many vested interests. There are too many people much too busy holding the other chap down, and they are by no means all on one side of the fence. For a long time now the Doctors have known the right answer and it looks as though they are going to get results. A leaf out of their book would do Engineers no harm.

The Efficient Generation, Distribution and Use of Steam in the Hospital

PART II

By H. R. H. WARD, A.F.C., B.Sc., A.M.I.Mech.E., A.M.I.E.E.

In the first part of this paper the Author concentrated mainly upon efficiency in the Boiler House so far as it was affected by combustion conditions. In this, the concluding part, he stresses the importance of inner cleanliness and condition generally. He then discusses the losses that can occur through faulty distribution and usage.

I MUST not leave the subject of boilers without a word about inner cleanliness. By this I mean the maintenance of the plates through which the heat in the fuel is transmitted to the water in the boiler and economiser, or to the air in an air heater. All plates and tubes should be maintained as nearly as possible on both sides in as clean a condition as they were when the boiler left the shop. You are all well aware that both scale formed on the water surfaces and soot and carbon deposits adhering to the fire and flue gas surfaces reduce the "power" of a boiler. This is because soot and scale are both bad conductors of heat, so layers of them on the plate surfaces are to some extent heat-transfer insulators, as lagging might be. They must therefore be kept to a minimum by periodical removal. Scale formation is inhibited by proper water treatment and as this is the province of specialists maintenance staff are well advised to consult them and strictly carry out their recommendations. The prevention of soot and carbon deposit can be kept to a minimum by proper attention to combustion, particularly in the case of oil-fired furnaces, and any tendency to growths should be manually removed regularly. In cases where soot blowers are installed they should be religiously used as directed by the manufacturers. All plate surfaces must be regularly cleaned by scraping and brushing when the boiler is down for periodical cleaning and inspection. The effect on the efficiency of the boiler due to the layers of soot and scale may not be serious but will be reflected at the higher loads by unusually high gas temperatures and an inability to get the load out of the boiler. This may, too, cause difficulty in getting proper combustion conditions.

So far, then, as the boiler and auxiliary plant are concerned the conscientious engineer, with an eye on his operating efficiency, will be concerned primarily with his combustion conditions, regulating his primary and secondary air to get optimum performance with a minimum of excess air; he will examine and maintain in good condition his brickwork settings and boiler casings; he will keep an eye on his ash or riddlings to keep down any excessive combustible matter discarded in them; he will keep his lagging in good repair and attend immediately to any steam leaks, and he will keep close watch on the conditions of his boiler water and the amount of blow-down. Above all he will never allow his boiler to blow-off steam through the safety valve in spite of working it at the proper pressure, for every boiler works at its highest efficiency at the pressure and load for which it was designed. He will see that all heating surfaces are kept clean and that his feed water receives the treatment prescribed.

To assist him in this work he will have to see that his instruments and meters are properly maintained in efficient and accurate working order. Nothing is more misleading than a faulty meter. He may also find it advisable to see that his maintenance equipment includes a portable gas analyser and a thermocouple set. A portable draught gauge is also useful.

I have just pointed out that a boiler works at its greatest efficiency at its designed normal load, but this is on the understanding of course that the mechanical firing equipment has also been properly designed and installed in the boiler to suit that load. A boiler efficiency falls off slightly on overload and on low loads, and below 50% of its normal rated output it is likely that its efficiency may fall as low as 60% or less. This is because some of the losses from the plant, such as radiation, will remain constant in B.T.U. value. Also at low loads the air infiltration may remain constant so the flue gas losses increase in percentage. It is also difficult to regulate air supply at low loads. It is always advisable to try to divide the load between boilers so that any individual boiler steaming is carrying as heavy a load as can be arranged. The same applies to electrical generating plant: it is better to run one machine at full load or even occasionally on overload within reason than two machines at about half load or less. For this reason it is often

advisable to have machines and boilers of different sizes. Never use a large boiler or machine if a smaller one is available and will cover the load.

Before we leave the boiler house let me say a word about its cleanliness. Cleanliness begets efficiency. One can scarcely expect a high degree of cleanliness in a cramped basement or semi-underground boiler house. They are often badly lighted and so abounding in dark and dirty corners. Where such conditions exist, I recommend that the engineer tackles the lighting first. Improve this, bring it up as near as possible to standards of daylight, then the dark corners will show up the dirt and a keen boiler attendant will soon start cleaning up. This better lighting will be conducive to better attendance to leaks, repairs to lagging and all other work which will go towards stopping those " unaccounted " losses of heat. The maintenance of a high standard of lighting in a boiler house is essential to good overall efficiency, therefore see that the lighting is good and kept so. Similarly with its decoration. In spite of the fact that it may tend to get covered with a layer of dust, see that the boiler house is decorated in light colours and kept clean. In our more modern hospital boiler houses in Wales and particularly those where oil firing has been installed, the incentive to keep the place clean has already been provided and I have been highly pleased to see the way in which the operating staff have been filling in their time with some naval type polishing.

Lastly, still in the boiler house or its vicinity, care must be given to the economical use of power for driving auxiliaries, etc. No auxiliary should consume more power, be it steam or electricity or maybe compressed air, than the minimum it needs at the time. Valves, dampers, etc., should be used to the full. Plant installed for specific occasional purposes should only be used for those purposes and so on. I have in mind for example in the case of oil-fired installations, the provision of certain equipment (heaters or tracers) provided for conditions such as starting-up; this should not be left in use continuously. Some oil pipe lines have tracers installed, either steam or electric or both, which the designer only intended to be used in cold weather or after a shut-down, so they should not be used at other times and in cases whether either steam or electricity can be used, the engineer will have to decide which is the cheaper.

I cannot complete my reference to efficiency in the boiler house without making a strong recommendation for the careful keeping of a log recording hour by hour certain instrument readings and plant conditions. These, where conscientiously entered by the boiler attendant, will serve as a most useful guide and record for the engineer of what is going on in his plant. The most important items that should be recorded are steam pressure gauge reading, feed water temperature, CO_2 in gases at boiler exit, temperature of gases at boiler exit, steam flow in lbs./hr. and once or twice per day the steam flow integrator reading, oil-flow integrator reading, or coal meter reading, electricity meter integrator reading and similarly for gas (if any). Some engineers will have a preference for recording meters, such as steam flows, CO_2 etc., but even where these are installed I strongly recommend the keeping of hourly entries in a log sheet. It is not irksome to keep such a log in the case of mechanical stoker or oil-fired jobs, but might be difficult where the plant consists of a battery of hand-fired grates.

The cost of producing steam should be entirely the responsibility of the engineer and he must keep it to a minimum. He should be consulted about or even decide on the fuel to be supplied, he should have full control and direction of all labour in the boiler house and be given as free a hand as possible on the necessary expenditure on repairs, etc. Having this responsibility he will meet the confidence placed in him to produce steam from his plant at the lowest possible cost and keep himself informed from week to week of the exact cost of producing the unit of steam at each of the boiler houses under his control.

2. Efficiency in the Distribution and Use of Steam in the Hospital

As we are considering the distribution of steam around a hospital, I propose to consider principally a hospital where the main distribution of heat from the central boiler house is by steam serving calorifiers for heating and domestic hot water services arranged in the various independent blocks. In such an arrangement a steam main, or two or more steam mains, will radiate out from the boiler house, each line serving one or more buildings. These mains may be arranged in masonry ducts or on short supports above ground where they are installed outside buildings, crossing roadways, etc., in ducts or by passing overhead. In the case of those in ducts the expansion of the pipes is generally catered for by the provision of expansion loops, although in some instances patent expansion joints are installed, thus saving the off-set loop in the duct. The maintenance engineer will, of course, prefer those systems laid above ground for obvious reasons but unfortunately they are generally very unsightly and often a hindrance to free access across the ground. These mains when laid must be well heat-insulated and in either case the insulation must be weatherproof. In the case of the surface mains the maintenance of this lagging may well prove a costly item as it is so prone to damage from external sources. On the other hand such damage and leaks or other faults in the installation quickly becomes visible and can be attended to. With

mains laid in ducts, these ducts may be shallow and often have very little room inside for attention to leaks or lagging repairs, and, being covered by concrete slabs which are awkward to lift, many necessary maintenance works go undetected for long periods with consequent losses of steam or other inefficiency. Where these steam distribution mains pass through buildings they can often be accommodated in larger ducts, or crawlways or even walkways as these can also serve other purposes. In some cases in buildings, however, they are housed in shallow ducts below corridor floors. In this latter arrangement any leak or other attention needed by the maintenance engineer is fairly soon evident. It is in the crawlway where the necessary attention may be missed for many months. The best installation from the maintenance angle is that in which the engineering piped services are run in walkways giving a headroom of about six feet.

One further point I should mention while considering the steam distribution mains is that of heat loss in them. It is quite obvious that the circumstances of weather will have an effect on the loss of heat through the lagging, and the losses from those pipes running above ground will be much more than from those in ducts. The heat losses through distribution mains is quite considerable, being of the order of 10% dependent on many conditions, of which one obviously is length. Distribution mains should therefore be as short as possible. They should also be as free from bends as is practicable, as every bend adds to the power needed to drive the steam past it. This power is self-contained in the steam and has the result of increasing the water condensed from it. Heat loss from the steam distribution mains and for that matter from all steam pipes, fittings, etc., must of course come from the steam passing through them and as this in almost every case in hospitals is unsuperheated steam, in fact in most cases will not even be dry-saturated steam but contain a small moisture content, it will be evident that such loss of heat must be loss of latent heat in the steam, so causing some of the steam to become water.

The presence of such water in a steam distribution line is most undesirable and the water must therefore be removed. The old remedy of hand operated drain cocks at regular intervals has generally given way to automatic drain cocks, or steam traps as they are called. Steam mains should be laid with a slight fall in the direction of the steam flow for the purpose of allowing the water which will collect in the bottom of the pipe to flow forward with the steam to the draining point; or they may be laid vertically or with such a slope that the condensed water will gravitate back against the flow of the steam. It will be clear, therefore, that all low points in steam lines must be drained to steam traps. This is particularly necessary at the end of branch lines feeding some equipment for example, and especially so if that equipment is not taking a continuous supply of steam. In such cases it may be advisable to fit additionally a hand controlled cock to drain the branch line if it is at all long. In many instances it will be found advisable to fit filters immediately before steam traps.

I have not the time here to discuss the use of the various types of steam traps now available, but those in general use in hospitals are (*a*) the small balanced pressure thermostatic trap, and (*b*) the more complicated lifting trap, which is a combined trap and pump, and is used in places where it is necessary to lift the condensate to a point higher than the line it is draining. These traps must be kept in good repair as they are essential to the efficient distribution of the steam and the economic operation of the service. Wherever reasonably practicable all condensate should be returned to the boiler plant and the heat in it conserved by lagging the pipes. By this means a very considerable conservation of heat is effected which is essentially reflected in a fuel saving and so lower fuel bills. It behoves every maintenance engineer therefore to make sure that his steam traps, and in fact, the whole of his condensate system, is maintained in first class condition. I am afraid many an installation suffers from lack of attention to steam traps which are left to leak or by-pass live steam into the condensate line and so to the hot-well, where in consequence temperatures of 190°F. and over are registered. An abnormally high temperature in the hot-well is often the first indication a maintenance engineer will have of some of his steam traps failing.

Pressure reducing valves are another source of trouble and inefficiency, but faults in them are likely to cause more worry from the point of view of safety than efficiency. It is unfortunate that many have to be used in a hospital system, but they must be properly maintained so that they allow the reduced pressure main to be supplied with all the steam it calls for and yet prevent any excess pressure in that line causing a loss of steam through the low pressure relief valve.

Finally a word with regard to the efficient use of steam in the hospital. It is often pleaded that the engineer has very little control over this but the emphasis here must be on the word "use." The maintenance engineer should have every responsibility for the efficiency of the system supplying steam to the user and for seeing that the apparatus using the steam is in proper and efficient working order, not only as intended by its designer and manufacturer, but by his own reasonable modifications and additions which often can be made to some of our older equipment. I have in mind the fitting of such additional refinements as simmering devices and thermostatic controls fitted to

small sterilisers, etc. The proper attention to all steam valves, traps and other fittings incorporated in the appliance will all assist in keeping the steam consumption to a minimum and lagging should not be overlooked.

