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The Irish Plumber and Heating Contractor, April 1961 (complete issue)

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Recommended Citation

(1961) "The Irish Plumber and Heating Contractor, April 1961 (complete issue)," *Building Services Engineering*: Vol. 1: Iss. 1, Article 1.

doi:10.21427/D77T45

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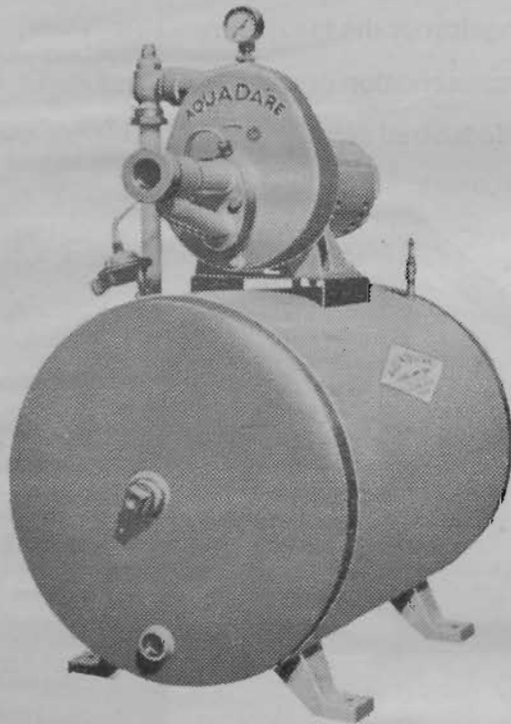
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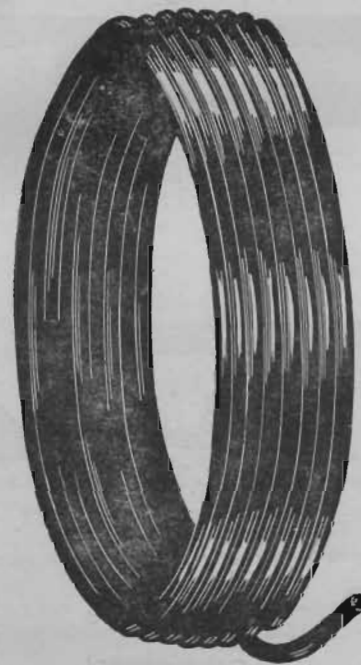
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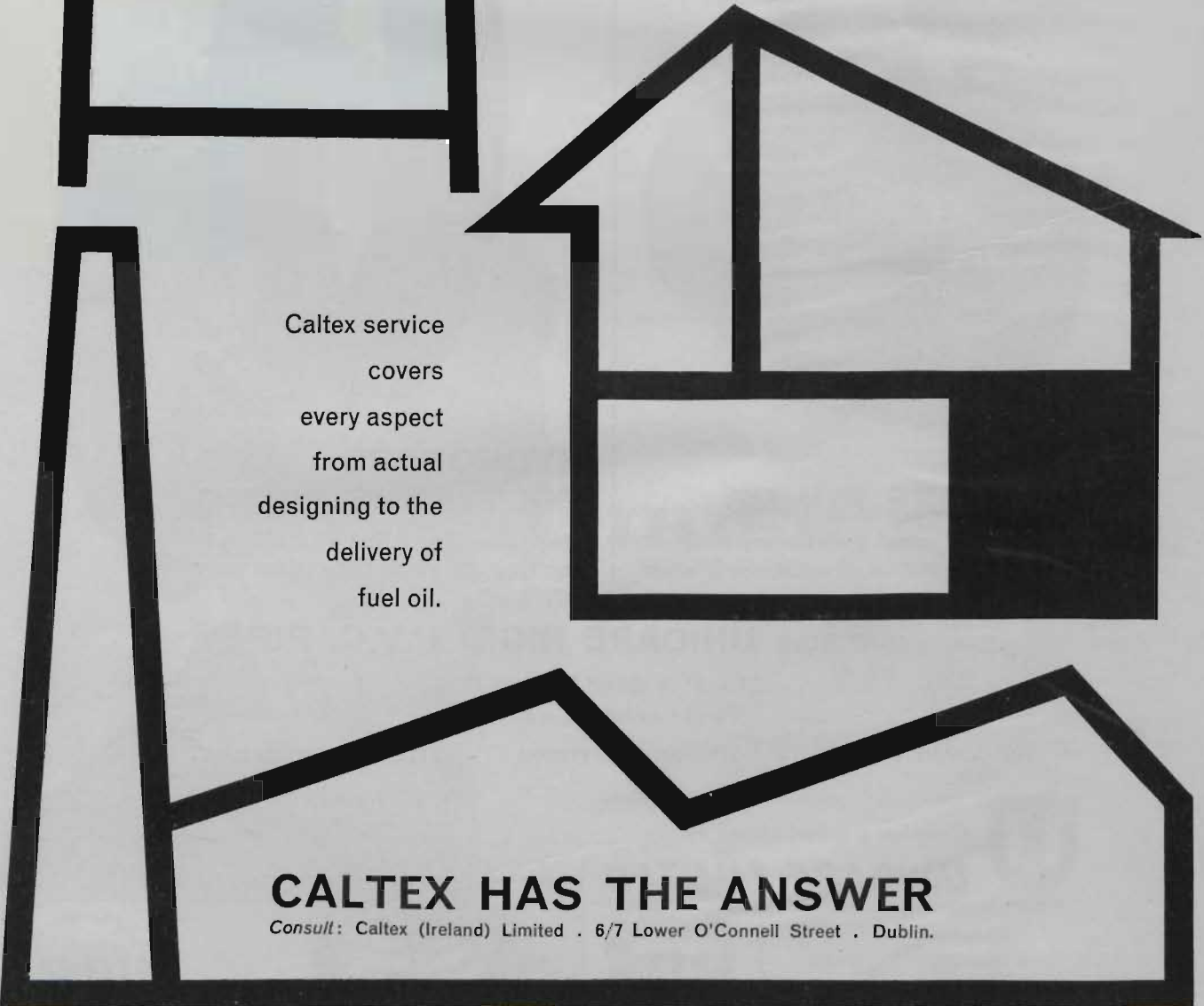
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THE IRISH PLUMBER & HEATING CONTRACTOR

Vol. 1. No. 1.

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Editorial and advertising offices:
Callaghan Chambers,
13/15 Dame Street,
Dublin, 2. Tel.: 56466.

APRIL, 1961.

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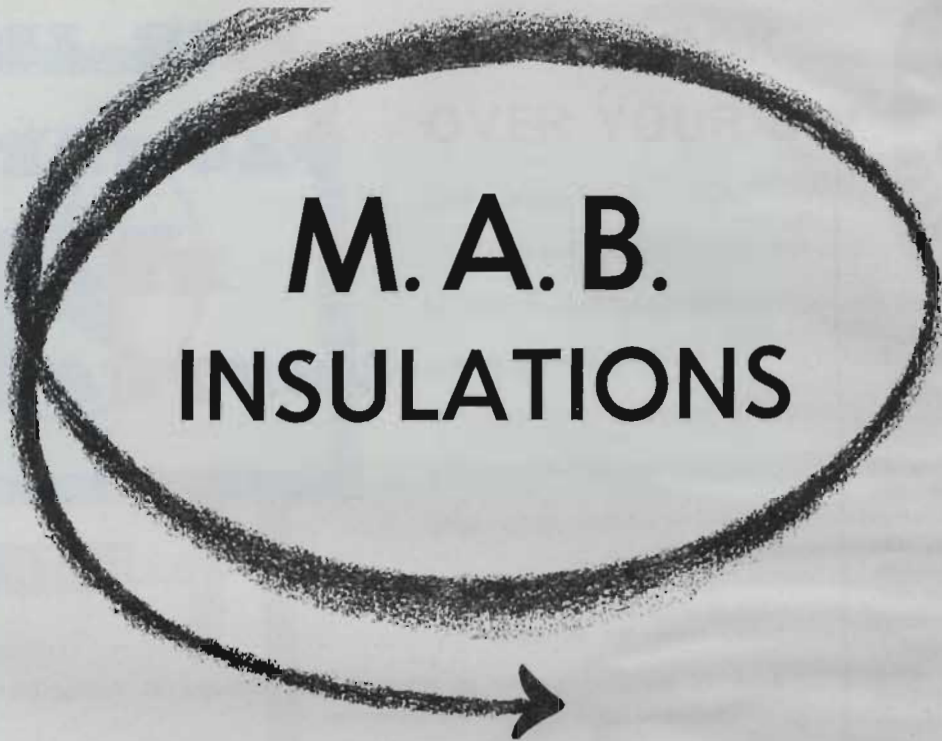
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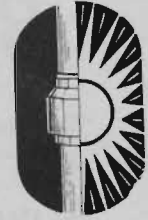
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THE IRISH PLUMBER & HEATING CONTRACTOR



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April, 1961.

Dear Reader,

We are pleased to announce the introduction of a new publication for the Plumbing and Heating trades, "The Irish Plumber and Heating Contractor." This will be the only journal in Ireland catering for these two important and extensive trades.

The decision to publish such a magazine as this has been taken following repeated requests from interested parties engaged in the industries concerned that a publication catering for their needs was definitely required. With this knowledge, we set about the planning and research necessary for the success of such a venture and we are now pleased to present our first issue.

It will be our constant aim to produce consistently a magazine of the greatest interest, value and quality to our readers. By so doing we are confident that we will succeed in maintaining the largest possible active readership.

On this count we are at all times very pleased to hear from our readers by way of advice and constructive criticism.

This morning, then, we sincerely hope that "The Irish Plumber and Heating Contractor," as it comes to you and your colleagues throughout Ireland, will be warmly received.