The steam-using equipment over which the engineer has direct control consists of plant such as heat-exchange calorifiers, hot water circulating pumps, etc. My previous remarks will apply equally to this plant, namely the prevention of all leaks, keeping heat exchange surfaces (tubes, etc.) free of scale, keeping lagging in good condition, not using more plant than the load demands, making sure that all automatic controls are in proper working order and keeping them so by regular attention and having thermometers fitted in strategic positions to tell what is happening. In a large installation a log should be kept in which should be entered a record of such items as what plant is in use, when it was brought in and taken out; temperatures should be recorded regularly including the outside atmospheric temperatures, dates when the various items of plant are taken down for cleaning and repairs carried out.

In conclusion I hope in this somewhat brief time I have been able to give hospital engineers and particularly those of you responsible for operating and maintaining plant, a few ideas or shreds of advice that will assist you to get the most out of your plant, to supply steam to your hospitals at a reasonably low cost and hence efficiently, and to see that your distribution network is as efficient as it could be.

ADDENDUM

It is appropriate here to add a serious warning relative to oil-fired installations and this concerns acid corrosion in the flues. In most fuel oils the sulphur content is greater than in an equal weight of coal and in consequence we can expect to find more sulphuric acid in the flue gases. Now sulphur unites with oxygen in the process of combustion forming firstly sulphur dioxide (SO_2) and in the presence of further oxygen the sulphur dioxide becomes sulphur trioxide (SO_3) which will combine with the moisture (H_2O) present in the flue gases to form the deadly sulphuric acid (H_2SO_4) far more readily than will the sulphur dioxide. It is essential therefore to prevent the sulphur dioxide from becoming sulphur trioxide by reducing to a minimum the free or available oxygen, that means keeping the excess air to a minimum and most definitely preventing all ingress of air into the flues.

Temperature also has a serious effect on acid corrosion of steel plates. The most serious cause of acid corrosion is from the liquid acid settling on the plates, whereas the acid in its gaseous form has very little effect. The "dew point" of the gaseous sulphuric acid is about 320°F., so we must keep the flue gas temperature well above that figure. If, on the other hand, we allow it to fall as low as 240°F., the dew point of the steam in the flue gas will be reached and water will be formed which will not merely dilute the acid but increase its covering power by spreading it further over the plates.

I have already reminded you that air leaking into the flues reduces the temperature of the flue gases. Experience has proved that in an oil-fired boiler plant the highest efficiency combined with minimum corrosion takes place with a CO_2 content of 14% and a temperature of 380°F. in the flue gases leaving the plant. On low loads such conditions are difficult to obtain and for this reason it is preferable, if available, to steam a smaller boiler on light loads. To allow the burner to shut off for a period and then to come into use again for a limited period is generally undesirable and is not to be encouraged if other alternatives can be adopted. It will be appreciated that this practice of shutting off a burner for restricted periods must have the effect of allowing the flues to cool, very likely to a surface temperature lower than 320°F., with the results I have just mentioned. If such an undesirable practice has to be adopted, then steps should be taken to insulate all steel plate flues, and, in addition, to close the I.D. damper(s) to conserve the heat in the installation.

A further warning is necessary to those of you operating oil-fired boiler plant and that relates to the emission soots which take the form of very light, soft and damp particles of carbon. There is at present no known means of preventing carbon deposit on the walls of flues and chimneys, especially on the cooler surfaces. It is to these particles of soot that the sulphuric acid has a habit of adhering; then, when a burner relights with a puff, creating a sudden rush of gases in the flues and chimney, these acid-soaked soot particles are dislodged and as often as not will find their way on to Mrs. Jones's washing.

I hope I have said enough to warn you against the serious consequences that are likely to result from faulty operation and maintenance of an oil-fired installation.

NEW ELECTROLUX SALES DIVISION

A new sales division has been formed by Electrolux Ltd. to cover the South Wales area. The divisional offices are at 60 Newport Road, Cardiff (Tel. Cardiff 30846).

The manager of the new division is Mr. David F. Ireland, formerly deputy divisional manager of Electrolux Ltd.'s Western Division whose offices are at Bristol. His deputy divisional manager is Mr. Percy A. Bates formerly an area manager in the Company's Western Division.

Air Filtration — Why and How

By G. H. VOKES

PART II

In Part I of this paper, published in our January issue, the Author surveyed briefly air filtration by thermal and electrical precipitation. In this part mechanical separation is the theme. The concluding part will appear in our March issue.

Mechanical Separation

THIS term covers a multitude of types of apparatus and would provide more than enough subject matter for a dozen full length papers. We shall endeavour to cover as much as possible of the subject, and as most of the author's experience has been with mechanical separators, perhaps he may be forgiven for rather concentrating on this section.

It will be divided into two parts, dealing respectively with filters and strainers on the one hand and apparatus in which a controlled swirl is given to the gases (such as cyclones) on the other hand.

The two basic types of filter—namely the dry fabric and viscous—will be covered under one heading, as the basic principles under which they operate are the same.

The fundamental difference between a *filter* and a *strainer* must be emphasised.

A *strainer* removes particles from a fluid because the interstices between the fibres or other filter matrix are smaller than the particles arrested. This principle is useful for the separation of fairly large particles or where a sharply defined "cut" is required at a certain size. Separation and estimation of solids by sieving is important enough for the British Standards Institution to have issued BS.1796 dealing with recommended methods for wet and dry sieving for the estimation of small solids.

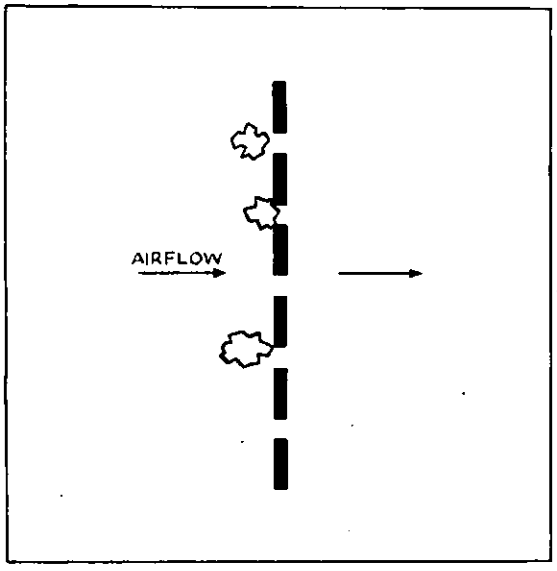


Fig. 4. Strainer.

Not all strainers are coarse; there is at least one micro-membrane material available which can literally sieve out particles as small as half a micron on the surface of the material. This material is of great value for collection of bacteria in a manner facilitating their incubation and microscopic observation on a flat surface.

Unfortunately, it is too expensive for use in commercial filters, and even if it could be used, its rate of clogging would be excessive for most bulk air filtration purposes.

So much for strainers. Returning now to the true *filter*. It surprises many to learn that the spaces between the fibres of a nominal ten micron filter may be 100 microns or more. Obviously, such a filter can only *strain* out chunks larger than 100 microns, and yet the efficiency on ten microns particles may be anything up to 99·9%.

It is necessary to appreciate this if the performance characteristics of most air conditioning filters—both dry and viscous—are to be understood.

In order to provide a simple explanation of the operation of a filter, many attempts have been made to introduce larger scale analogies, but perhaps it is better to go straight to the point and consider the particles as such. Fig. 5 gives a very crude impression of a cross-section through a fabric filter with dust-laden air entering from the left. As the stream-lines of air flow arrange themselves to pass the individual fibres, a change of direction is involved, and this causes inertia forces to be set up. The result is that the particles tend to become centrifuged closer to the fibres—as shown in the lower magnified portion of the diagram. Once they have touched the fibres the chances are that they will be retained there, either by molecular attraction if they are very small, by an adhesive effect, or perhaps due to roughness on the fibres if they are larger. In the case of a viscous filter, the sticky wetting agent film is the main factor in retention.

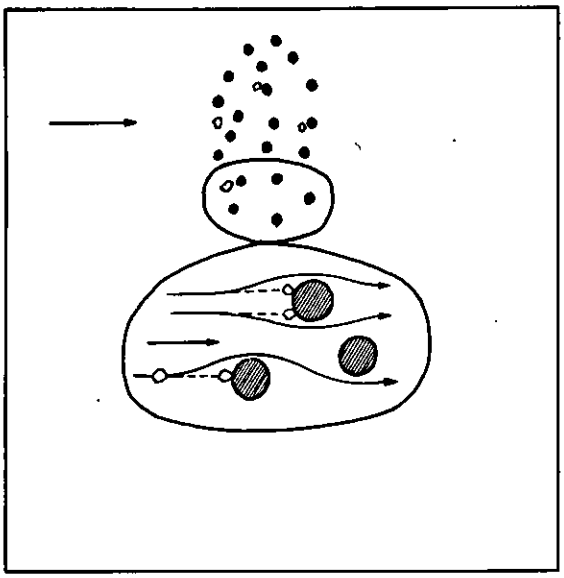


Fig. 5. Depth Filter (Particles over 1 Micron).

It can be shown mathematically that the effectiveness of centrifugal separation becomes reduced as the particles get smaller. This is due to a characteristic known as the " termina velocity." In effect, the terminal velocity, i.e. the limiting speed reached by a particle falling through a viscous fluid, depends on the mass, shape and size of the particle, as well as the characteristics of the fluid. The major single influence is size, because of the surface to volume ratio referred to earlier. As the size is reduced, the surface area, and hence resistance to movement, decreases less rapidly than the mass, which is the factor causing the movement. Hence settling of a fine particle is slower than that of a coarse particle.

All of this much over-simplified theory leads to the fact which most of us would expect anyhow, namely that the filter or separator will be less efficient on small particles than on large particles. Many other factors would enter a more detailed appreciation of the effect, but all would sooner or later be reduced to terms of terminal velocity. Shape is an important characteristic.

Someone may well suggest that this is going a long way round to prove something which is common sense anyway. However, there is a reason for this approach. The process does not continue indefinitely. If we continue reducing the size of our particles we may be surprised to find that when they get small enough the efficiency of separation starts to *increase* again. This effect can be explained variously by the Brownian movement of molecules and fine particles in gases or by the diffusion theory. Whichever is considered, the effect is similar, and as the Brownian motion theory is easier to explain in simple terms (though perhaps not strictly as accurate) we will proceed to describe it (Fig. 6).

The chance of a given particle striking a surface in the filter would be considerably improved if, as well as passing through the filter with the air, it were oscillating sideways. This proves, in fact, to be the case, and extremely small particles below about 0·1 micron are more influenced by this process than they are by the direct impingement first referred to. For most practical purposes, the minimum efficiency of most filters will be experienced somewhere in the range 0·1—0·5 microns, and a dust of such a size, other things being equal, will have greater penetrating properties than either a coarser or a finer one. The main interest of this is in connection with absolute filters. For most usual air conditioning problems we are concerned largely with particles over 0·5 micron, and for these the predominant characteristic is impingement.

This is admittedly a considerably over-simplified explanation, but should help to show why a depth filter can have such outstanding dirt retaining capacity. In effect, such a filter, whether dry or viscous, does not become clogged until practically all the internal surfaces have become coated with a considerable layer of dust; the available area for collection on a surface filter would be many times less, although to some extent this could be counteracted by deeply pleating the filter and so increasing the superficial surface area. Generally we find advantage taken of a combination of these factors—a depth filter medium pleated to give as much superficial area as possible.

A few words on the relative advantages of dry and viscous filters may be useful. Generally it

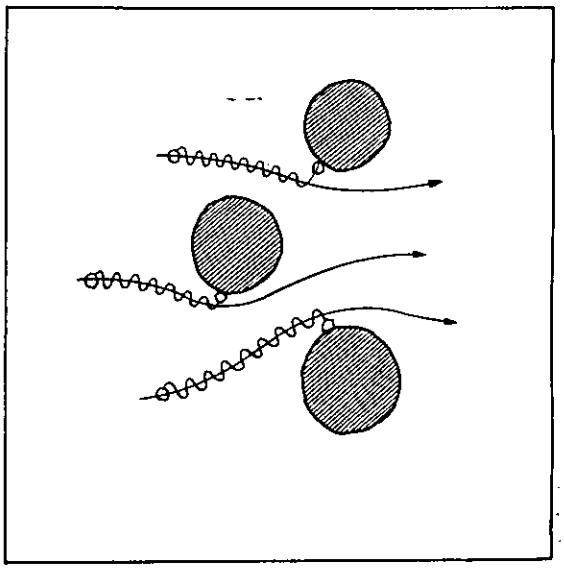


Fig. 6. Depth Filter (Particles below 0·5 Micron).