Yours very truly,

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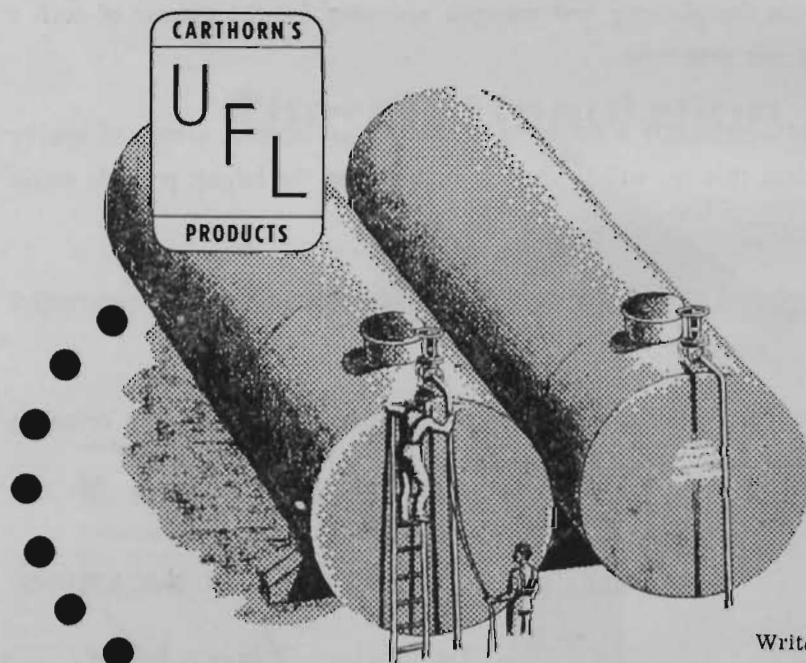
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THE AUTHOR . . . John G. Bolton, Lecturer in Plumbing and Heating at the College of Technology, Bolton Street, Dublin. Full Tech. Dipl. City & Guilds, London—Silver Medalist & 1st Place in Sanitary Engineering City & Guilds, London—First Place, Dept. of Education, Senior Test in Plumbing—First Class Pass, Final Examination, Heating Engineers Work, C. & G. London—Associate of the Institute of Welding.

Recent developments : a brief survey

THE developments which have taken place in the plumbing and heating industries during the past twenty-five years have been considerable, and it would be a difficult task to foretell what lies ahead in the future. The demand for the publication of this journal is but a symptom of the way things are progressing.

In this country, plumbing and heating engineers have had to study new techniques and processes, both in job methods and in materials, and it is significant that the very name of "Plumber"—a worker in lead—has come under fire in some quarters as not being in accord with modern ideas.

Our American opposite number "Domestic Engineering" has even held a poll of its readers as to their approval of the term "hydro-mechanic" instead.

In sanitation, we have seen the gradual change-over, especially in the case of large buildings, from the separate soil, waste, and vent pipes of the Two-Pipe System to the combined soil-waste pipe and its vent, as applied in the One Pipe System, and in order to simplify further, we have in the past few years, the ultimate in streamlining, the Single Stock System with its one pipe and controlled falls of 2½ to 5 deg. on the branch connections. This last system has proved very suitable for multi-storied flats, and has been used by Dublin Corporation in its housing developments.

An interesting point in this system is the economic connection of the pipes to the main stack, and in some cases it has been found necessary to import special branch units. It should be economically possible for some Irish firm to produce a unit with pre-formed openings and so eliminate the "Christmas tree" effect when building up with standard branches. This difficulty does not arise when

copper soil stacks are used, as it is here that bronze welding has proved its worth.

The use of asbestos cement soil pipes has also proved a very successful innovation, and has, for certain types of work, proved a strong rival of cast-iron. In the field of underground drainage, pitch-fibre pipes have been used on some jobs, and this may develop on a larger scale later.

Common feature

THE flushing valve is now a common feature in sanitation, and has, for large installations, ousted the W.C. cistern from its place of honour. In its early days, most contractors will have memories of the continual adjustments and call backs on jobs, but this seems to be a thing of the past now. Another interesting development in waste disposal is now beginning to enter the Irish-plumbing world—that is, the electric food disposal unit fitted on the waste outlet of kitchen sinks. This unit eliminates the need for a garbage bin, and makes for greater cleanliness in the home.

With the great emphasis on rural water supplies, another vast field has opened to the trade, and it is here that the newer materials such as plastics have come into their own. Polythene and Rigid P.V.C. tubing are now installed all over the country, and in some instances have rendered feasible water supply systems in cases where cast iron and similar materials for water mains have been impossible to lay due to corrosive soil conditions. It has been said that coming generations will look on this as the Plastic Age instead of the Atomic Age, and it is very evident that plastics will take the place of many traditional materials in use at present—witness the plastic pipe, ballcock, float, W.C. cistern, wash-basin etc.,

and just around the corner awaits the plastic hot water pipe.

In the pumping of water, rural electrification has made the hand worked pump a relic of the past with many farmers, and we are now in the realms of jet and centrifugal pumps, all varying in design with regard to output, lift etc. It is imperative, therefore, that the rural plumbing contractor will have a good knowledge of the basic principles of pump installation and relative matters in order to meet the challenge.

In the provision of hot water and heating systems, the modern boiler house is a real pointer to the advance in trade methods. When one looks at the remote controlled motorised valves, thermostats, C/O2 recorders, oil burner units, photo-electric controls, etc., it is evident that the heating craftsman has come a long way since the early days of greenhouse heating with rust cement joints.

Gravity circulation is out, even for domestic heating systems, and the pumped circulation has taken over. Indeed, on one Dublin job, the boiler house is on the roof of the building, so giving valuable space for business purposes.

Prime favourites

SOLID fuel and oil-fired boilers are now both prime favourites, but the vast number of oil-fired units being installed perhaps gives a pointer to the future. In some installations, electrode boilers working off peak hours have proved a serious rival.

The advent of the small bore heating system for private houses is a comparatively recent development, but in the short time it has been with us, it completely revolutionised ideas of home comfort. This is another field where the plumbing and heating contractor has tremendous possibilities of advancement.

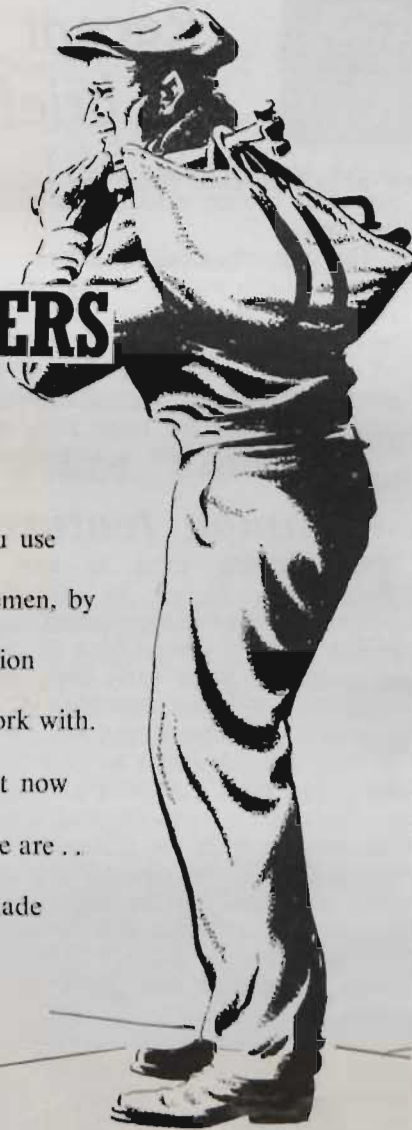
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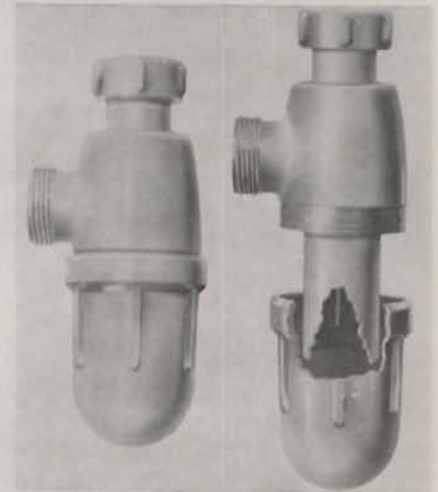
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resistance to both induced and self-siphonage providing a complete safeguard against unsealing under both average and severe siphonic action. The Monitor was found to have had all the qualities of a perfect hygienic waste trap.

Size: 1½" B.S.P. male outlet "P" trap. Adaptor available for conversion to "S" trap outlets.

Outlet connections: Outlets suitable for connecting these traps to copper, steel, lead and plastic piping are available.

Next objective of social

policy—Neil T. Blaney,

Minister for Local Government



GOVERNMENT TO SPEND £35 MILLION ON TEN YEAR WATER PLAN

PIPED WATER to rural areas was the subject of the recent conference-exhibition which closed at the Mansion House, Dublin, on April 15 last. The four day exhibition followed a conference addressed by the Minister for Local Government, Mr. Neil T. Blaney.

A full report, with pictures, of the conference and exhibition will appear in next month's **CONTRACTOR**. In this issue we review the £35,000,000 Government plan for water supplies and sewerage schemes as the Minister outlined it, at a Dublin press conference, when he said that with the approaching completion of the rural housing and electricity programmes running water was emerging as the most pressing environmental need in the countryside. It is the next objective of the social policy, he said.

"With the approaching completion of the rural housing and electricity programmes, running water in dwellings is emerging as the most pressing environmental need in the countryside, and the next objective of social policy.

"The fall in rural population, the low marriage rate, and the consequent distorted population structure in country districts is due to social as well as economic causes. Better living conditions will not solve, but they will help towards solving this major national problem. The Government have also had regard to the value of piped water as a potent factor in agricultural efficiency, particularly in relation to livestock farming," the Minister stated.

He said that water and sewerage services are required in many of the smaller towns and villages. In a number of cities and larger towns the existing services require augmenta-

tion, improvement or renovation. The more favourable financial terms now announced will apply both to new installations and to the extension or modernisation of old services.

The Minister, speaking in the Dail, called on local authorities to proceed as rapidly as possible with schemes already in planning.

The following are the details of the new Government financial terms:

Exchequer Contribution to Loan Charges:

Area	Old Rates		New Rates
	Water	Sewerage	Water and Sewerage
	%	%	%
Gaeltacht Areas, former Congested Districts and Urban Districts under £25,000 valuation	43½	50	60
Other Areas	38½	45	50
Dublin City	38½	38½	40

Loan Period: The maximum period for the repayment of loans which may be borrowed in future for sanitary services schemes has been extended from 30 to 50 years.

Repayment Method: At present loans obtained from the local Loans Fund for waterworks and sewerage schemes are repayable on the instalment system. This method imposes a heavier charge on local authorities in the initial years than the annuity method. In future local authorities may, where they so request, be permitted to repay loans on the annuity system.

Approved Costs for Subsidy Purposes: Hitherto costs of acquiring land, water rights, etc., were excluded

from the capital costs of schemes for subsidy calculation. These may now be included.

Supplement

AN IMPORTANT supplement to the work of local authorities in providing public water supplies and sewerage systems is the installation by private individuals of services in

their own homes either by taking connections from public mains or, in more remote areas, by providing their own water supplies and sanitation.

Grants are available from the Department of Local Government to persons providing private water supplies and/or sewerage facilities in dwelling houses, including connections to the public services in certain circumstances. These grants may be of amounts up to £50 for a water supply or £25 for sewerage facilities in any case and a grant of equivalent amount may be paid by the local authority.

Continued page Thirty-three.

Thirteen



HUNDREDS DIE BECAUSE OF CARELESSNESS

THE wise contractor works with a care for his own safety and for the safety of those about him. Because not everybody is as careful, hundreds are killed and many thousands seriously injured at building work every year. It is advisable to know some of the more common causes of accidents, since this may help you to avoid them.

Ladders with missing or faulty rungs must never be used, and home-made ladders should be used only if they have been properly made. Even then they should be treated with great care. They must always stand on a firm, solid and level base. Bricks and other packings must not be used to level the ground; if the ground is uneven the high spots must be removed.

LADDER WORK is the cause of large numbers of accidents, mostly through ladders breaking or slipping. Ladders should be soundly constructed and well looked after; and the worker should always have an eye to the dangers involved in using them.

Ladders used to give access to a roof or a platform must be long enough to pass the roof or platform edge by at least four feet in order to give a good handhold. The top should, if possible, be securely tied to a good anchorage. If this cannot be done, a responsible person

must "foot" the ladder. Where a ladder is laid up a sloping roof with its foot thrusting against the main upright ladder, the weight and attention of a responsible person is essential to counteract this thrust and prevent the danger of slipping.

A much safer method is to arrange that the top of the ladder on the roof should have some fixing over the ridge. This is sometimes done by tying on to it a short ladder, which will hang down the other side of the roof and act as a counterweight.

Heavy materials should not be carried up ladders; instead, a hoist of some kind should be used. Do not strain or overreach when working from a ladder. If necessary, come down and move it to a more convenient position.

KILDARE COUNTY COUNCIL have asked heating contractors to tender for the supply and delivery to the Machinery Yard, Droichead Nua, of a heating system for the new workshop. Specification and official envelope can be had from the Secretary, Kildare County Council, St. Mary's, Naas, with whom completed tenders should be lodged not later than Friday, April 28.

Telephone 908217.

Thomas J. Kelly

Plumbing, Heating and Sanitary Engineer

46 Orchardstown Drive, Templeogue,
Co. Dublin



FACULTY OF PLUMBING . . . A. L. Townsend, M.R.P., M.R.S.H., a Lecturer at the Oxford College of Technology begins here the first part of a four stage course in plumbing. The author has closely followed his own lecture programme and has paid particular attention to scientific and technological innovations.

tools for the trade



GOOD TOOLS are indispensable to the plumber, but buying them can be an expensive business. It is sensible to get a few of them at a time, as your experience grows and as you need them. A kit of good quality tools, built up in this manner, is a sound investment which will pay handsome dividends, as any experienced workman will tell you.

Many firms will buy tools for their apprentices at a trade discount which will reduce the price considerably; these can be paid for by agreed weekly deductions from wages. The cost of the kit will, of course, depend upon the quality and number of tools bought. Manufacturers now produce such a wide variety of tools in addition to the traditional implements, and so many plumbers make or adapt others to suit their own special needs, that there is no limit to the possible contents of the kit. The list below, however, is agreed to be a full kit of tool which should enable the plumber to carry out any reasonable job.

Bent pin or bolt; Brace and bits up to $\frac{3}{4}$ inch; Blow lamp, excepting the replacement of spare parts, other than the body of the lamp; Bobbins, all sizes to 2 inch; Bossing stick; Boxwood dressers (large and small); Boxwood setting in stick; Boxwood bending dresser; Boxwood mallets (large and small); Bradawl; Card wire; Caulking tools for ordinary work; Chase wedges; Compasses; Copper bit; Cutting pliers; Draw knife; Footprints, 6 inch, 9 inch; Fixing points (or clamps); Flat chisel for wood; Gimlet for lead pipe; Gimlet for wood screws; Gouge for wood; Glass cutter and putty knife, if glazing is normally done by plumbers in the district; Hacking knife; Hacksaw frame; Hammers, small and large (2lb. maximum); Hand dummy; Handsaw; Handbrush; Hand ladle; Lavatory union key; Mandrills, 1,

$1\frac{1}{4}$ and $1\frac{1}{2}$; Pliers, two holes; Plumb bob and chalk line; Pot hook; Rasp; Rule; Screw drivers (large and small); Scribing plate; Shave hooks; Small brick drill; Snips; Soil pot and brush; Spirit level; Springs for bending $\frac{1}{2}$ inch and $\frac{3}{4}$ inch light gauge copper pipes; Square; Steel drip plate; Steel chisels for brickwork up to 20 inches long; Stillson or other pipe wrench up to 12 inch; Tan pins up to 2 inch; Tool bag or box; Trowel, small; Wiping cloths.

More expensive

YOU WILL have noticed that the list does not include such items as sockets and dies, pipe cutters, pipe vices, welding kits, and several other of the larger and more expensive tools. These are provided by the employer. Neither does the list contain various tools used for specialised ways of working sheet copper and aluminium roof weatherings. Many of these are easily made by the plumber himself, and they will be described as the need for them arises.

By now you will have handled the traditional tools of the trade—lead dressers, bossing mallets, chase wedges, shavehooks, blowlamps and so on—on the site or in the plumbing workshop of your technical college. A lengthy description of these is therefore unnecessary.

The maintenance of hand tools is important both from the practical angle and from the point of view of safety. This applies to all tools, whether they be your own or provided by your employer for your use. Blunt, damaged, and generally uncared for tools will not produce good work, and they are liable to prove dangerous to the user.

All wood tools used for working

lead should be kept quite separate from steel tools which could mark or bruise them. These blemishes would result in damage or scratching of the lead.

Wood tools, like cricket bats, should be carefully preserved from damp, which would cause them to swell out of shape. On the other hand, they should not be allowed to become dry, since this would make them shrink and crack. An occasional dressing with linseed oil will keep bossing and other lead work tools in good order.

The cutting surfaces of files and rasps must be kept clear by frequent cleanings with a wire brush.

Cutting tools must be kept sharp, and the cutting edges covered when the tool is not in use so as to protect them from damage, and also avoid the risk of personal injury. For example, a short length of bicycle inner tube slipped over the handles of a pair of snips will keep the cutting blades closed and safe. Short lengths of hose pipe might be used to protect the cutting ends of chisels. You will think of several more dodges of this nature which will be effective.

"Mushroomed" or burred cold chisel edges should be dealt with quickly since these burrs are apt to chip off. If they fly into the eye, they can have tragic results. The simplest treatment is to grind off the burrs until the end of the chisel regains its original shape. Use goggles

(Continued page Seventeen).

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1961

from page fifteen

Well kept tools mean better and safer work

to protect the eyes from flying dust and metal particles when using the carborundum grinder.

Stocks and dies, pipe vices, copper tube benders, pipe cutters, etc., all need an occasional rub over with an oily rag to protect them from rust. But be careful to keep the handles free from oil—it makes them slippery, and in building work, a slip can be dangerous.

Wedges in the heads of hammer and mallet handles often work loose, and the tool becomes unsafe. Faulty wedges should be refixed or replaced as necessary. Split or damaged hammer handles should be ruthlessly scrapped, and new ones fitted.

Always remember that well-kept tools not only produce better work; they also mean safer working. No one can afford to be careless in this important matter.

Reduce time

PORTABLE ELECTRIC powered tools help to reduce time and effort, but it is advisable always to

seek advice from a competent electrician (or some other responsible person) before connecting or using them. They need constant care both when being used and when in store. Frayed or damaged leads must be replaced at once.

All portable electric equipment should be fitted with heavy duty three-core cable, properly connected through a three-pin plug and socket; and it should only be used when a proper earth connection has been made.

Electric extension-lamps should be waterproof, fitted with a three-core cable, and effectively earthed. Do not connect extension lamps to ordinary lamp-holders—they do not have an earth connection.

OXY-ACETYLENE WELDING.—This equipment is commonly used by the modern plumber for pipe welding and lead burning. If correctly stored and used, the gas and equipment are perfectly safe, but acetylene gas is inflammable and

when mixed with air in a certain proportion is highly explosive. No one should meddle with oxy-acetylene equipment unless properly instructed in its use.

A plumber often finds that the ability to sketch details of his work is very useful, since by this method he can express an idea more quickly, and often more effectively, than in a written or spoken description. It is not difficult to learn how to do it if one practices often enough.

Job planning is hardly a tool of the trade, but you will find that if some thought is given to the placing of materials on the site, and the order in which the work should proceed, there will be a considerable saving in labour and time. This sort of forethought is characteristic of the good plumber, who must very often think and act on his own.

NEXT MONTH

WATER:

Properties of water, specific gravity, water pressure, rules and conversions, and measurement of water pressure.