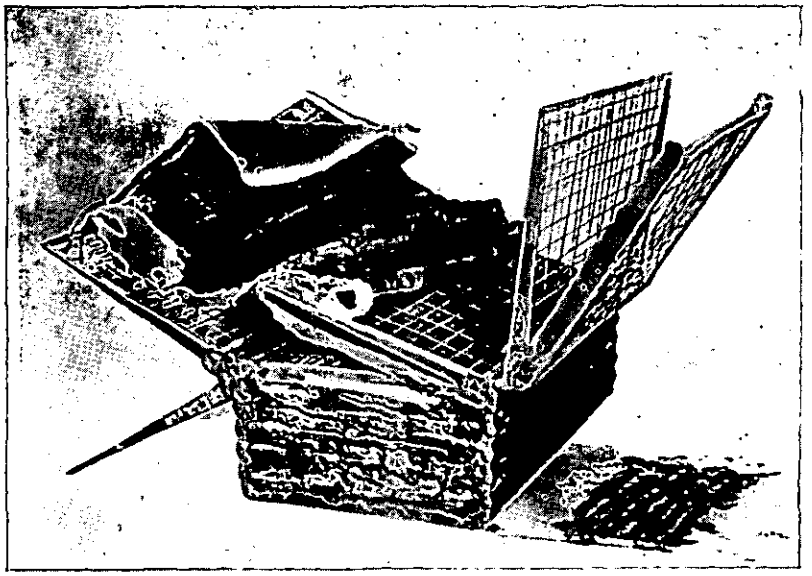


Fig. 7. Dry Filter with Throw-away Medium.

is possible to make a dry filter give any desired degree of separating efficiency with far greater ease than it is with a viscous filter, as in the latter it is not possible to decrease the flow passages too far or the oil film would close them up altogether. Also, a dry filter can provide remarkable performance on dry granular dusts, as a large proportion of these can be easily dislodged during service by slight vibration or reverse air flow.

When a dry filter is used in an industrial area, two factors are immediately noticed: firstly the separating efficiency improves due to the sticky nature of much of the dust; secondly it is difficult to remove such matter from the filter, which must therefore generally be looked upon as a throw-away type. To take advantage of the potential high efficiency of dry filters at low cost, versions have been devised in which the medium can be removed, thrown away, and new fitted, without necessity for destroying metallic or otherwise permanent components. Such a filter is shown in Fig. 7.

Viscous filters are of two fundamental types. There is firstly the so-called non-clogging or reducing efficiency filter, which is so designed that even when all the adhesive coated internal surfaces have accumulated a considerable load of dust, the spaces between the surfaces are yet large enough to permit air flow to continue substantially unhampered. (Fig. 8.)

The other type has characteristics more closely approximating the dry fabric filter and can be termed the constant efficiency variety. In this type the coated surfaces are arranged to form a finer structure, so that by the time the oil film has become absorbed by accumulated deposits, the latter have virtually bridged the spaces, causing a substantial increase in flow resistance but maintaining efficiency by a continued surface filtration process.

Obviously, choice of one or the other type can only be made with knowledge of individual circumstances, and as one concerned with effective filtration, the author naturally prefers the type that maintains its filtration efficiency when choked rather than the type which gives no indication that it is no longer operating as a filter. However, there are cases when reduction of air flow, even in abuse conditions of long delayed lack of servicing, is more serious

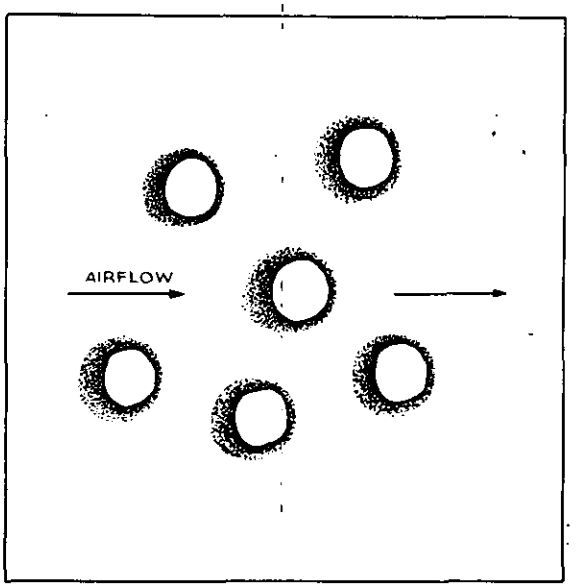


Fig. 8. Dust Loaded Oil Wetted Filter (Non-Clog).

than transmission of solids. In such cases, the reducing efficiency filters form a useful alternative.

Some filters have been so designed as to allow their use either dry or oil wetted.

The modern tendency in industry is towards automation, and filters are no exception. One of the older and better known semi-automated cleaners is the "oil bath." Most "reducing efficiency" filters would possess more or less constant efficiency characteristics if the viscous coating agent could be constantly removed and replenished. This is achieved in the oil bath by arranging for the air flow to fleck up oil from a container and convey it to a scrubber pack in which both oil and solids are separated, and then return under gravity to the container. This type of cleaner, of course, is widely used on internal combustion engines, etc., and is unsuited for most air conditioning purposes because of its intrinsically high back pressure characteristics. More recently effort has been directed towards securing the constant washing and oil-replenishing of basically "reducing efficiency" panel filters by causing them to be passed periodically through a turbulent container of wetting agent. The "S.C." (self-cleaning) filter shown in Fig. 9 is a good example, and is ideally suited to handling heavy dust loads without constant attention, and at minimum cost.

The dry filter equivalent of this appears in Fig. 10, and in this type the throw-away medium principle is employed. A roll of filter material is located on the upper spool, passes across the air duct and is wound on to a take-up spool at a rate controlled by back pressure across the filter.

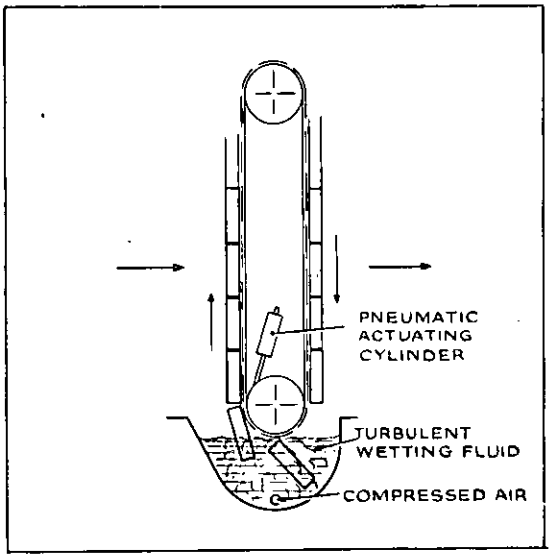


Fig. 9. Automatic Oil Wash Viscous Filter.

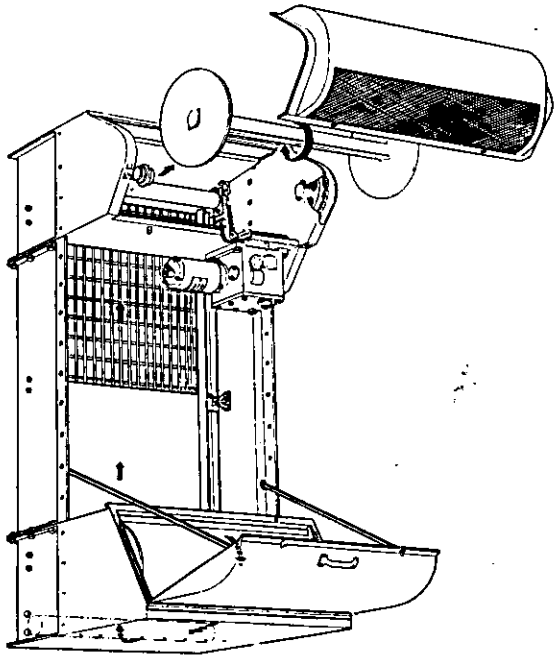


Fig. 10. Automatic Roll Type Filter.

Both these types of filter are finding increasing application in industry, and the former, particularly, is proving of extreme value under desert conditions for cleaning the air fed to stationary gas turbine engines, etc., used for oil pipe-line pumping.

The automatic roll filter is the modern answer to problems imposed by constant increases in maintenance labour cost. Manual effort on site is literally confined to removing a roll of fouled filter medium (either glass fibre or self-bonded acetate fibre) and inserting a new one on the top spool. Thenceforward the clean fabric is fed across the filter aperture until it is nearly exhausted, when a paper end section interrupts air flow over a vane switch and causes an audible or visual alarm to operate. Even capital installation cost of this type of filter compares very favourably with most static arrangements. New uses are continually being found, including some in the atomic energy field, where the reduction in handling of potentially active material has more than mere financial advantages.

The Absolute Filters

So far we have described in general terms what may be termed "commercial" grade filters, i.e. filters which can be capable of adequate performance for all normal air conditioning purposes. Good examples can remove up to 99% of a standard contaminant dust such as that described in British Standards Specification No. BS.1701. Some processes require a standard of air cleanliness which

Fig. 11. Early Asbestos Wool Sub-micron Filters at a Nuclear Establishment.

could not be achieved by these means, while in addition, certain modern processes can produce fine highly toxic, radioactive, or pathogenic particles which must not be allowed to escape, even to the general atmosphere. This requirement is quite distinct from " dust collection," in which relatively large quantities of nuisance dust, product, or valuable materials are handled. Hence comment is not out of place in this record.

Maintenance of extremely pure or sterile air for bacteriological work was one of the first incentives to the design of high efficiency filters, and this was quickly followed by a whole range of requirements for the atomic energy industry and, to a lesser extent, in the photographic field.

The first approach to this problem was to use tightly packed masses of fine fibres such as asbestos or slag wool, and it was possible by these means to achieve very high standards of air purity, provided one were content to use an air compressor instead of a fan. Obviously, such a requirement would seriously limit the extent to which high efficiency filtration could be applied, and intensive research was devoted during and after the war on both sides of the Atlantic to evolving filter media which came closer to reconciling what may be termed " the eternal triangle of filtration "—namely back pressure, dirt capacity and separating efficiency on the one hand, with size and cost on the other.

Reference has already been made to the " common sense " fact that finer fibres and more closely packed fibres will increase separating efficiency. Likewise, coarser fibres can provide a more open-structure medium with low back pressure but with low efficiency. Several authorities independently discovered that the answer was to combine the two and use a framework consisting of relatively coarse fibres to support a finely carded mass of fine fibres considerably more loosely than would be possible if the latter were used alone. The technique in manufacturing such media is quite critical, but when successfully carried out the resultant filters have a remarkably high efficiency/low resistance combination.

The earlier filters of this type usually consisted of an admixture of Merino wool and asbestos fibres, and many thousands of such have been made which possess a Methylene Blue penetration rating of under 0·001 %, or, one part in one hundred thousand. (The Methylene Blue test will be described presently.) Alongside this type of lap filter, the medium of which is generally approximately 1 in. in depth, was also developed a so-called Resin Wool Filter, where instead of the fine asbestos fibres, special resinous materials capable of exerting a strong electrostatic attraction on particles are dispersed through the mass of woollen fibres. This type has now been largely discarded in favour of the " mechanical " fibre admixture types.

Although extremely reliable and effective, the asbestos wool type of filter possesses one disadvantage: it is bulky, and consequently expensive per c.f.m.

Later variations of the " canister " type filter have employed several concentric laps to reduce the space requirement, and in the so-called Box Canister, the filter medium is disposed in deeply pleated form. In this version, which is perhaps the most widely used of all in the most stringent applications, the filter medium is usually a carded admixture of cotton and asbestos fibres, or, alternatively, a blend of fine and superfine glass fibres.

An even later development is the " paper absolute " filter. In this case the fibre admixture is made up on a fourdrinier paper-making machine, and a soft fibrous blotting-paper-like material is produced. This has an even finer structure than the various lap media, and can be utilised in thicknesses of $\frac{1}{16}$ in. or less, so providing ample scope for disposition in a deeply pleated form to provide an exceptional surface area.

These filters are made to give Methylene Blue penetration ratings of 30% right down to the 0·001% achieved with the later canister filters. The great advantage of this type is the relatively low cost per c.f.m., and it is possible to filter 1000 c.f.m. of air to almost sterile cleanliness for a pressure loss of under 1 in. w.g. in a unit 2 ft. square.