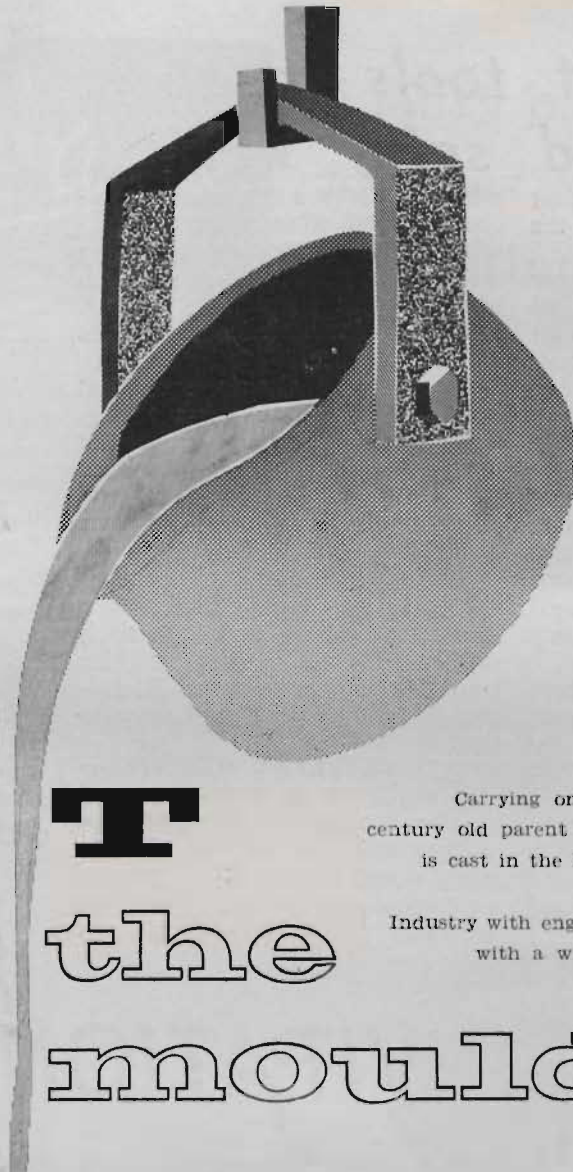
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The first of a series on automatic temperature control

BASIC CONSIDERATION OF AUTOMATIC CONTROL

IT IS now generally accepted that automatic temperature controls are a necessity in the successful operation of a modern heating or air conditioning installation.

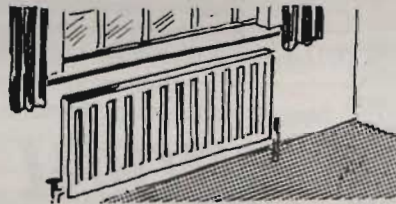
In recent years there has been a rapid advance in design of controls—to such an extent that it is often difficult, even for the experienced engineer, to decide which type of control will best suit his purpose. Furthermore the technology of automatic control has tended to become specialised and it is not easy to find literature which will assist the heating engineer in determining his requirements. It is hoped that this and subsequent articles will fill that want and in particular give the basic considerations that are necessary to determine the required control system.

If one wanted a general definition of an automatic controller it would be that it is a device to change one physical value as a function of another. As a practical example one must vary the heat input to a heated space to compensate for outside temperature changes or increased occupancy or incidental heat gains or permutations of all three. Obviously the type of control suitable for one application may not be suitable for another—so let us examine the five main groups of control systems which are available.

TWO POSITION CONTROL—As the name explains this system is one in which the final control element, such as a motorised valve or an electric immersion element, takes up one or other of two extreme positions namely “open” or “closed,” or in the case of the immersion element “on” or “off.” When the temperature of the controlled medium rises to the operating point of the thermostat or detector then the final control element moves to the closed or off position and the input of heat is stopped. Conversely when the temperature falls the

control element is opened or switched on.

It can easily be seen that such a controller must oscillate above and below the desired value or set point of the thermostat. The amount of



this oscillation is known as the differential and is directly related to the system time lag and the rate of rise or fall of temperature in the controlled medium.

System time lag can be expressed as the time it takes the thermostat to sense the reaction of the operating sequence it has set in motion. A given time lag will therefore give a greater differential if the rate of rise of temperature is fast.

Very suitable

TWO POSITION control is therefore very suitable where time lags are small and rates of temperature are slow.

PROPORTIONAL CONTROLLER—In this type of control system the final control element is positioned in proportion to the amount which the temperature of the controlled medium has moved from the set point of the thermostat, i.e. the amount of corrective action initiated by the thermostat is directly proportional to the amount by which the controlled medium temperature has deviated from the set point of the thermostat.

The range of temperatures which can be obtained by moving the final control element from one extreme to the other is known as the proportional band.

For many purposes the proportional controller is ideal but for general

heating and ventilating installation it suffers from an inherent characteristic known as “offset.” Assume that a room is being heated by radiators and the method of control is a proportional controller comprising a hot

By
R. E. AYERS,
M.A.S.E.E.

water valve and room detector. The controller has a proportional band of say 10 deg. F. and it is required to hold room temperature at 65 deg. F. To do this let us assume the valve under stable load conditions is 50 per cent. open. The outside temperature falls and as the rate of heat loss increases the room temperature commences to drop. This will operate the valve to a more open position and the valve will continue to operate until it takes up a new position where the rate of heat input is increased by an amount proportional to the fall in room temperature. The fall in room temperature will be stopped but providing the outside temperature does not alter further the valve will stabilize in a position which will just balance the increased heat losses and therefore the room temperature will remain at some lower value than required. The difference between this new value and the desired value is known as the “offset.”

The amount of this offset is a direct function of the proportional band and by reducing the proportional band it is possible to reduce the amount of offset—but there are definite limits to which this can be done in practice because as the proportional band decreases the valve will tend to hunt and in the final analysis become a two-position valve and under these con-
(Continued page Twenty-one)

Nineteen

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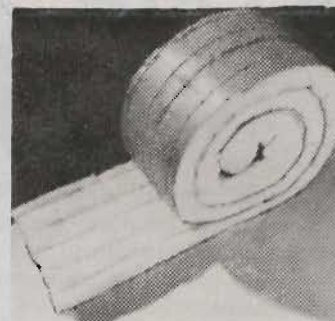
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FOR EFFICIENT HEATING

from page nineteen

Basic consideration of automatic control

ditions the control tends to become unstable.

An attempt can be made to reduce or remove offset in some proportional controllers by using a compensating element usually in the form of an additional thermostat or detector situated outside the controlled medium i.e. external to a building. The function of this extra detector is to raise or lower the control point of the system by an amount which will give sufficient corrective action to bring the controlled medium temperature to its true desired value. While this method goes some way towards correcting offset it is not a complete solution as it assumes that all heat input changes are as a result of outside temperature changes and this is not always true.

Stable control

TO SUMMARISE, the proportional controller can give stable control but the inherent offset results in the temperature of the controlled medium varying as the heating load changes i.e. increase in heating load produces a lower controlled temperature and vice versa. Where used to control installations with medium to short time lags and a slow rate of change of temperature then stable control can be obtained without excessive offset.

FLOATING CONTROLLERS—This type of controller is one which operates towards one or other of its extremes as long as there is a difference in temperature of the controlled medium from the desired value. For example an immersion thermostat in a mixed flow main senses that the water temperature has fallen. It therefore operates the mixing valve to obtain more hot water and continues to do so until the water has risen to the desired value. If the water temperature rises the reverse occurs. It is usual to incorporate a dead zone in the thermostat so that frequent reversals of the control element are eliminated and when the system is exactly balanced this element remains or "floats" in the dead position until a further deviation of temperature occurs.

A single speed floating controller operates at the same rate irrespective of the magnitude of the deviation. A multi-speed controller, using two or more speeds, can to some extent recognise the magnitude of deviation and move at the speed necessary to correct the deviation in as short a time as possible. Although the term "speed" has been used here, it could equally apply to those floating controllers using predetermined periods of operation i.e. the greater the magnitude of deviation the longer the controlling element operates.

An ideal control system for installations having small time lags and a fast rate of change of temperature.

INTEGRAL CONTROLLER—This system is really a logical progression of the floating controller in that if you could have an infinite number of speeds on a floating controller you would obtain an integral controller. In short, the integral controller moves the control element at a speed proportional to the magnitude of the deviation of the controlled temperature from the desired value. So long as any deviation exists there is corrective action.

The characteristics of this type of system, while desirable, can only be applied to a limited field, because like floating controllers it can only be used on installations with small time lags and rapid rate of change of temperature. If long time lags exist then the control becomes unstable.

PROPORTIONAL INTEGRAL CONTROLLER.—The proportional controller gives stable control but with "offset"—the integral controller gives corrective action as long as deviation exists but can only operate on installations with small time lags. Obviously then a control system which can combine the advantages of these two controllers is approaching nearer the ideal controller.

Briefly in such a controller the final corrective action is the sum of two separate control actions—a proportional action which is proportional to the amount of deviation and an integral action which provides additional corrective action at a rate

proportional to the deviation.

In such a controller both the proportional bands and the integral action are adjustable.

The proportional/integral controller is suitable for installations where large time lags exist, such as air conditioning plants.

Main groups

MOST CONTROLLERS can be divided into one of three main groups depending upon the medium used to transmit the corrective action between the detecting element and the final control element.

Hydraulic systems—this entails the use of a liquid filled phial and connecting capillary tube to the final control element. Expansion and contraction of the liquid provide the motive power for the final control element which is usually of the proportional controller type. The advantage of this system is that it can be used where no electric power is available. Care must be taken in installation especially in regard to the capillary and the use is limited by the low motive power available.

Pneumatic systems—In these systems compressed air is used as the operating medium, the thermostat releasing pressure in the system and thus operating a diaphragm motivating the final control element. This system has advantages where a multiplicity of control points is required but careful maintenance is required to obtain maximum efficiency.

Electric systems—The detecting impulse is used to operate an electrical circuit. All the types of controllers described above can be obtained to operate electrically and it can be readily seen that an impulse caused by the smallest deviation of temperature can be amplified electrically to produce greater motivating power for the final controller.

Briefly, then, the types of controllers and control systems have been described. In subsequent articles it will be shown how they can be applied to the everyday problems of the heating, ventilating and air conditioning of buildings.

NEXT MONTH

SPACE HEATING
CONTROLS

Twenty-one

from page eleven

Main difficulty is shortage of skilled operatives

The main difficulty from the contractors end is the shortage of skilled operatives to install the system, and perhaps with the co-operation of Vocational Education Committees and the major fuel companies, short instructional courses could be held to rectify this.

While on the subject of heating, it is very interesting to note the complete change in jointing methods. Previously the screwed joint with union was in general use, now, however, oxy-acetylene welding has almost superseded it, and on large modern schemes, screwed joints are few and far between. This, of course, demands of the craftsman a high degree of welding skill, and it is now almost a routine question for employers when engaging staff to ask "can you weld and braze?" In order to bring some sort of uniformity in this, the Irish Welding Institute have formulated test procedures, and it is intended that eventually a recognised certificate of proficiency in welding similar to A.P.I. and Lloyds standard will be

available.

In the important branch of plumbing concerned with roofing, the use of sheet copper, and to a lesser extent sheet aluminium has overshadowed the traditional lead. This again has brought the question of shortage of competent craftsmen into the open, but gradually this is being overcome through technical training—in fact, it would be true to say that 90 per cent. of our copper roofing experts owe their skill to day and evening courses in our technical colleges.

Future aspect

THIS brings us to a very important aspect of the future—the training of the craftsman plumber and heating fitter. It is obvious that he must be well educated in the first instance,—no longer the old adage "oh! sure, he has a good pair of hands" will do. That this fact has been recognised, is seen by the new Apprenticeship Act recently passed through the Dail. This specifies that a pass in certain subjects of the Intermediate Course, or alter-

natively a pass in the Group Trade Certificate obtained after attending a two years course in a vocational school, is a necessity before entering a trade as an apprentice.

This Act will come into full force in September, 1963, and is certainly not before its time. On the contrary, it is long overdue, as those responsible for training apprentices know only too well.

In the College of Technology, Bolton St., Dublin, and in similar Colleges and Schools throughout the 32 Counties, courses in plumbing and heating have been held for many years, and it is gratifying to note that most of the major firms in the industry, are controlled by what may be termed "graduates" of these institutions.

In conclusion, it would seem that future developments will lie in the use of plastics, pitch fibre, or resin impregnated drainage pipes, pre-fabricated copper or aluminium roofing sections and in the heating field we shall see even greater automation in the control of installations. District heating from one boiler house may well come to the fore also, and will help to give clean air over our cities.

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The first article in a short introductory series which will deal with

SMALL BORE HEATING

AS THE standards of living increase, so the demand for comfort also goes up. Such a statement has been found to be very appropriate to this country recently with regard to people having their houses centrally heated.

The small-bore system of heating is one which was first developed by the British Coal Utilization Research Association. Their work on this form of heating was primarily brought about by the necessity to make the best possible use of Britain's solid fuel resources. In investigating what forms of heating were most likely to achieve this need, certain other conditions, mainly economic in character, had to be fulfilled.

The first of such considerations was that the cost of installing any system had to be within the reach of the average householder, that is at a comparatively low prime cost. Secondly, that running costs should be little more than would normally be encountered with less efficient means of heating. In addition, it was desirable to introduce a system that would allow the piping to be installed in an existing house without costly structural work being necessary, and at the same time using pipes that were small in overall diameter, unobtrusive and neat in appearance.

The work done by the British Coal Utilization Research Association has produced a system fulfilling these conditions and the many thousands of satisfactory installations in operation now have proved the merit of their initial work.

It must be stated that the small-bore heating installations should be correctly designed and installed to ensure that the required amount of heat is available and to make open fires unnecessary. It is possible, however, to design an installation that will give background warmth only and yet allow the luxury of open fires as well.



by

JAMES M. HAIG,
A.M.I.W., A.M.I.P.

At the time that the British Coal Utilization Research Association were doing their experimental work it is unlikely that they thought of such an installation working in reverse, but such heating systems can during the summer be connected to cooling coils and the water circulates throughout the piping and radiators, thereby cooling the premises.

Before going into details, it would be well to give some thought, by way of comparison, to the more conventional type of heating installation which has hitherto been used in domestic installations.

To install a full traditional central heating system in an existing dwelling is a costly business and, because of this, few have been able to afford the expense involved, even though they fully understand and appreciate the many advantages to be obtained from living in a house having an equable temperature in every room. In addition to the cost of the actual installation itself, there are many extra costs to be met for redecoration, the very real possibility of permanent damage to floors where the pipes have to be let into floor joists and also the risk of weakening such structural members. Further, there is not infrequently the feeling that, having expended a considerable sum of money in fitting such a system, the running costs will be high, and that, in spite of the trouble and expense involved, one may have an inefficient system, providing room temperatures that are high, uncomfortable and lacking in that degree of

flexibility so necessary to deal with our variable climate, and yet so essential to ensure bodily comfort, unless expensive control devices are employed. The alternative that is usually forced upon the householder is to open windows in order to reduce the room temperature, resulting in a corresponding waste of fuel.

The original purpose of developing the small-bore heating system was to heat a dwelling of up to 1,500 sq. feet floor area. It is nevertheless possible to instal such a system in premises having a larger area, provided that the installation can be designed round a centrally placed heating unit, making it possible to design the pipe layout to include more, but shorter, pipe circuits.

Briefly, the small-bore heating system consists of a boiler to which the radiators are connected by means of 1 in. nominal bore copper tubes, the heated water being forced through the tubes and radiators by means of a specially designed pump or circulator.

To ensure proper temperature control, an automatically operated mixing valve is used in conjunction with a by-pass pipe. This mixing valve, which is actuated by the outside air temperature, thus ensures that the heat output from the radiators is controlled under such weather conditions, without affecting the boiler temperature. Such an arrange-

Continued page Twenty-seven.

Twenty-three

THE STUDENTS AND GRADUATE SECTION OF THE INSTITUTE OF ELECTRICAL ENGINEERS ORGANISED A SYMPOSIUM AT THE PHYSICS THEATRE, TRINITY COLLEGE, UNDER THE HEADING 'THE BIG HEAT'. HERE ARE SOME OF THE POINTS MADE BY THE FIVE SPEAKERS . . .

THE BIG HEAT



● J. J. Hussey, A. M. Inst. E., Sales Manager of Thomas Heiton.

SOLID FUEL— Little said in its favour

THE ADVANTAGES of other means of heating have been widely publicised but little has been said of the reasons in favour of solid fuel, said Mr. J. J. Hussey, A.M.Inst.E., Sales Manager of Messrs. Thomas Heiton and Co. Ltd.

We quote here some of the points raised in his lengthy paper which spoke out strongly in favour of the use of solid fuel.

The battle for solid fuel, he said, is essentially a combined operation. Look at any trade or industry in this country and you will find that sales promotion is a joint responsibility, accepted as such and embracing the efforts of producer and distributor alike.

Based on this realisation, a scheme is envisaged which will entail the close co-operation between the Coal Trade as such and the mining interests in this country. I feel that there is a big potential for the future if the joint interests are prepared to put their backs into salesmanship and publicity in view of the ever growing demand of the consumer public for the lowest cost central heating.

For the purpose of this paper, I
to page Thirty



● Frank Lunney, Assistant Technical Development Supervisor with Bord na Mona.

is best, he continued. Radiant heat has the advantages that it is not consumed until it meets some body which can absorb, and that it can warm our bodies without appreciably warming the air between ourselves and the source of heat.

With convected heat on the other hand, air is used as the medium of heat exchange and the air in a room heated by convection is always warm.

However, said Mr. Lunney, the most serious disadvantage of radiant heating is its cost. One must either use a high-grade fuel such as gas or electricity, both inherently expensive fuels, or else use a comparatively cheap low grade fuel at an extremely low efficiency in an open fire. In his opinion the immediate future of

to page Thirty

GAS— Eight points in its favour

THE CASE for gas as a fuel was put forward by Mr. E. W. Apsey, Installation Engineer, of the Alliance and Dublin Consumers' Gas Company, who listed eight main advantages of the fuel.

He said that gas provided no storage problems, it was always on tap, was flexible, easily and cheaply controlled, silent in operation, smokeless, had a low initial cost and free after-sales service.

The slightly higher cost per useful therm, as compared with solid fuel or oil, was being overcome to a great extent by the introduction of attractive tariffs, he said. The Dublin Gas



● E. W. Apsey, Installation Engineer, of the Alliance and Dublin Consumers' Gas Company.

TURF— An ideal, economic fuel

I WOULD point out at the outset, said Mr. Frank Lunney, Assistant Technical Development Supervisor with Bord na Mona, that the subject under discussion is domestic heating and not domestic central heating, which is only one aspect of the matter.

As between radiant and convected heat it is difficult to say which type

Co. tariff for whole house heating is:—First 40 therms per quarter, 2/2d. per therm; next 20 therms per quarter, 1/10½d; and the remainder, per quarter, 1/7½d. All gas consumed is charged at this rate, consequently there is a considerable increased benefit for those using gas for other purposes, i.e., cooking, water heating.

More manufacturers are recognising the advantages of gas and are entering this rapidly developing market, consequently there is a much wider choice of suitable units. All are fully auto-

to page Thirty

ELECTRICITY— Sold fully refined

SPEAKING for the E.S.B. Mr. Paddy Walsh said that he must admit to a bias in favour of electrical heating. "It would be very strange if I did not feel this way," he said.

"You can draw your own conclusions to my arguments in favour of electrical heating," he added, before outlinging four important factors connected with the use of electrical power.

Cleanliness: "Of all the fuels which you will hear of to-night electricity is the only one which is sold to you in a fully refined form. It is the only fuel which will be converted 100 per cent. into heat—without ashes, without fumes, without condensation, without products of combustion of any kind. Those products of combustion have been left behind in our power stations and cause no discomfort or dirt or

damage to decoration in your home."

Convenience: "It is almost universally agreed that electrical heating is the most convenient form of heating one can have. It lends itself readily to thermostatic control; it can be installed with minimum disturbance to the house; it requires no fuel store, tanks or chimneys, and it can be added to gradually to bring you progressively—without variation from 100 per cent. efficiency—from intermittent heating through background heating to full comfort central heating."