C.f.m. for c.f.m. filtered, the cost of providing " absolute " standard filtration is inevitably greater than that required for " commercial " standards. It is self-apparent that more matter will be collected, as not only will the coarser solids have to be handled, but much superfine matter as well. Unfortunately, the problem is not quite as straightforward as it might seem at first sight: the mere act of interposing

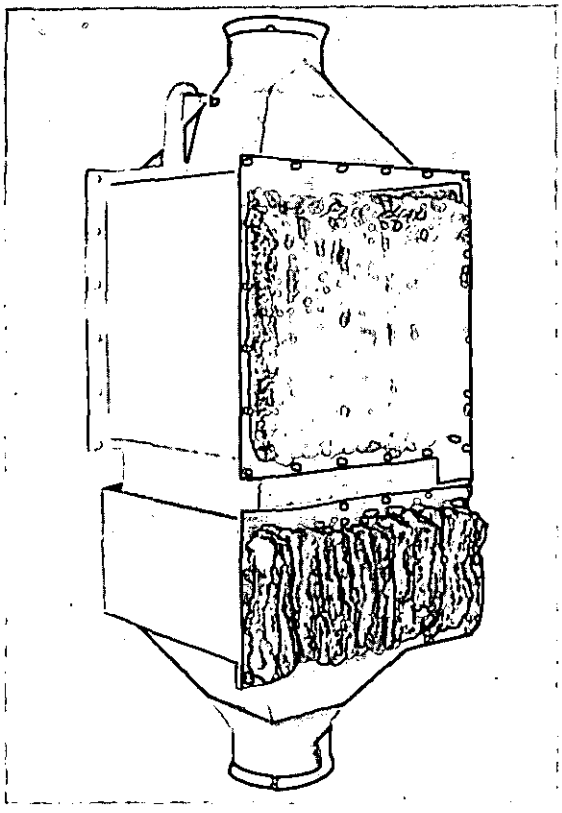


Fig. 12. Sub-micron Box Canister Filter with Blended Asbestos Cotton Stage pre-filtered by Fine Fibreglass.

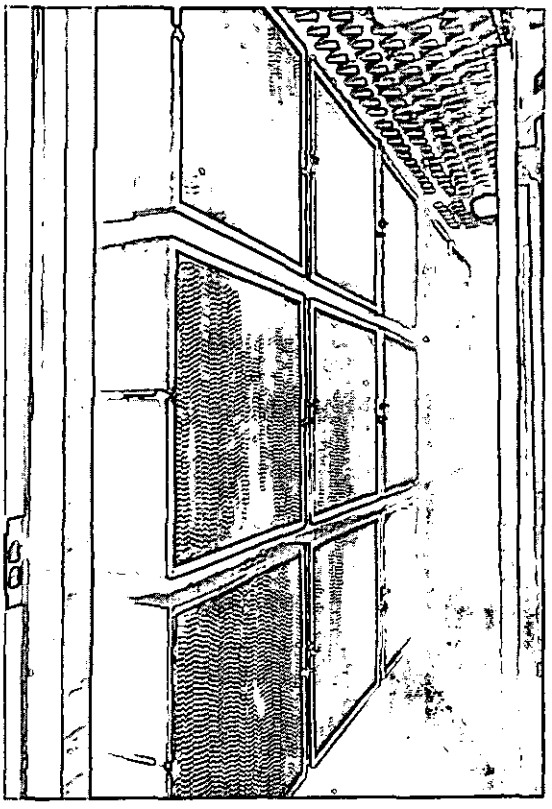


Fig. 13. Pleated Paper " Absolute " Filter.

a pre-filter to remove the coarser atmospheric solids before they reach the high efficiency filter does not automatically confer the desired advantages. The dust load that any filter can accommodate depends largely upon the structure and disposition of the foraminous mass referred to as the " filter medium." Also, however, when a certain load of solids has accumulated, the properties of the solid bed must be considered. Subsequent filtration will be partly by the normal processes of impingement and diffusion, and partly by straining (maybe assisted also by the other factors) through the accumulated solids.

A bed of solids containing a wide range of particle sizes from coarse to fine will have a lower resistance to flow than one consisting of " fines " alone. That is what one would expect anyway from first principles. So if we interpose a pre-filter to remove the coarser or gross impurities, we leave only super-fines to be collected by the absolute filter, which will evidently not now be able to accommodate as heavy a dust load as before (for a given limiting pressure loss rise).

Fortunately, the situation is not generally quite as black as this explanation might convey, and use of pre-filters is nearly always advantageous. A

typical result from pre-filtration (perhaps by " Kompak " or automatic roll type filter) might be, for example, to triple the absolute filter's service life by relieving it of 90% of the total gross contamination load.

We therefore find that absolute filter installations are almost always preceded by one or two stages of coarser pre-filtration, though it is obviously necessary to study each application on its merits before making a firm recommendation.

The same principle applies to almost all other instances of pre-filtration, even in the less refined arrangements sometimes found in automotive or agricultural practice when a crude cyclone is used before (say) an oil bath or fabric intake filter.

It is frequently desirable purposely to arrange for the pre-cleaner to be limited in efficiency to achieve the best overall results.

(To be continued)

Epoxy Finishes

By H. LAWRENCE,
B.Sc., A.R.I.C.

This article is based on part of a short paper read before a meeting of the Midland Branch, and the subject has been treated in rather more detail here by the Author who is Chief Chemist of Messrs. Hadfields (Merton) Ltd. As is described, surface coatings based on epoxy resins have been introduced in recent years having high resistance to corrosion and mechanical damage. It is suggested that they may have certain applications for hospital use in spite of greater cost.

Introduction

AMONG the most important of the many new materials introduced of recent years in the field of surface coatings are those based on epoxy, or, as they are also called, epoxide, resins. The name is derived from the characteristic chemical group, the epoxy or epoxide group $CH_2\text{–}\overset{O}{\diagup\diagdown}CH\text{–}$, present in epichlorhydrin which is one of the principal raw materials used in the production of the resins. The particular chemical reaction employed can be taken to various stages, the resulting resins varying from extremely reactive liquids to more highly polymerised solids. The reactive epoxy groups retained in the resin molecule are primarily responsible for the high degree of reactivity shown by the resins which allows them to be chemically combined in many different ways, some of which may be utilised in the preparation of paint media. For this purpose the more manageable, rather less reactive solid resins are used.

In the U.K., epoxy resins are marketed under the brand names of " Araldite " (Ciba (A.R.L.) Ltd.), and " Epikote " (Shell Chemical Co. Ltd.), the corresponding name for the latter in the U.S. being " Epon."

Epoxy resins were originally developed as adhesives and figured prominently in aircraft manufacture during World War II. Since then their use has been widely extended to include the manufacture of high performance electrical varnishes and of air drying and stoving paints and varnishes for many industrial and decorative uses. The chief characteristics of epoxy finishes as surface coatings are high resistance to chemical attack and good adhesion to many different types of surface. The inclusion of even a comparatively small proportion of epoxy resin in the paint vehicle can result in great improvement in the adhesion of stoving finishes to metal surfaces formerly regarded as difficult, such as zinc coated steel used in washing machines and refrigerators.

By comparison with other resins normally used in paint and varnish production the epoxy resins are expensive, so that they are generally used only in high performance products.

It is proposed in this brief survey of epoxy finishes to consider more specifically their use as air drying decorative finishes with particular reference to their possibilities for hospital work, and to do no more than mention some of their many industrial uses on manufactured articles.

Because of their chemical composition epoxy resins may be utilised in two distinct ways. Since they are alcohols they may be combined (esterified) with fatty acids derived from vegetable oils to give oil varnishes, and paints prepared from these are sometimes known as Epoxy Resin Ester or One-Pack Epoxy Finishes.

Alternatively, epoxy resins may be interacted with curing agents which develop the film forming properties of the resin by cross-linking and polymerisation, and such oil free materials are sometimes known as Two-Pack Epoxy Resin Finishes. In this type the base and curing agent are supplied separately and

are mixed together only a short while before use. The two types differ considerably and may be considered separately.

Epoxy Resin Ester Finishes (One-Pack Type)

It is possible to incorporate epoxy resins in the manufacture of alkyd varnishes such as are commonly used in decorative paints, but there are practical difficulties in doing so and the advantages obtained in the varnish are not commensurate with the added cost; the resins need to be used without admixture to take maximum advantage of their potentialities. The nature of the fatty acid combined with the epoxy resin greatly influences the properties of the resulting varnish. Thus if the fatty acids from a drying oil such as linseed are used the reaction product dries on exposure to air by the absorption of oxygen in a similar manner to a normal oil based varnish.

To ensure maximum adhesion, chemical resistance, and speed of drying, it is necessary to use rather more epoxy resin than is chemically equivalent to the fatty acid taken. It is also possible to modify the varnishes by the use of acidic resins such as rosin to increase the hardness and speed of drying. Using fatty acids from drying oils, with or without modification, varnish media can be prepared making possible the formulation of air drying paints thinnable with white spirit and suitable for brush application for interior and exterior use. Primers, undercoats, and gloss finishing paints based on such media are available, though they are likely to be more expensive than normal decorative finishes.

For general decorating work where chemical resistance is not required, gloss epoxy ester finishes have no special advantage over alkyd finishes, being somewhat inferior to them in fullness of film and degree of gloss. On exterior exposure they also tend to chalk rather more. However, the films they give are tough and quick drying, with good water resistance and adhesion, showing very good resistance to softening by detergents, grease and lubricating oils, and to chemical attack by acidic fumes and cutting oils. They are also much less readily attacked by caustic alkali than are alkyd finishes. Their main use, therefore, lies not so much in the decoration of walls and woodwork in wards and corridors, but in specialised sections such as laundries and laboratories, and on equipment subject to contamination with oil or to mild chemical attack.

Esters of fatty acids derived from semi-drying or non-drying oils can quite readily be made though these may not all be soluble in white spirit. Stoving enamels of exceptional adhesion, flexibility, and colour retention, such as are used on collapsible tubes, can be produced from varnishes made from dehydrated castor fatty acids. These are sometimes also modified by the addition of other resins such as melamine.

Two-Pack Epoxy Resin Finishes

Another way of utilising epoxy resins is to combine them with chemicals such as amines or alternatively with polyamide resins, both the epoxy resins and the curing agents being dissolved in suitable solvents. The reaction causing the setting of the film takes place at normal temperatures and is not dependent on the presence of oxygen as in a normal air drying varnish. Provided the solvent can get away, quite thick films harden without skin drying or the wrinkling normally associated with over-thick films. When fully cured, air dried films or two-pack epoxy resin finishes have outstanding chemical resistance, and the toughness and adhesion more usually associated with a stoving enamel than with an air dried paint.

A range of epoxy resins, differing widely in their reactivity with curing agents, is available to the paint manufacturer. For normal surface coating work the rather less reactive resins are selected. These are not soluble in solvents such as white spirit commonly used in decorating paints, but require stronger solvents such as ketones or alcohol-ethers, e.g. cellosolve. By proper selection solvent mixtures of high flash point can be made having sufficiently low volatility to permit brush application. The base is mixed off shortly before application with a solution of the catalyst or cross-linking agent which promotes the polymerisation reaction. Amines are effective cross-linking agents but apart from being rather strong smelling they are inclined to be toxic and skin irritants, and for this reason are not normally used in decorating work. It is more usual to make use of polyamides as curing agents, which are themselves resins and contribute to the film properties. Though these are much less noxious than the amines, the use of barrier creams is advisable if materials of this type are repeatedly handled.

Interaction takes place in the liquid state, but it is necessary to allow a short induction period of about half an hour before applying the mixed paint. One result of the interaction is a progressive increase in viscosity of the paint, which has therefore a limited pot life determined by the maximum viscosity at which it can be satisfactorily applied. The rate at which the viscosity increases is very much influenced by temperature, but with a polyamide curing agent it is possible to prepare paint which under normal working conditions will remain usable during a working day, and of which any residues can still be used up next day by mixing off with freshly prepared material. By storing the mixed paint in a cold place the pot life can be greatly extended.

The proportion of cross-linking agent to epoxy resin is important and it is usual for manufacturers to supply the two components separately for mixing in simply related proportions. These may not however be the same for primer and undercoat as for gloss finishing paint because of the difference in

the epoxy resin content of the paints. Thus for a primer and undercoat a commonly used ratio would be 4 parts of base paint to 1 part of catalyst solution, and for finishing paint 2 parts of base paint to 1 part of catalyst. Manufacturers' instructions for mixing should be strictly observed.

Application may be by brush or spray but it is usual to supply separate qualities differing only in the nature of the solvents used. For both types the solvents present no toxic hazard, but adequate ventilation is necessary.

For brush application an interval of 24 hours between coats is recommended but for spraying this can be reduced.