Price Stability: "I have some figures here which may surprise you—the variation in the average price of electricity from 1935 to date. If we take the price in 1935 as 100 per cent.

to page Thirty-one

OIL— Lowest running cost

OIL FIRED central heating has the lowest running cost of any fully automatic system, said Mr. Dave McCoy, Esso's Home Heat Promoter. He went on to outline the three main systems of oil fired central heating.

Low Pressure Hot Water System.—Using oil as a source of heat, water is heated in a boiler unit and circulated throughout the house to radiators or similar units located in each room which transmit their heat into the room. The boiler unit will also heat all water for domestic use if required.

Warm Air Systems.—Instead of using hot water and radiators, air can be heated in a furnace and blown via

● Paddy Walsh of the Electricity Supply Board.



● Dave McCoy, Esso's Home Heat Promoter.



special ducts through a grille into each of the various rooms. Warm air systems can also be used to supply domestic hot water.

Warm air systems are most suitable
to page Thirty-three

The questions they asked...

One member of the audience had recently built a house and stressed that the saving he made by eliminating chimney breasts and fire places in most rooms and by not having wooden flooring, "went a long way towards the capital cost of a floor heating installation."

Regarding the trouble and inconvenience of stoking and clearing coal boilers, etc., Mr. J. J. Hussey suggested that an automatic means of doing these jobs could make solid fuel boilers a much more popular means of heating.

The necessity for a high degree of

ventilation with oil and gas systems was mentioned by a member of the audience. He was using a gas and an oil heater and found that having to leave windows open to ventilate the room called for a considerably high heat input to maintain a comfortable temperature and the running cost amounted to about £1 per week even when the heaters were relatively seldom used.

The very low efficiency of turf as used in boilers was questioned and Mr. E. Tunney pointed out that these low efficiency figures were quoted for coal boilers burning turf. He suggested that

burning turf in a specially designed turf boiler would improve matters considerably.

A member of the audience questioned the economy of oil and stated that an oil heating system was costing him £3 per week to run. Mr. McCoy pointed out that the installation would be in use continually for only a few months during the year. Over a full year the running cost would probably amount to about £1 per week and this would be more in keeping with the figures he (Mr. McCoy) had quoted previously.

The use of the heat pump was also raised but Mr. P. Walsh stated that importation from the U.S.A. and the very high capital cost would make it prohibitive for this country.

Twenty-five

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An electrical engineer looks at the ...

BASIC HOT WATER REQUIREMENTS IN THE HOME

THE BASIC problem in any hot water installation is generally to provide hot water to three taps—the sink, basin and bath—in a simple and efficient way, economical in both installation and running costs.

There are two ways in which the problem can be solved by the use of electricity. In the first, electricity is used as the sole means of heating the water; in the second, electricity is used in conjunction with solid fuel in order to ensure a constant supply of hot water all the year round without the necessity of using solid fuel during mild weather.

Experience indicates that water at a temperature of 140°F. is sufficiently hot for all domestic requirements, including dish-washing and laundry work. Except where storage capacity is limited, storage of water at a higher temperature is not recommended since:

- (a) It tends to cause scale deposits in hard water districts.
- (b) It raises steeply the heat losses from hot pipes and storage vessels.

The importance of adequate insulation of the hot water cylinder cannot be too strongly emphasised—an average cylinder of 25 gallons capacity kept continuously heated to a temperature of 140°F. will lose heat equivalent to about 80 units of electricity per week. Since one unit of electricity will heat 4 gallons of water to 140°F. the heat wasted is enough to supply 320 gallons of hot water. This is more than double the weekly quantity of hot water necessary for the average household. If the same cylinder is fitted with a good insulating jacket 2" thick, the heat losses from the cylinder will be reduced from 80 units per week to about 20 units per week—a saving of 60 units per week.

As an alternative to the ready-made jacket, the cylinder may be insulated satisfactorily by building a box around the cylinder and filling up the

box with a good insulating material such as vermiculite (the large-grained vermiculite of the type used for insulating roof spaces is suitable). The vermiculite should have an average thickness of 3", or more if possible, all round the cylinder and particularly on the top. The top of the cylinder should not be left exposed.

When fitting insulating jackets, great care should be taken to ensure that the jacket fits snugly all round.

Two types

BROADLY, there are two types of electric water heater; first, the immersion heater or circulator consisting of a heating element and thermostat for fixing into an existing hot water cylinder; and secondly, the self-contained type consisting of storage cylinder, heating element, insulating material and outer case, the whole being designed and constructed in the factory.

The immersion heater offers a cheap and simple means of converting an existing solid fuel water heating system. For economical operation,

the cylinder should be adequately insulated and the draw-off pipe to the sink should not be too long or of too large a size.

A circulator is an immersion heater fitted downwards from the top of the tank and surrounded by an outer sheath or draught tube. The water in contact with the element circulates upwards and emerges through a hole at the top of the tube. The size of the hole is restricted so that the quantity of water flowing is raised to a usable temperature during its passage through the tube. A small quantity of hot water is thereby made available within a few minutes of switching on.

Circulators are not suitable for hard water districts as the tube or outlet hole may become choked with scale.

The double immersion arrangement comprises two immersion heaters—one in the usual position near the bottom of the cylinder, and one placed near the top (about 6" from the upper rim) so as to heat about 5 gallons of water.

Continued Page 36

SMALL BORE HEATING—*from page twenty-three*

ment ensures that adequate heat is available in the boiler to give an abundant and constant supply of domestic hot water.

Essential

ON THE domestic hot water side, it is essential to use an indirect copper cylinder coupled to the boiler by an independent gravity circuit. This circuit is normally run in $\frac{3}{4}$ in. or 1 in. copper tubing and is entirely separate from the radiator runs, apart from the permissible case of a towel rail being fitted.

The purpose of using an indirect cylinder is that it will act as an accumulator to absorb any excess heat in the boiler, in the event of a sudden reduction in the required heating

load and until the boiler damper control slows down the burning rate.

Returning to the heating side of the installation, it is generally only necessary to use $\frac{1}{2}$ in. diameter copper tubes in the heating circuits apart from where the circuits run into a common flow and return. At such points these common mains would be increased to $\frac{3}{4}$ in.

The use of $\frac{1}{2}$ in. diameter copper tubes in the heating mains means that there is no need to hide them from view, as they are neat in appearance and can be run so as to blend with the surroundings. The pump allows great freedom in deciding pipe runs, thus permitting

continued overleaf.

Twenty-seven

easy installation without costly structural work or damage to interior decorations. Furthermore, a considerable saving in pipe length is achieved because it is not necessary to rise above the floor levels on which the

the most three, major pipe circuits with perhaps a short loop feeding a single radiator as might be required in a hall or cloakroom.

To ensure that the full benefit of a small-bore heating system is ob-

Thus the following temperatures can be taken as giving comfort conditions:

- 65°F. for living-rooms.
- 55°F. for bedrooms, cloakrooms and halls.

Where a room is used only intermittently and for comparatively short periods, such as a dining-room, it is advisable to adopt a design temperature of 70°F., thus ensuring a quicker warming-up of the room concerned. Generally with ordinary domestic premises there is sufficient heat available in the kitchen from the boiler itself and the various hot water pipe mains and flue pipes to maintain an adequate temperature. Where an outside boiler is used, provision must be made to warm the kitchen and in this case 65°F. will be found to be a satisfactory temperature.

The foregoing temperatures are those required to give full central heating comfort. Where, however, open fires are to be used with the small-bore heating system providing only background heating, 60°F. may be taken as the design temperature for living-rooms.

from previous page

SMALL BORE HEATING

radiators are to be fitted; this, in turn, results in lower heat losses from the distribution system and a consequent saving in fuel.

The pipe runs need not be laid with a constant rise or fall for ventilating purposes. Inverted loop circuits, such as may be met with in running round the door casings, may be used, without fear of airlocking the system. Air-cocks fitted at such points are used only during the initial filling up of the installation. Generally, single pipe circuits connecting two or more radiators are used, the temperature difference between the flow and return being of the order of 20°F. With such a low differential the radiators are all maintained at more or less the same temperature. Obviously, the number of circuits used in any given installation will vary according to the type of dwelling involved, the positioning of the rooms and whether it is a house or bungalow. In general, the normal house would have two, or at

tained, it is advisable to insulate the roof space so as to avoid loss of heat and consequent waste of fuel. The domestic hot water storage cylinder should be fitted with an insulating jacket and where, as in the case of a bungalow, any pipes are run in the roof space, they must be protected against heat loss.

In designing a small-bore heating installation the following procedure should be adopted:

1. Decide the required room temperature and then calculate the heat losses through walls, floors, ceilings, etc.
2. Plan radiator positions and pipe runs.
3. Calculate the friction losses in pipe circuits, and determine from these the pump size.
4. Size the radiators and boiler.

Room temperature requirements may vary from client to client, but generally the recommended room temperatures stated in the Egerton Report will find ready acceptance.

NEXT MONTH

Calculating the heat requirements.



SATCHWELL TM ROOM THERMOSTAT

THE SATCHWELL TM thermostat is the latest in a line of room thermostats which have been manufactured by The Rheostatic Co. Ltd., Slough, for nearly thirty-five years. A new design of switch mechanism enables the thermostat to handle up to 20 amps on A.C. supplies at the same time giving a long contact life and a minimum in radio interference.

Although the appearance of the thermostat has been designed to appeal to the general public advance in design and manufacturing techniques made it simple to install and wire, extra reliable in operation and lower in cost than any comparable unit.

It has been designed to give accurate control in a wide variety of applications. Practical tests have

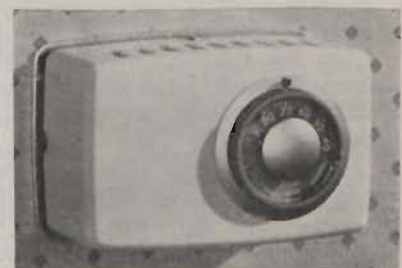
proved that the actual working differential of the TM in the majority of typical applications is less than 1/2 deg. F.

This practical figure should not be confused with the mechanical differential which is often quoted in relation to room thermostats. In fact the performance of a room thermostat depends on various factors outside the thermostat, such as the rate of change of space temperature and the load being controlled, so that the mechanical differential is rarely any guide to its performance.

Styled by a leading industrial designer, the TM is aesthetically pleasing in itself. The white cover is moulded in tough polystyrene which is resistant to any knocks it is likely to

receive. A compact instrument, it measures only 4 1/4" x 2 1/4" x 2 1/4". A grey dial with a serrated edge makes it easy to select the required control temperature and adjustable stops are incorporated which can be set to limit the knob travel to selected high and low (or "day/night") positions.

The new Satchwell TM room thermostat. Available from: The Manager for Ireland, "Graystoke," Nashville Road, Howth, Co. Dublin. Price: Standard instrument listed at £3.1.0 shows a considerable reduction on the price of earlier types.



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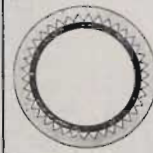
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THE BIG HEAT— *from pages twenty four and twenty five.*

SOLID FUEL— Little said in its favour

propose to restrict the topic to L.P.H.W. central heating, since it is accepted that radiant heating is preferable to warming by convection and also in view of the fact that as living standards rise and domestic help becomes more difficult to obtain, the trend towards central heating increases.

For the average dwelling in this country, the small bore heating system, designed, tested and proved by the British Coal Utilization Research Association has many advantages to offer for existing and new homes.

Many people contemplating central heating will be considering which fuel to use and the yardstick on which judgement should be based is running cost and efficiency. Too frequently comparisons are made between out of date coal burning appliances and the newest oil fired apparatus. If the proper comparison is made, I am quite certain that solid fuel would win hands down.

On the question of efficiencies, figures of 75-80 per cent. are claimed for oil fired boilers. It should, however, be appreciated that with automatic oil burners, which are intermittently operated, the efficiency falls off rapidly as the ratio of "off" to "on" time increases.

What really counts is overall efficiency and with reasonable care and cleaning this can remain at a high standard on solid fuel appliances.

Mr. Hussey then went on to point out that most types of solid fuel appliances had been considerably improved in recent years in terms of efficiency, labour reducing factors and streamlined appearance.

Dealing with the question of fuel he provided the following figures of costs per useful therm:

Coke, at 8/- cwt. burned at 60% efficiency costs 1/1 per useful therm;

Anthracite Grains at 8/- cwt. burned at 75% efficiency costs 8¼d.;

Gas at 1/10½ per therm burned at 80% efficiency costs 2/4d.

Electricity at 1/1 per unit used in an immersion group at 100% efficiency

costs 2/8¼d. (No allowance has been made for standing charge);

Electricity at 8d. per unit used in under floor heating at 95% efficiency costs 2/1d. (No allowance has been made for any standing charge);

Oil in low pressure jet burner at 1/5 per gallon and 75% efficiency costs 1/1¼d.;

Oil in vapourising burner at 1/8 per gallon and 75% efficiency costs 1/5 per useful therm.

A final point made by Mr. Hussey was that on present known resources alone there is at least 80 years supply of anthracite available on present demand in one mine alone in this country and there are estimated reserves of 25,000,000 tons of good commercial fuel.

TURF— An ideal, economic fuel

domestic heating lay in convector appliances.

Having discussed the various systems of heating, he went on to outline the relative cost of heat from various fuels. "These costs are based on the total therms in the fuel and not necessarily the total heat which is usefully available," he pointed out.

FUEL.	Price per Therm.
	s. d.
Gas	1 10½
Electricity at 1.1d. per unit ..	2 8¼
Electricity at 0.8d. per unit ..	2 1
Coke at £8 per ton	0 6½
Anthracite grains at £8 per ton	0 6½
Gas oil at 1/5 per gallon ..	0 10
Vapourising oil at 1/8 per gallon	1 0½
Machine turf at £4 10s. per ton	0 8
Peat briquettes at £5 10s. per ton	0 7

Since turf fuel is sold on an ex-works basis the delivered prices varies with the distance from the point of supply. The prices quoted above are rather higher than average.

The main advantages of turf fuel, said Mr. Lunney, are:—

(1) High reactivity, which gives rapid response to control, and complete combustion to a fine ash, with-

out cinders or, in the normal course of events, clinker.

(2) Ability to burn without smoke formation, an important point in view of the increasing public consciousness of air pollution.

Best results can be achieved with turf fuel, as with all other fuels, only when the proper appliances are used. Bord na Mona is always ready to advise, without any charge, on the choice of equipment.

"I would now question the advisability of using central heating in preference to individual room-heaters for the average home," he said. It was an indisputable fact, he pointed out, that central heating is many times dearer to install and also dearer to operate than an equivalent number of individual room heaters.

High running costs are due to the fact that inevitable losses occur from the boiler and from the distribution piping. The main wastage is, however, due to the fact that unless constant attention is exercised, radiators are left on in unoccupied rooms.

The individual room-heater, on the other hand, is an extremely cheap appliance to install and operate. All the heat released—apart from chimney losses, which also occur with central heating boilers—is used in the room to be heated. Fuel cannot be seriously wasted in an unoccupied room since the appliance will simply not be refuelled.

Peat briquettes are an ideal fuel for the closed or openable room-heater. Due to their high reactivity rapid response to air control is assured and full heat can be reached from the "slumbering" position in a matter of minutes.

In conclusion, extremely low-burning rates can be achieved and the fire will remain dormant for many hours. It can be rapidly rekindled by merely opening the air control.

GAS— Eight points in its favour

matic with ignition device, time and temperature control and adequate safety control, and are of contemporary design, colour and finish. Installation of these units is both

simple and cheap and developments in balanced flues, branched flues and the "See Duct" principle have further facilitated installation.

Small Bore Heating has received considerable publicity recently and undoubtedly it has definite advantages over the conventional low pressure gravity system, particularly for installation in existing houses. "Packaged" gas fired units are available which include all controls, pump, etc., suitable for connection to any type of system. Installation costs are comparable with any other type of unit, and typical costs for complete small bore heating systems with gas-fired units range from £230 for a 20,000 B.Th.U./hr. installation to £480 for a 60,000 B.Th.U./hr. installation. Gas consumptions range from 500 therms/annum for a 20,000 B.Th.U./hr. installation to 1,500 therms/annum for a 60,000 B.Th.U./hr. installation.

Full central heating and hot water supply can be provided for a gas consumption of from 1,000 therms/annum for a house of 1,200 sq. ft. area to 1,700 therms/annum for a house of 2,000 sq. ft. area.

The Warm Air Heating method, as widely used in the U.S.A., has its own special advantages over conventional

central heating systems and is particularly suitable for gas firing. Research and development work have resulted in the production by various manufacturers of a wide selection of units with outputs ranging from 17,000 B.Th.U./hr. to 50,000 B.Th.U./hr. at thermal efficiencies of 80%.

Basically the installation consists of a fully automatic centrally located unit from which warm air is distributed by a silent running fan through ducts to suitably located outlet louvres in the rooms to be heated. Indirect type units incorporate water to air heat exchangers, the hot water being supplied by a conventional gas-fired boiler which also provides domestic hot water supply by use of a calorifier. Direct type units use a heat exchanger in which the air is heated directly by a gas burner and the resulting products of combustion.

An important application of the direct type unit is the "selective" system, which provides full heating in selected rooms at selected times, or background heating over a wider zone. Cost of complete installation, including time and temperature control, is in the region of £100 to £150. A recent test showed the running cost

for selective space heating, cooking and water heating to be £59 per annum. Importance of adequate insulation and the control of ventilation and humidity cannot be over-emphasised. Sufficient attention has not been directed to these features in connection with domestic space heating, and the increased initial cost is more than justified by the saving in running cost.

ELECTRICITY— sold fully refined

the following were the average prices at various times since then: 1945—96½ per cent.; 1955—100 per cent.; and at present—115 per cent.

"No other fuel can show the same measure of price stability as this over such a long period, and price stability is an important consideration when planning a heating method because when installing a heating system one should be concerned not alone with the price of fuel at the time of installation but how it might vary

Continued page Thirty-three.

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Grants up to a maximum of £100 are paid by the Department of Agriculture to farmers providing piped water supplies to their dwellings by connections with public mains or otherwise. Additional grants up to a similar amount are available under certain conditions for water supplies

from page thirteen

£35,000,000 to be spent on ten year plan

to cow-byres, farmyards and milking parlours.

Roinn na Gaeltachta provide grants up to £55 and £30 for the installation by connection with public mains or otherwise of water supplies and sewerage facilities respectively in dwellings in Gaeltacht areas.

The Minister then inaugurated a drive for the all-round improvement of water and sewerage services in both urban and rural areas. He visualised a ten-year programme of works at a rate of output much in excess of the present level of activity.

A circular letter was issued to sanitary authorities informing them of the Government's decision regarding better financial terms for sanitary services works, which enables local authorities to go forward confidently with the planning and execution of water and sewerage schemes. The circular emphasised the importance attached by the Minister to the extension of services to rural areas, where the raising of living standards must now be regarded as a major national objective. A memorandum accompanied the circular letter outlining the targets to be aimed at by local authorities, the steps to be taken towards comprehensive surveys and planning, and the revised procedure to be followed for the efficient preparation and execution of schemes.

Comparison

THE need for greater activity in the provision of piped water supplies in rural districts is apparent from the following comparison between towns and rural areas:

	Towns and Villages	Rural Districts
Population ...	1,539,928	1,358,336
Served by public piped water	1,503,000	41,000
Percentage served	97%	3%

In addition to those served by public piped supplies, some 9% of per-

sons living in rural districts have installed private piped water supplies.

The position is accordingly that 88% of all persons living outside towns and villages do not enjoy the benefits of piped water. This figure relates to both farmers and other country dwellers. Taking the figures for farmers alone, the position is

slightly worse: only 11% of farm dwellings have piped water.

Ireland is definitely lagging behind other European countries in the matter of rural piped supplies. In many European countries the corresponding percentages are from 50 to 80.