After application, the film takes about 7 days for the curing process to be completed, but this time depends very much upon the temperature of the work and may be reduced to as little as an hour if a light stoving is given. Curing practically ceases at temperatures below about 55°F. For this reason, therefore, it may not be possible to apply two-pack epoxy schemes to new work during winter months unless heating can be provided.

For brushing on broad surfaces nothing larger than 3-in. brushes should be used. The flow of both undercoat and finish is good and care is needed to avoid runs. Nevertheless once the solvent has evaporated the film sets quickly and rapidly reaches a dust free condition. Brushes should be cleaned immediately after use with the appropriate thinners supplied by the paint manufacturer; it is not possible to use white spirit for cleaning purposes.

The solvents used in two-pack epoxy resin finishes are rather stronger than white spirit but will not usually attack old paint films, providing these are thoroughly hard. It is, therefore, possible to repaint existing oil based paint with a two-pack epoxy scheme, but it should be borne in mind that one of the principal reasons for using this type is the high chemical resistance provided and this will obviously be reduced if there is present in the scheme paint of an oil varnish type. In addition to gloss finishing paints, primers and undercoats are available on a two-pack epoxy resin basis and should be used where the highest performance is required.

Two-pack epoxy resin finishes have excellent adhesion to most surfaces and outstanding chemical resistance. They are particularly resistant to caustic alkalis and will withstand, without damage, continuous immersion for many months in strong caustic solutions that would completely destroy finishes on an oil varnish basis, such as alkyd, in a few hours.

Most normal colours are available in this type of finish but some restriction may be placed on colour where particularly severe chemical conditions have to be met. The medium tends to yellow with time which may slightly affect the colour of white and very light tints but will not be noticeable in deeper shades.

The finishes have also great toughness and will stand abrasion very much better than more traditional air drying finishes, both in full gloss and reduced gloss such as eggshell. The wear resistance of a fully cured two-pack epoxy scheme approaches that of a stove enamel finish. For this reason they have found an important use as floor paints, e.g. on concrete and granolithic floors. The high chemical and abrasion resistance of these finishes, therefore, makes them of particular value in laboratories, plating shops, etc., where the maximum chemical resistance is required.

Considerable interest has also been shown in their use in operating theatres where a hard, impervious and highly glossy film is required to withstand repeated washing down with detergents and disinfectants.

Fully cured, the finishes have good resistance to many different types of solvent and will withstand contact with hot lubricating oil for long periods without softening or significant colour change.

Generally speaking these finishes find their greatest use in interior work and are not specially recommended for exterior use where they are inclined to be less satisfactory than normal decorating paints based on alkyd resins.

Clear two-pack varnishes may also be made from epoxy resins. In a similar way to the pigmented finishes described above they are prepared by mixing a base varnish with a catalyst solution; polyamide resins are often used for this purpose.

They give tough, hard, chemically resistant films of good adhesion and find an important use as varnishes for wooden floors and for laboratory benches. They are inclined to yellow with time which may limit their use on the palest woods. Brushing and spraying qualities are available. They are less satisfactory on exterior work, e.g. wooden cladding where their life is inferior to the best quality alkyds and marine varnishes.

The difficulties of application of the two-pack type are greater than for normal paints but are well within the capacity of a high class decorator and more and more are gaining experience of this type of product.

However, epoxy finishes, both in their one-pack and two-pack forms, are considerably more expensive than normal decorating paints and their use therefore is likely to continue to be restricted to those circumstances where full advantage can be taken of their outstanding chemical resistance and of their toughness and wear resistance.

Nevertheless they form a valuable group of products with which to meet continually increasing demands made upon the paint and varnish manufacturer for products of ever higher technical performance.

B.S.I. News

Abstracts from information supplied by the British Standards Institution

ELECTRICALLY CONDUCTING RUBBER FLOORING (B.S. 3187 : 1959)

The accumulation of static electricity is a serious hazard in, e.g. explosive works and hospital operating theatres. The right sort of flooring is an important factor in the safe discharge of this electricity to earth.

What the right sort of flooring is for a variety of these special purposes is laid down in the new British Standard on " Electrically conducting rubber flooring " (B.S. 3187) which has just been published. Rubber, which normally is a very good insulator, can be made suitable for this type of flooring by the incorporation of materials such as carbon black, and then resistivities down to 1 ohm cm. can be obtained.

B.S. 3187 puts an upper limit on the permitted electrical resistance (50,000 ohms) but no lower limit, and makes the important proviso that where this type of flooring is in use, all wiring and controls must be outside the zone of risk, and portable electric equipment and flexible connections prohibited. Thus there is no possibility of electric shock or fire from the good earth the flooring provides.

B.S. 3187 deals with all the factors necessary to make such electrically-conducting floors safe and durable: composition, workmanship, dimensions, resistance limits, hardness, etc. Standard methods of test and sampling are given, together with the method of earthing. Sheets of rubber flooring which comply with the standard must be marked on the back with a continuous red line, the manufacturer's identification and the number of the standard. Manufacturers may, if they wish, be licensed to apply the Kite-mark to flooring that is to B.S. 3187.

In some cases a rubber flooring is needed which is also conductive enough to disperse static charges, but sufficiently resistive as well to limit safely any leakage current from the electrical installation. This is properly called " anti-static " flooring and must have both upper and lower limits of resistance clearly defined; a further British Standard to cover these requirements is in preparation.

RUBBER PROOFED BED SHEETING FOR HOSPITAL USE

This revised publication (B.S. 2508 : 1959) provides for rubber proofed sheet containing a lower percentage of rubber than that specified in the original (1954) edition of B.S. 2508. Tests which have been carried out have shown that this type of sheeting is entirely suitable for hospital purposes.

The 9-pp. standard specifies, in relation to three types of sheeting, requirements for fabric, proofing and testing. Colour is specified; and a marking clause draws attention to the conditions under which B.S.I.'s " Kitemark " monogram may be used on the product.

An appendix to the standard contains a set of useful recommendations on the storage of rubber proofed bed sheeting.

PLASTICS FIRE BUCKETS

Plastics fire buckets suitable for holding water or sand are dealt with in this new British Standard (B.S. 3184 : 1959). Of two-gallons nominal capacity, and round-bottomed or flat-bottomed according to choice, these fire-fighting buckets are the outcome of recent research in the plastics industry.

Apart from specifying materials, construction, dimensions and finish, the standard lays down a series of searching tests. The test for " impact resistance," for example, involves filling the plastics bucket with 30 lb. of wet sand and dropping it from 4½ ft. on to a concrete floor. After this test, the bucket must still be fit for temporary service.

For Local Authority purchasing officers—and for the many other organisations with an interest in fire-fighting equipment—this standard will provide a valuable and up-to-date purchasing " blueprint."

In all their essentials as fire-fighting appliances these buckets will function in the same way as the conventional metal buckets specified in B.S. 1689.

IDENTIFICATION OF EARTHING CORES DISCUSSED

The identification of the earthing core in flexible cords was one of the important topics discussed at the Autumn 1959 meeting in Lugano of the CEE (International Commission on Rules for the Approval of Electrical Equipment). Of the 130 delegates attending the various sessions, there were 13 representatives from the United Kingdom.

The earthing core question was discussed at the full plenary session when it was recalled that a proposal to use a green/yellow colour combination had been agreed at the Spring 1959 meetings of the CEE. Member countries had been asked to say whether, and if so on what date, they would be prepared to adopt this proposal in their own countries.

The British delegation had expressed disappointment that the colour green could not be adopted universally as the identification of the earthing core. They made it clear that it would not be possible for the United Kingdom to depart from present practice so far as British Standards were concerned but it was hoped that the Wiring Regulations Committee of the Institution of Electrical Engineers would be able to recognise green/yellow as an alternative to green alone, so far as imported products were concerned.

It became apparent that the green/yellow combination would be accepted within the next few years by all other CEE member countries, either as an alternative to their present practice or as the sole national standard.

Also discussed at the plenary session were proposals —emanating from the IEC—on gauges for Edison-screw lamp-caps and holders. This subject has presented many difficulties because of the varying lengths of lamp cap and designs of lampholders used on the Continent. Delegates agreed to accept the gauges proposed by the IEC on the understanding that slight changes would be made to take account of Swedish safety requirements for lampholders.

Reports of some of the other topics discussed by technical committees are given below:

Connectors. The meeting completed reading the fifth draft of a specification for appliance couplers and discussed standard sheets covering the four types of couplers.

A standard sheet for the proposed new British non-reversible 13A connector for kettles and liquid heating appliances with protected earthing contacts was also

considered. For international purposes it would be rated at 16A, but it could not be accepted by the CEE because it permitted both single-pole and double-pole insertion of Continental two-pin plugs. The British delegation was asked to make a further attempt to provide the non-interchangeability which was an essential requirement of the CEE Specification.

Switches for appliances. The whole of the meeting was spent in considering the second draft of a specification for switches for building into appliances. It was decided that timing switches would be included but that requirements and tests for the timing mechanism would be omitted.

General requirements. It was decided not to draft the specification for screwed terminals separately but in the form of clauses for incorporation in the appropriate CEE publications.

Cables and insulated wires. It was agreed to submit for the approval of the plenary meeting an amendment to Publication 13 *P.v.c.-insulated cables and flexible cords*, reducing by 0.1 mm. the mean thickness of insulation of 750V single-core cable for conductor sizes of 4mm². and upwards.

Another important proposed amendment (apart from that on the green/yellow earthing core mentioned earlier in this report) to Publication No. 2 *Rubber-insulated cables and flexible cords*, related to the sizes of conductors. At present the sizes are expressed in terms of sectional areas, the diameter and number of wires forming each conductor area being specified. Proposals for a new list of nominal section areas was agreed, together with a suggestion that for each nominal area the maximum electrical resistance and the minimum number of component wires should be specified.

Motor-operated appliances. Delegates dealt with a specification for portable tools, Part I of which, on general requirements, had already been completed and agreed for submission to the CEE plenary meeting next Spring. At the meeting in Lugano, Part II, dealing with specific types of tool, was completed and it is hoped that this can also be finally approved at the next plenary session.

Correspondence

10*th February*, 1960.

The Editor.

DEAR SIR,

It is heartening to read the excellent letters from Messrs. D. S. Marsh-Jones, V. A. T. Wade and others before them, in the JOURNAL. It shows that something may even yet be done before it is too late when Hospital Engineers can unite in condemning conditions which could easily lead to a complete collapse of the engineering structure of the Health Service as we know it.

My own prediction is that, unless something is done now to improve recruitment, in about five years time the Ministry will be forced to act suddenly, and not in a way that we would like. This will result from being stirred both by anxious H.M.Cs. conscious of their responsibilities and the knowledge that their engineering staffs have already become sub-standard and will get worse, and Regional Boards who, because of this deficiency, have been forced to take on engineering work that should properly have been borne by the H.M.Cs. themselves.

It will be too late then for any salary improvement to save the situation—even competent engineers have to acquire the necessary specialised training. In any case, by that time the existing salaries will probably be quite appropriate for the general quality of staff employed.

The Ministry will then have two alternatives:—

(1) To arrange with the Ministry of Works to do what they are now doing elsewhere and handle everything except day-to-day work.

(2) To do the same thing with the Ministry's own engineering organisation, probably on a Regional basis.

In both cases only an engineer-in-charge and a skeleton staff would be required in a hospital to deal with day-to-day repairs and maintenance, work of a professional nature being handled by others. It could be argued that this would be effective but, in my view, it would be disastrous for us all and thoroughly bad for the hospitals in the long run.

There is still time to avoid this collapse if no more time is lost. It is evident that all our progressive and farsighted Branches are convinced that Whitleyism has failed in our case. Our only hope is an independent committee of enquiry whose recommendations will be accepted by the Minister, as in the case of the Noel Hall Report.

Speed is essential. The five years could easily become three if a large new hospitals building project was got under way.

Yours faithfully,

S. G. GILMORE, A.M.Inst.F., M.I.H.E.
Superintendent Engineer.

Nottingham No. 3 Hospital Management Committee,
Mapperley Hospital,
Nottingham.

"CORNER TUBE BOILER" AGREEMENT

Newton Chambers & Company Ltd., Sheffield, have recently entered into a licence agreement with Corner Tube Boiler Company Ltd., for the production and sale of Corner Tube boilers in Great Britain.

This agreement covers the supply and installation of Corner Tube boilers of up to 5,000 lbs. evaporation fitted with any type of fuel burner and Corner Tube boilers for steam up to 10,000 lbs. evaporation or for hot water up to 10,000,000 B.T.U's/hr. capacity when fitted with "Emma" stokers and where additionally required with other types of fuel burners for the use of alternative fuels.

It is not, however, an exclusive agreement for any size except for coke fired boilers using the "Emma" firing system.

Babcock & Wilcox Ltd., can supply either steam or hot water Corner Tube boilers of any capacity except where "Emma" stokers are required and the other licencees, J. Hickey & Sons (C.T. Boilers) Ltd., will continue to supply Corner Tube steam boilers up to 15,000 lbs. evaporation except in those cases where "Emma" stokers are preferred and for which Newton Chambers & Company Ltd., are the sole licencees in Great Britain of the patentees, Bronswerk N.V., Holland.

The Corner Tube boiler is of unique design relying upon the heavy downcomers at its corners to support the tube banks and thereby dispensing with the need for an external skeleton of structural steelwork and is suitable for working at high pressures.

The "Emma" stoker is specially designed for the most efficient use of solid fuels and is particularly suitable for burning all types and sizes of coke.

On the Market

A Review of new equipment and materials and their development

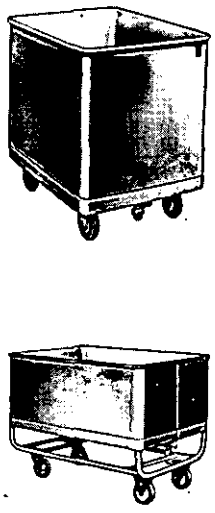
LIGHT ALLOY HEAT HARDENED WELDED TROLLEY CONTAINERS

A new range of trolley containers especially designed for handling vegetables in hospital kitchens, is now introduced by **Light Alloy Construction Ltd.**, Mowden Hall, Darlington, Co. Durham.

These are fabricated from aluminium alloy which is heat hardened after forming, resulting in a tough hard surface that is said to be as clean to handle as glass, and positively not to " mark off." It can be easily sterilised under highest temperatures without harming the surface. These trolleys are about half the weight of steel and their cost is a fraction of that of stainless steel. They are mounted on a strong lightweight chassis which is fitted with tapered bearing castors, the whole being non-corrodible, no matter how long their usage. The container is all welded and completely liquid tight.

A draining tap at the base facilitates emptying and cleaning out of the container. It can also be fitted with a loose diaphragm plate to keep contents free from contact with draining water and other fluids.

Full details of the Latrol trolleys for use in the wards, kitchens and laundries, can be obtained from Light Alloy Construction Ltd., address as above, or their London Office, 5a Dean's Yard, S.W.1.



Two views of the new Light Alloy trolley containers for hospital kitchen use. It is fitted with a drain cock.

SIGNS OF THE TIMES!

The sale of " safety notices " is rocketing in industry.

Now a London company, one of the largest office and factory equipment suppliers in the world, is offering a complete range of " off the peg " safety signs.

Says Mr. L. G. Leanse, Chairman of **General Trade Equipment** of Seymour Place, London, W.1: " In the past two years there has been a five-fold increase in the demand for danger and machinery notices such as ' Goggles Must Be Worn,' ' Machine Must Not Be Worked Unless Guards Are In Position,' and so on.

" In the past such notice plates were made to measure and were comparatively expensive but now we are marketing a full range from stock, because industry has so obviously become more safety conscious."

" CLEAN-AID " MOPPING TANK TROLLEY

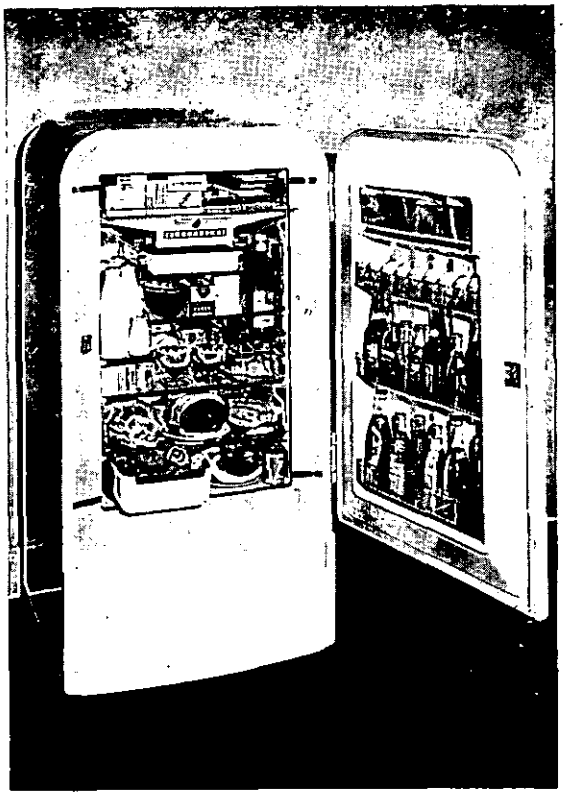
A new addition to the " Clean-Aid " range is now available: this is a Mopping Tank Trolley, with double tanks and an adjustable wringer for squeezing out mops. It is intended for the efficient washing and rinsing of large floor areas with a minimum of time and labour.

The frame is of welded tubular steel and carries two separate tanks, one for holding clean water for rinsing and the other for soiled water or cleaning solution. Each tank has a working capacity of 15–16 gallons, and is easily detachable from the frame if necessary. The tanks each have a gunmetal tap underneath for emptying. Sufficient room is provided under each tap for placing buckets or other containers. The end of each tap is threaded so that a union and hose can be fitted if preferred.

The wringer comprises two rollers which can be separated or brought together for squeezing the mop-head by means of a toggle action lever. The rollers are of white rubber, each 14 in. long and 2 in. diameter, one of them being provided with a chrome plated handle for turning. The wringer can easily be removed and the handle also is detachable.

The trolley has two 6 in. diameter rubber cushion tyred wheels, and two swivel castors with 4 in. diameter rubber tyred wheels. The overall dimensions are 42 in. long, 21 in. wide and 39 in. high.

The manufacturers are **Powell & Co.**, " Clean-Aid " Products, Burry Port, Carms., South Wales.



The new Electrolux luxury model L.50 refrigerator provides 10 sq. ft. of shelf area, a full width frozen food compartment, three door shelves for bottles and small packages, special butter and cheese compartments, a cold tray, an interior light and a lockable door handle. Available in white or cream high gloss enamel.

NEW ELECTROLUX 5 cu. ft. LUXURY REFRIGERATOR

New to the **Electrolux** range of refrigerators for 1960 is the 5 cu. ft. luxury model L.50, which provides 10 sq. ft. of shelf area, a full width frozen food compartment, three door shelves for bottles and small packages, special butter and cheese compartments, a cold tray, an interior light and a lockable door handle.

The full-width frozen food compartment is fitted with a blue tinted translucent plastic door and is equipped with three ice trays to provide a total of 54 cubes of ice at each filling. The door storage shelves of blue, translucent plastic are easy to remove for cleaning; the top shelf can be used as an egg rack and the centre shelf is adjustable in height to make room for the storage of tall bottles. Covered compartments at the top of the door give ample storage space for butter and cheese.

To keep fruit and salad vegetables fresh and crisp, the new Electrolux L.50 has a large, covered vegetable drawer. It is supplied with a set of food containers, and there is a large cold tray for storing uncooked fish and meat.

Sturdily built, the L.50 has a cabinet exterior of high-gloss enamelled steel and the easy-to-clean interior is made of porcelain, enamelled in ice blue. There are four storage shelves and cabinets are available in either white or cream.

Outside dimensions: Height 4 ft. 5¼ in.; width 2 ft. 2¾ in.; depth 2 ft. 3¼ in.

Inside dimensions: Height 2 ft. 7¼ in.; width 1 ft. 7 in.; depth 1 ft. 1½ in.

The model L.50 is available for operation by electricity, gas, paraffin or bottled gas.

Prices: Electric or Gas £96 13s. 7d. (including £14 18s. 10d. P.T.); Paraffin £92 9s. 8d. (including £7 14s. 11d. P.T.); Bottled Gas £100 4s. 7d. (including £15 9s. 10d. P.T.).

NEW PORTABLE UNIT FOR EMERGENCY LIGHTING

A new portable unit which provides automatic emergency lighting immediately on a mains failure has been introduced by **Nife Batteries** of Redditch, Worcestershire. The unit is designed for use in all places where permanent emergency lighting schemes are impracticable and is particularly suitable for offices, factories, fire stations, hospitals, old people's and children's homes, and any building in which it is not necessary for the emergency lights to be permanently illuminated. It contains a Nife nickel cadmium alkaline battery which can stand indefinitely without damage and is virtually free from self-discharge; because of this, trickle charging is unnecessary and maintenance is negligible. Furthermore, there are no installation costs; all that is necessary is to plug in to the lighting circuit and automatically, on mains failure, light is provided by the unit.

The unit, known as type R.E.6, comprises a 6-cell Nife steel alkaline battery contained in a heavy gauge steel case finished in a high grade enamel and fitted with a lid and carrying handle. The bulb holder, double filament 6-volt 3-watt and 18-watt bulb, the domed translucent glass giving maximum light distribution, and a simple relay unit are mounted in the lamp front, to which is connected a flexible lead from the 220/250 volts A.C. supply. The relay is held in the open position by the A.C. mains and closes instantly on mains failure, thus connecting the 3-watt reserve filament of the bulb to the battery. If additional light is required the switch on the lamp front can be depressed to connect the 18-watt main filament. The battery will power the 3-watt filament for approximately 20 hours, or the 18-watt filament for 3 hours before recharging is necessary.

PREMIER DECOPATH SURFACING

Decopath is a cold applied asphalt, produced especially to enable owners to carry out repairs to paths, drives and service roads.

The material is comprised of carefully graded medium gauge aggregate bound together by blended bitumen, and supplied in sacks for easy handling. It does not deteriorate in storage.

The area to which Decopath is to be applied should first be thoroughly swept clean and be free from oil and grease and, if necessary, made level by making up depressions.

The surface may be primed by spreading Decopath Primer as directed over the whole area with an old brush, which should be periodically dipped in water to prevent clogging. It should be emptied from the sack directly on to the surface. If there is any coagulation of the particles, a sharp tap with a spade will disperse them.

Decopath should be raked level to an even unrolled thickness of about ¾ in. and rolled until compressed to a thickness of approximately $\frac{7}{16}$ in., using wood laths as edge guides, and for determining the thickness. The edges of the finished path *must* be protected. Wetting the roller prevents picking up.

Decorative chippings, when required, should be sprinkled evenly over the surface before the material is fully compressed by rolling.

This material is said to improve with wear and traffic. Any indentations which occur immediately after laying will disappear after a period.

Laying implements may be cleaned with paraffin or diesel oil.

The manufacturers are **Premier Bitumen & Asphalte Co. Ltd.** of Western Road, Bracknell, Berks.

SGB INTRODUCE NEW SAFETY GIN WHEEL

A new Gin Wheel which ensures greater safety and provides easier and faster fixing is now being marketed by the Building Equipment Division of **Scaffolding (Great Britain) Ltd.**

A unique feature of the new SGB Gin Wheel is the specially designed drop forged swivel ring which replaces the usual hook. This ring completely encircles the tube, eliminating the need for lashing and mousing and thereby ensuring the maximum degree of safety.

The 10 in. diameter pressed steel wheel has a self lubricating oilite bearing and is mounted in a strong welded steel frame. It is suitable for ¾ in. diameter (2¼ in. circ.) rope and has a safe working load of 5 cwt.

A Test Certificate is issued with each wheel which is individually tested in accordance with the Building (Safety, Health & Welfare) Regulations, 1948, and marked with the safe working load.

Full details of the new Gin Wheel, prices and hire rates, may be obtained from SGB Building Equipment Division, Mitcham, Surrey, or from any of the SGB branches throughout the country.

FLUORESCENT LIGHTING FOR VEHICLES, ETC.

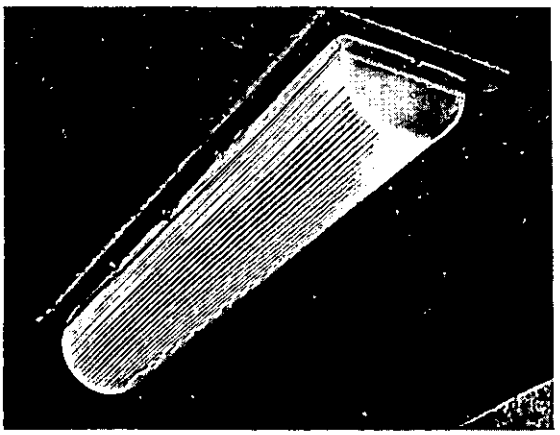
The new C.32 Fluorescent Lighting Unit is the well-known Eascolyte range of low voltage units. This new item will, in fact, give two or three times the light of an equivalent wattage filament bulb.

The fitting incorporates a single 2 ft. × 20-watt tube, an opal Perspex diffuser, and a transistorised control unit. It is so designed that the diffuser and its chromium-plated retaining frame can be dispensed with, if desired. Because of instant-start circuitry, the lamp reaches full brilliance within approximately one second of being switched on. Two standard models are available, for nominal voltages of 12 and 24 D.C. supply.

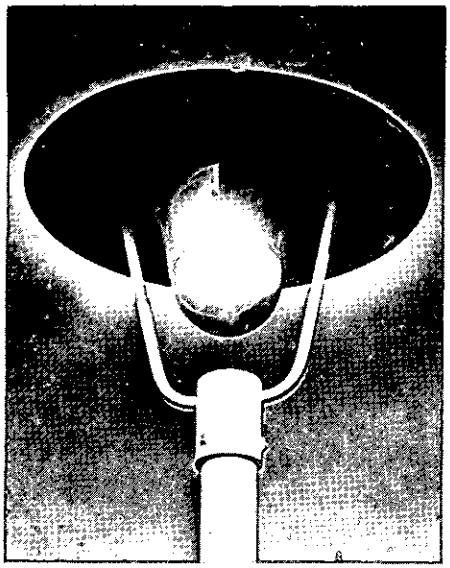
The unit is rigid and robust. All metal parts are of 20 s.w.g. steel, rust-inhibited and stove-enamelled white. The fitting is powered by a transistorised unit.

Current consumption of the 12-volts model is 1·8 amps.; of the 24-volts model, 0·9 amps. The control unit is so designed that it will accommodate variations in input voltage normally encountered in vehicle electrical systems. These are taken as + or — 2-volts on 12-volts circuits, and + or — 4-volts on 24-volts circuits. The unit can be adapted to deal with situations where their limits may be exceeded (for example, public service vehicles).

Weight of the unit complete is 5 lb. (less diffuser and frame, 3½ lb.). Suppliers are Easco Electrical Ltd., 6 & 8, Brighton Terrace, London, S.W.9.



A new fluorescent fitting for 12 or 24 volt operation and suitable for vehicles.



One of Troughton & Young's new Outdoor Fittings.

FITTINGS FOR USE OUTDOORS

Troughton & Young (Lighting) Ltd. have produced two new street lights for use with class B street lighting columns with 3 in. diameter and 3 in. long spigot as specified in B.S. 1308 and 1840.

F.1001 uses white flashed opal glass with 5 in. diameter opening in the base and with screw threaded top. It is designed to take a 200 watt E.S. lamp. The diameter of the top is 2 ft. 4 in. and can be finished to any specified colour.

F.1002 is similar, but is an enclosed glass and is only 1 ft. 10 in. in diameter. It also takes a 200 watt E.S. lamp.

The poles are not normally included but can be supplied to order.

The price of the fitting only for either is £17 10s. 0d. each.

BALANCED BEAM FIRE ALARM EQUIPMENT

Although there is already a great deal of equipment designed to detect and extinguish fires there has been for some time a need for an efficient and reliable system to cover large areas at an economic price, particularly where the areas are either infrequently visited or where the building does not lend itself to conventional methods of protection.

Photoelectronics (M.O.M.) Ltd., have therefore developed and now have available a Balanced Beam Fire Alarm unit designed specifically for the purpose. It comprises a pair of light beams which are projected across the area to be protected just below roof level. The positioning and length of the beams is determined by the size and shape of the building so that as much coverage as possible can be obtained. These two beams fall on to photo-cells which, through the control circuitry, are inter-linked and balanced. Thus variations in light levels due to fog, varying daylight, artificial lighting and such like which affect both cells equally are balanced out and nothing happens. Should, however, either beam be put out of balance, which would be the case if a fire started due to smoke, then a relay action is obtained to give an alarm or to operate extinguishing equipment. This method of detection is extremely rapid and where smoke precedes flame then the warning would be given within seconds of the smoke first being made even before the flames appear and irrespective of any rise in temperature.

Price of the equipment varies with the beam length required but for a pair of 40 ft. beams with appropriate control circuitry the price would be £85 complete, with delivery 4–6 weeks.

Further details from **Photoelectronics (M.O.M.) Ltd.**, Oldfields Trading Estate, Oldfields Road, Sutton, Surrey. Telephone: FAIrlands 4571.

P.T.F.E. ADHESIVE TAPE

Adhesive-backed P.T.F.E. (polytetrafluoroethylene) tape is now available from the Fluorocarbons Department of **A.E.I. Radio and Electronic Components Division.** This concern is the first in this country both to manufacture and market this product.

Bulk quantities of the tape can be supplied in sizes up to 2 in. in width and 0·015 in. in thickness. Equipment now being installed by the Fluorocarbons Department means that greater widths and thicknesses will be available in the near future.

The material has very useful adhesive properties when applied cold. In this case, the surface to which it is to be affixed is thoroughly cleaned. After the backing paper has been removed, the tape is pressed firmly into position, with pressure applied from the centre outwards to avoid trapping air.

The bond strength can be increased further if, after the tape has been applied as described, the assembly is heated to approximately 200° F. for 20 minutes. To obtain maximum bond strength an additional five minutes' heating at 300° F. is required. After this heating process, the material should be left to stand for 24 hours.

Samples applied to shim steel by this method have shown peel strength of the order of 2 lbs. per inch width, and sheer strength of between 12–20 lbs./sq. in. The adhesive becomes thermoplastic at temperatures in excess of 150° C., but retains useful adhesive attributes up to 200° C. Resistance to acids and alkalis is good, but the adhesive is affected by most organic solvents.

Uses for P.T.F.E. adhesive tape are legion, and can be found in almost all industries. The tape is supplied in its " natural " translucent white colour.

Notes for Members

News of I.H.E. activities, etc., and items of interest from Branches

OBITUARY

Mr. A. G. Baker

We regret to announce the death of Mr. Albert George Baker on December 30th, 1959, at the early age of forty-seven.

Mr. Baker served a four year apprenticeship with Messrs. George Thomas & Co. Ltd. from 1929, after which he obtained a position as Assistant Engineer to the Kent County Public Assistance Institution at Dover.

In 1956 he was appointed Senior Engineer at the Buckland Hospital, Dover, which position he held until his death. He was elected a member of the Institution in 1957.

Mr. T. Baker

We regret to announce the death of Mr. Thomas Baker in January, 1960, after an illness lasting eight weeks. He was fifty-four.

Mr. Baker was apprenticed for six years to the Charlaw Company, Newcastle-upon-Tyne. In 1934 he joined the engineering staff of Hereford Mental Hospital (later Burghill Hospital), was appointed Assistant Engineer in 1943, and was subsequently promoted to Senior Engineer. He was elected an Associate Member of the Institution in 1946.

ELECTION OF OFFICERS, 1960

A Council Meeting was held on Saturday, January 30th, preceded on the Friday by a meeting of the Finance and General Purposes Committee.

The election of officers resulted in the following appointments for the year 1960 :—

Chairman of Council: H. A. Adams.

Vice-Chairman: H. Wright.

Treasurer: R. G. Rogers.

Finance and General Purposes Committee: H. A. Adams (chairman), H. Fothergill, L. Hunt, G. B. Metcalfe, R. G. Rogers and H. Wright.

Incorporation Sub-Committee: H. A. Adams, R. G. Rogers and H. Wright.

Representatives to Whitley Council:

Committee B: H. A. Adams and R. G. Rogers, with a deputy from Committee D when necessary.

Committee D: H. A. Adams, R. E. Rogers, R. G. Rogers and H. Wright, with G. B. Metcalfe and J. D. Lewis in reserve.

Committee F: C. N. Anderson and W. C. Jeffries, with V. Riley in reserve.

Representatives on B.S.I. Committee: The practice as laid down in 1957 is to be continued and the existing representatives were re-elected *en bloc*.

BRANCH OFFICERS, 1960

The following additional details have been received in regard to elections of Branch Officers for 1960.

NORTHERN IRELAND BRANCH

Chairman: C. G. Lapthorn.
Vice-Chairman: J. McCullough.
Hon. Secretary: W. H. J. Moore.
Hon. Treasurer: R. Patrick.
Representative to Council: A. C. Barr.
Deputy Representative to Council: W. H. J. Moore.
Hon. Secretary's address: " Piney Ridge," Purdysburn Hospital, Saintfield Road, Belfast.

MIDLANDS BRANCH

Chairman: M. K. W. Ashton.
Vice-Chairman: J. W. Black.
Hon. Secretary: R. G. Smith.
Representative to Council: F. J. Chance.
Hon. Secretary's address: 75, Chestnut Drive, Erdington, Birmingham, 24.

SOUTHERN BRANCH

Chairman: A. P. Shepherd.
Vice-Chairman: S. R. J. Elson.
Hon. Secretary: W. Hendry.
Committee: J. H. Lloyd and J. Finney.
Representative to Council: H. Fothergill.
Deputy Representative to Council: W. Hendry.
Hon. Branch Auditor: E. C. Rogers.
Hon. Secretary's address: Knowle Hospital, Knowle, Fareham, Hants.

1960 ANNUAL CONFERENCE

As members will be already aware, it has been decided not to hold a summer school on the usual basis in 1960. In view of this the Yorkshire Branch are investigating the possibility of holding a short two-day school at Harrogate on June 9th and 10th. Though we have, as yet, no precise details, this would be arranged to coincide with the Committee and Council Meetings that have been arranged for the same days.

The programme as arranged so far is as follows:—

Thursday, June 9th: F. & G.P. Committee Meeting.

Friday, June 10th: Council Meeting.
Annual Dinner.

Saturday, June 11th: Annual General Meeting.

All the above functions will take place at the Cairn Hydro Hotel, Harrogate, and further details will be distributed in due course.

NORTH EAST BRANCH

A Branch meeting was held at the Liberal Club, Newcastle-upon-Tyne, on January 9th, 1960.

A talk on the subject, "Electronic Control of Heating Apparatus," was presented by Mr. S. Walters of Messrs. Honeywell Controls Ltd.

Before the commencement of the formal business which followed, members stood in silence for a few moments as a mark of respect to the late Mr. James Forsyth, Treasurer of the Institution.

YORKSHIRE BRANCH

The Branch held a meeting at Seacroft Hospital, Leeds, on January 16th, 1960.

A paper, "Site Generation of Electricity," was read by Mr. J. D. Lewis, Superintendent Engineer to Leeds "B" Group H.M.C. The lecturer covered his subject very comprehensively and created considerable interest.

The meeting heard that the Branch Annual Dinner and Dance had been a great success and discussed details for the 1960 event.

Members stood in silence in memory of the late Mr. James Forsyth.

SOUTHERN BRANCH

A meeting of the Branch was held on January 26th, 1960, at the Hospital for Infectious Diseases, Portsmouth.

The opportunity was taken to show a number of films sponsored by the Gas Council, but the meeting was otherwise devoted to business matters.

LONDON BRANCH

A meeting of the Branch was held at the Westminster Hospital Medical School on January 16th last.

A period was devoted to five short discussions covering a variety of topics, some technical, some domestic. The business was otherwise concerned with formal matters.

The following programme of papers, etc., has been arranged for 1960:—

Papers

"Developments in Radiation Therapy."
"Modern High Speed Sterilisation Techniques."
"Developments in boiler feed water treatments."
"The position of the Engineer in the National Health Service."
"Antistatic explosion precautions in hospitals."
"The mechanics of Poliomyelitis treatment."
"Fire Precautions in hospitals."
"Industrial heating by electricity."

Visits

Joint Meeting with the Southern Branch.
Acme Flooring & Paving Co., Barking.

CHESHIRE AND STAFFS BRANCH

A very early member of the Institution retired recently in the person of Mr. Arthur Shawcross, he was in fact a founder member; he was responsible for the formation of the Cheshire and Staffs Branch of which he remained Hon. Secretary until 1950. He represented the Branch on Council for a number of years, and was subsequently deputy representative.

Mr. Shawcross was always a very regular attender at Branch meetings and at one of these, held on November 28th last, members paid him a verbal tribute for his very valuable help in their affairs. In his reply, he wished the Institution continued progress in the attainment of its high ideals.

After an unfortunate illness in the latter part of last year, Mr. Shawcross has decided to move to East Anglia to be near a married son.

GLASGOW BRANCH

We learn that Mr. D. McK. MacKay has retired after forty years in the Hospital Service. He was one of the longest serving members of the Branch and was Chairman for a period of three years. He also officiated at meetings of the joint Scottish branches.

The Glasgow branch held a Dinner at the Grand Hotel, Glasgow, to mark the occasion of his retirement when both members and their wives were present. Mr. MacKay and his wife both received gifts.

Mr. R. G. Freestone, Senior Engineer, Derby No. 3 Hospital Management Committee, Pastures Hospital, Derby, has been appointed Superintendent Engineer by Derby No. 1 Hospital Management Committee.

Forthcoming Exhibitions

THE following preliminary details are available regarding May exhibitions in London. We shall be giving further information in a later issue.

Fuel Efficiency Exhibition

Opening on April 27th and running to May 6th, the Fuel Efficiency Exhibition is again being held at Olympia, London. The scope will be considerably increased this year and, amongst the 170 exhibitors, every type of appliance will be on view. Many of them can be seen under working conditions.

Instruments, Electronics and Automation Exhibition

This exhibition, the third of its kind, will also be held at Olympia, London, occupying this year the Grand and National Halls. It will be open for one week only, May 23rd to 28th. Nearly 500 firms are exhibiting, of whom 100 are from overseas.

Mechanical Handling Exhibition

From the 3rd to 13th of May the Mechanical Handling Exhibition will be held at Earls Court, London.

Any intending visitor can obtain tickets of admission free together with full information from the Organisers, Dorset House, Stamford Street, London, S.E.1.

Trade Notes

BAKER PERKINS CHAIRMAN HONOURED

Mr. A. I. Baker, Chairman of the Baker Perkins group of Companies has been appointed President of the British Engineers' Association.

The British Engineers' Association was founded in 1912 with the object of providing a central national organisation in the engineering industry for the promotion and protection of the interests of British engineers and engineering concerns.

BRITISH VACUUM CLEANER NAME CHANGE

To conform to a wish to identify the firm's name with the products it manufactures, the Board of The British Vacuum Cleaner and Engineering Co. have changed its name to Goblin (B.V.C.) Ltd. The original name is being retained as a subsidiary Company to market all industrial vacuum cleaners.

HOSPITAL EQUIPMENT BROCHURE

Calthena Ltd. have sent us a copy of a new brochure covering the full range of equipment that the Company manufacture for hospitals. A wide range of bedside lockers is included of which the "Mobileg" is novel and consists of a combined locker and folding overbed table with additional stabilising leg for balance.

Other items include the "Mills" telephone trolley, designed by Mr. E. N. Mills, Superintendent Engineer to Chester H.M.C., and a variety of dressing drum stands and other trolleys.

ZINC-RICH PAINT

A leaflet from Secomastic Ltd. describes " Galvafroid " zinc-rich paint and claims its superiority and that it confers by brush a protection comparable with hot dip galvanising. Photographs of comparative tests are shown.

CRANE DEVELOP MECHANICAL SHAFT SEALS

Technical Bulletin No. 18 issued by Crane Packing Ltd., of Slough, describes this Company's developments in the design and manufacture of mechanical seals recommended for sealing against air, water, mild chemicals and solvents, lubricating oils and refrigerants. They are designed to be installed, in many cases, in existing stuffing boxes. The designs incorporate many refinements compared with the originals, and the bulletin is fully and well illustrated.

LOW COST LOUVRES

Courtney Pope of Tottenham, London, have sent us a leaflet illustrating a range of low cost louvres for lighting purposes. These can be supplied in standard sizes or tailor-made to suit special requirements. The range described is manufactured in plastic.

DARKROOM DRYING EQUIPMENT

A new Kodak leaflet describes specialist drying equipment for the X-ray Darkroom. Items referred to include two cabinets, models X and B, the wet film carrier model 2, and the spiral film drier model 100.

GRIT AND DUST SAMPLING DEVICE

Those who may have read the article " The Measurement of Grit Emission " by Dr. R. Jackson in our contemporary *The Steam Engineer* for September 1959, will no doubt be interested in a grit sampling device put on the market by Mancuna Engineering Ltd., of Denton, Manchester, and described in a brochure issued by them.

Operating on an identical basis to the apparatus described by Dr. Jackson, the Mancuna sampling device, which is a development from the Mancuna-Dustex High Efficiency Miniature Cyclone Collector, possesses the additional major advantage of collecting a large sample of material. Weighing and other sampling errors are thus minimised and a large scale representative sample is available for examination and analysis.

HODGKINSON FIREBAR DEVELOPMENT

The standard Hodgkinson " Low Ram " Stoker is supplied with firebars cast from cupola melted, heat resisting iron; however, James Hodgkinson (Salford) Ltd. now announce a development of far reaching importance.

New Foundry equipment, embodying a Mains Frequency Electric Furnace, now installed is producing Hicrome heat resisting steel to BSS.1648/1950, Grade C. This material has heat and wear resisting properties said to be far superior to the best cupola melted irons with the result that with normal usage a longer life can be obtained.

It has the additional advantage of operation without damage at higher temperatures than those encountered in current practice with ordinary heat resisting irons and it is, therefore, unnecessary to use steam cooling jets beneath the grates.

A consequent saving in fuel therefore, by using firebars made from this superior material, will, in many cases cover the additional cost in the first year of operation.

JAMES KENYON'S NEW SALES MANAGER

From the 1st January, 1960, Mr. G. Winterhalter took over the office of Sales Manager from Mr. J. Tetlow, who is nearing retiring age. Mr. Tetlow will still be available in an advisory capacity, as he will be carrying on with other activities in the firm.

Mr. Winterhalter joined the firm on leaving school, and in February of this year completed 25 years service with the Company.

PHILIPS APPOINTMENTS

The following appointments are announced by Philips Electrical Ltd.:—

Mr. I. F. Davies to be an Executive Engineer with the Lamp and Lighting Group.

Mr. M. G. A. Jackson to be Manager of the Lighting Design Service Department.

Mr. W. G. Whitaker to be Senior Lighting Engineer with Philips South East Region.

Mr. R. H. Chambers to be Regional Lighting Engineer, Midlands Region.

NEW TECHNICAL DIRECTOR

Elcontrol Ltd. announce that Mr. B. A. Worswick has been appointed to the post of Technical Director with a seat on the Board.

Mr. Worswick was until recently Chief Engineer of Fischer & Porter Ltd., and previously was Chief Development Engineer of Bailey Meters & Controls Ltd., after having served for some years with I.C.I. Ltd.

SITUATIONS VACANT (*Continued from page A.27*)

ENGINEER-IN-CHARGE

To be responsible for the maintenance of all heating and steam sterilising plant in the hospitals, and other mechanical engineering services. Control of maintenance staff and fuel economy. Salary Scale £625–£755, plus London Weighting. Qualifications required—Ordinary National Certificate in Mechanical Engineering, which includes heat and heat engines as a subject, and preferably has an endorsement in the Principles of Electricity. Applications with the names of two referees, to House Governor, St. Peter's Hospital, Henrietta Street, London, W.C.2.

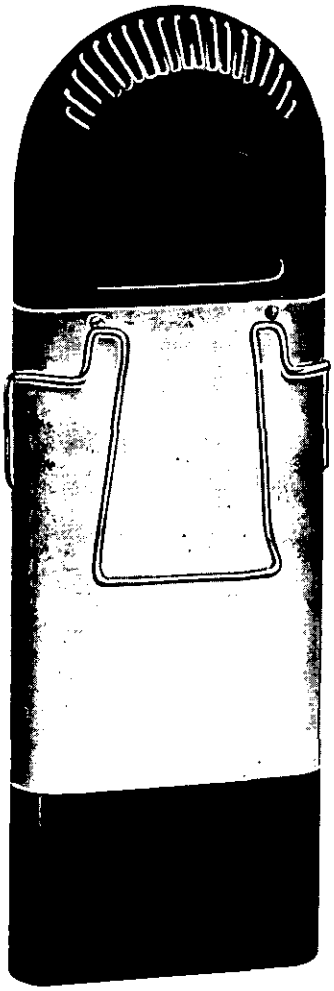
MISCELLANEOUS

Forklift Trucks. Petrol and Electric models. Electric Factory trucks and stillage trucks on solid rubber tyres. Stacking Machines. Elevating Machinery. Comprehensive list. Speed Electrics, Dept. H.E., Church Street, Basford, Nottingham. Tel. 75716.

HOSPITAL CASTORS and WHEELS.—All kinds Supplied—Also Repairs and Rerubbering. Grosvenor (Castor) Mfg. Co. Ltd., Beales Street, Aston, Birmingham, 6.

MULTITONE

leads in 'pocket' staff location



The New Flat
Personal Call Receiver

By far the largest number of Hospital Installations of the ' pocket receiver ' type, in this country, and we believe, overseas, are Multitone.

The Multitone 'PERSONAL CALL' Staff Location System is probably known to most readers of this Journal, but new developments and additional facilities will be announced in future issues of The Hospital Engineer.

NOW OVER FOUR HUNDRED INDIVIDUALS CAN BE CALLED

The new " MULTI-CHANNEL " Transmitter which has over four hundred individual channels and the new FLAT RECEIVER which can be supplied with or without speech facilities, are now available.

FOR THE SMALLER HOSPITAL

Our well-known standard ' Personal Call ' equipment is, of course, available for the smaller Hospital requiring fewer channels.

NO BATTERIES

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All Hospital Engineers who have not received a copy of the special Information File covering all aspects of the ' Personal Call ' Staff Location System are invited to write to us for a free copy.

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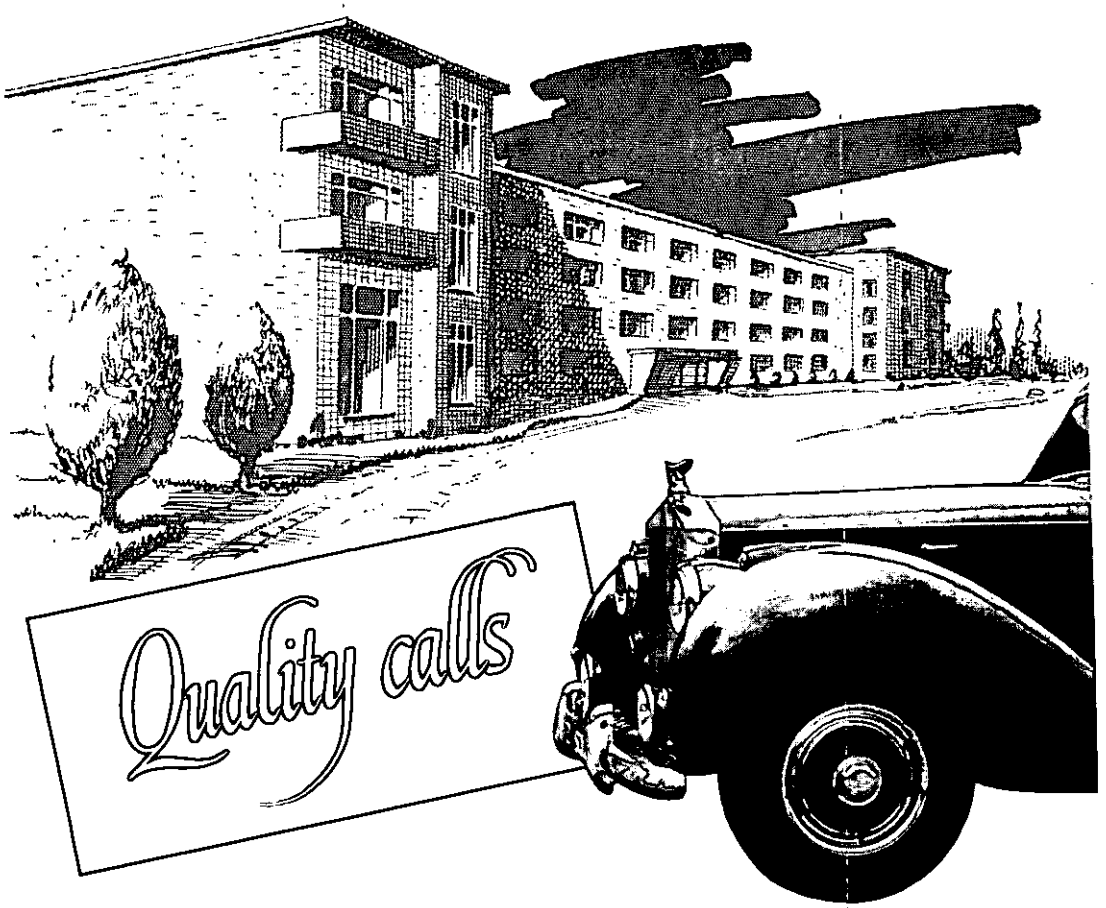

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