The fact that almost 90% of rural houses in Ireland lack piped water is an index of living conditions in country districts. In his "Survey of Agricultural Credit in Ireland," Mr. F. W. Gilmore, Deputy Governor of the U.S. Farm Credit Administration, remarked that:

Most farmsteads were equipped with electricity but the need for running water in the house and other modern labour saving improvements for the housewife was evident on all sides . . . Modern buildings that lead to improved health and better living conditions are worthy purposes for credit. With the ready availability of water facilities grants, there is no excuse for farm women having to carry water to about 90 per cent. of the homes.

The disadvantages of a poor water supply are not confined to the farmhouse. In dry seasons, farmers have to draw water for livestock, in some cases from considerable distances. The time and trouble taken in this way is lost to more productive work. Quality as well as abundance is also coming to be recognised as of prime importance in relation to water supplies for dairy and livestock farming.

The expansion of tourism will involve the use of the small guest-house as well as the large hotel. Running water and sanitation are virtually essential to the proper entertainment of visitors and a much wider spread of these facilities is clearly desirable from the tourist standpoint.

from page thirty-one

throughout the life of the heating system.

"Low initial cost, economy of operation and flexibility of design: My Board's approach to the domestic heating market is summarised in the Warm Home Plan which we introduced at the beginning of this winter. We believe that this plan offers a high degree of comfort to home owners at a very reasonable cost. Our approach is to provide background heating to 55 deg. F. to 60 deg. F. in the living areas of a house by storage heaters or floor-warming and intermittent heating by Convector heaters, tubular heaters or infra-red heaters in non-living areas—bedrooms and bathroom. It is whole-house heating, but not whole-house heating of the high first cost and high running cost of a full comfort (65 deg F.—70 deg. F.) central heating system.

"I don't consider that there is at present a very high potential market for full comfort central heating systems and I imagine that less than 1 per cent. of existing houses have a full comfort central heating system."

OIL— Lowest running cost

for installation in new houses, particularly bungalows.

Boiler/Burner Units.—There are two types of boiler/burner units. Firstly, the unit with a vapourising burner—for smaller houses—usually placed in kitchen and uses Esso Domestic Oil. Secondly, the unit with pressure jet burner—for larger houses—usually located outside either in garage or in an outhouse—uses Esso Heating Oil.

Type 1 is normally partially automatic in operation—i.e., works on high/low flame principle—and the latest types are being made fully automatic. Type 2 is always fully automatic.

Mr. McCoy then pointed out the advantages attached to the use of oil fired central heating as he saw them.

Cleanliness.—No stoking, raking or ash removal—and when burned efficiently no smoke emitted—no dust from fuel on curtains, covers or carpets.

Instant Control of Heat Requirements.—The equipment can be readily

continued overleaf

Thirty-three

from previous page.

controlled automatically—therefore, heat is only supplied as and when required.

Fully or Partially Automatic in Operation.—An oil burner needs little attention, even those that are manually controlled only need the turning of a knob. Fully automatic burners need no attention except for periodic servicing by a service engineer.

Quality of Fuel is Constant.—Fuel quality tested during refining process—made to stringent specification to ensure that only a product of the highest quality free from contamination is actually used.

Storage.—Oil lends itself to easy storage. Space required is small towards that required for solid fuels.

Lowest Running Cost of any Fully Automatic System.—In assessing comparative running costs the most informative basis is to compare the various fuels on a cost per "useful Therm" basis. A Therm (100,000 B.Th.U.) is the standard measure of heat. A certain amount of heat from most fuel goes to waste; the more efficient the heating appliance, therefore, the more heat usefully employed. Thus the cost of producing a Useful Therm, which is the heat put to good

use, is the REAL cost.

The following is the cost per Useful Therm for various fuels:—

	Pence.
Esso Domestic Oil for use in vapouring boiler/burner units..	16.8
Esso Heating Oil for use in pressure jet boiler/burner units ..	13.2
Coke	15.9
Anthracite	13.8
Electricity	27.8
Turf Briquettes	16.1
Gas	25.0

The assumptions made in arriving at the above figures are as follows:—

Esso Domestic Oil—1/8d. per gallon:	
Boiler Efficiency	75%
Esso Heating Oil—1/5d. per gallon:	
Boiler Efficiency	80%
Coke—£10 15s. 0d. per ton:	
Boiler Efficiency	60%
Anthracite—£13 10s. 0d. per ton:	
Boiler Efficiency	75%
Electricity—Average 0.9d. per unit:	
Efficiency	95%
Turf—£6 0s. 0d. per ton:	
Boiler Efficiency	50%
Gas—Average 1/8d. per therm:	
Efficiency	80%

In modern houses up to 1,400 sq. ft. in floor area it can be assumed that where a kitchen type boiler is being used the installation costs will

vary from about £300 to £400, while installations with outside boilers will vary from £350 to £450. These approximate cost figures are for systems providing full central heating and supplying domestic hot water.

Running costs providing for full central heating for a 30 week winter period and domestic hot water all the year round in houses up to 1,400 sq. ft. floor area would vary between £60 and £80 per annum depending upon house size and domestic hot water consumption.

Similar houses without central heating would spend between £35 and £45 per annum for heating (1 or 2 open fires per day) and domestic hot water.

Oil fired central heating installations are normally designed to give the following indoor temperature when the outside temperature is 30°F.:—

Living Rooms ..	65°F.
Halls and Corridors ..	60°F.
Bedrooms ..	55°F.

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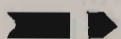
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from page twenty-seven

BASIC HOT WATER REQUIREMENTS IN THE HOME

Both immersion heaters are thermostatically controlled. The lower heater is usually of $1\frac{1}{2}$ or 2kW. size and is switched on only on washday or for baths. All other needs are supplied by the upper immersion heater, which is left switched on all the time. A suitable size for the upper heater is 750 watts.

The use of two immersion heaters gives the benefits of a constant supply of hot water, together with a substantial reduction in heat losses from the cylinder, since only a small portion of the cylinder normally contains hot water. For example, we have seen that, even when fitted with a good insulating jacket not less than 2" thick, the average cylinder kept full of hot water at 140°F . (which would be the case if it were heated continuously by the lower immersion group) loses heat equal to 20 units of electricity per week. On the other hand, if only the upper immersion group is kept switched on continuously, the losses would be reduced from 20 units per week to 10 units per week. This is a substantial saving and amply justifies the small extra cost of installing the upper immersion heater.

Where a single immersion heater is already installed in the lower part of the cylinder, the additional immersion heater in the upper part can be connected to the existing wiring.

All self-contained water heaters are similar in general construction and consist of a tinned copper water container, surrounded by a thick lagging of granulated cork or other heat insulation, and enclosed in an enamelled metal case. They are very efficient in operation since, due to the heavy lagging used, the standby losses are reduced to a minimum and losses in draw-off pipes are usually negligible due to the proximity of the heaters to the point of usage.

There are three different types of self-contained water heaters:—

Free Outlet Type: Supplies hot water to one point only. It is mounted on the wall or under the sink, and a connection made to the nearest cold water pipe and to the electricity supply. Nothing further is required. The flow of water is controlled by a stop-cock on the inlet, which allows cold water to enter and displace the

hot water through the open spout.

Pressure Type: This can supply a number of hot water taps. It must be provided with both a feed pipe and an expansion pipe to a cold water cistern.

Cistern Type: This consists of a standard pressure type heater with a self-contained ball tank added neatly to the top of the heater. It is intended for use where connection to an existing cistern is impracticable.

The cistern type will supply any number of hot taps providing these are at a lower level than the heater. It is particularly suitable for installation in rural areas in conjunction with automatic pressure storage water pumping systems. As an overhead tank is unnecessary, considerable saving in the installation is effected, and future extensions to the hot water system may be easily carried out.

Simple and cheap

THE double immersion heater offers a simple and cheap method of providing an adequate and constant supply of hot water to all hot taps in the house. It will be cheap to run provided the following points are observed:—

- (a) The cylinder must be effectively insulated with a jacket containing at least a 2" thickness of good insulating material.
- (b) Thermostats should be set to give water at 140°F . Higher temperatures are unnecessary and merely waste heat.
- (c) All circulation of electrically heated water should be avoided, e.g., through towel rails or radiators.
- (d) The length of draw-off pipe to the sink should not be excessive. In the average modern house, the draw-off pipe is usually $\frac{3}{4}$ " light gauge copper from the cylinder to the bath, continuing in $\frac{1}{2}$ " light gauge copper from the bath to the sink. Where these sizes of copper pipe are used, the total run from the cylinder to the sink should not exceed 25 feet. If it is over 25 feet "dead leg" heat losses will be relatively high and it will be more economical to install a small self-contained water heater at the sink.

It may be found, especially in some older houses, that large cop-pipes, or pipes of lead or galvanised steel are installed. In these cases, the maximum run to the sink should be somewhat less than 25 feet, depending on the pipes used.

- (e) "Single pipe" circulation in the draw-off or vent pipe should be avoided.
- (f) Airing cupboards should not be heated by leaving part of the cylinder uncovered by insulation for long periods.

The Self-contained Water Heater.—

In the smaller sizes ($\frac{3}{4}$ gals., $1\frac{1}{2}$ gals., or sometimes 3 to 5), self-contained water heaters are suitable for sinks and isolated washbasins where a general supply from the hot water cylinder is uneconomical due to long pipe runs.

In the larger sizes (12, 20, 40 gallons upwards) for installations where no hot water supply already exists; for large houses and institutions where the points of use are within reasonable distance of each other, or suitably situated in groups; or where an alternative localised supply is desirable on the grounds of economy or expediency.

With regard to wiring cupboards, it is sometimes thought that the lagging of the cylinder will make the cupboard in which it is contained ineffective for clothes airing. This is by no means the case. First, the amount of heat escaping from an unlagged cylinder is in many cases excessive, and there is evidence that the high temperature is a definite cause of reduced life of linen and other clothes. Secondly, the heat escaping through the lagging (assuming constantly heated water), while not appreciable, is sufficient for the purpose of keeping the cupboard in a warm dry condition suitable for keeping clothes without deleterious action.

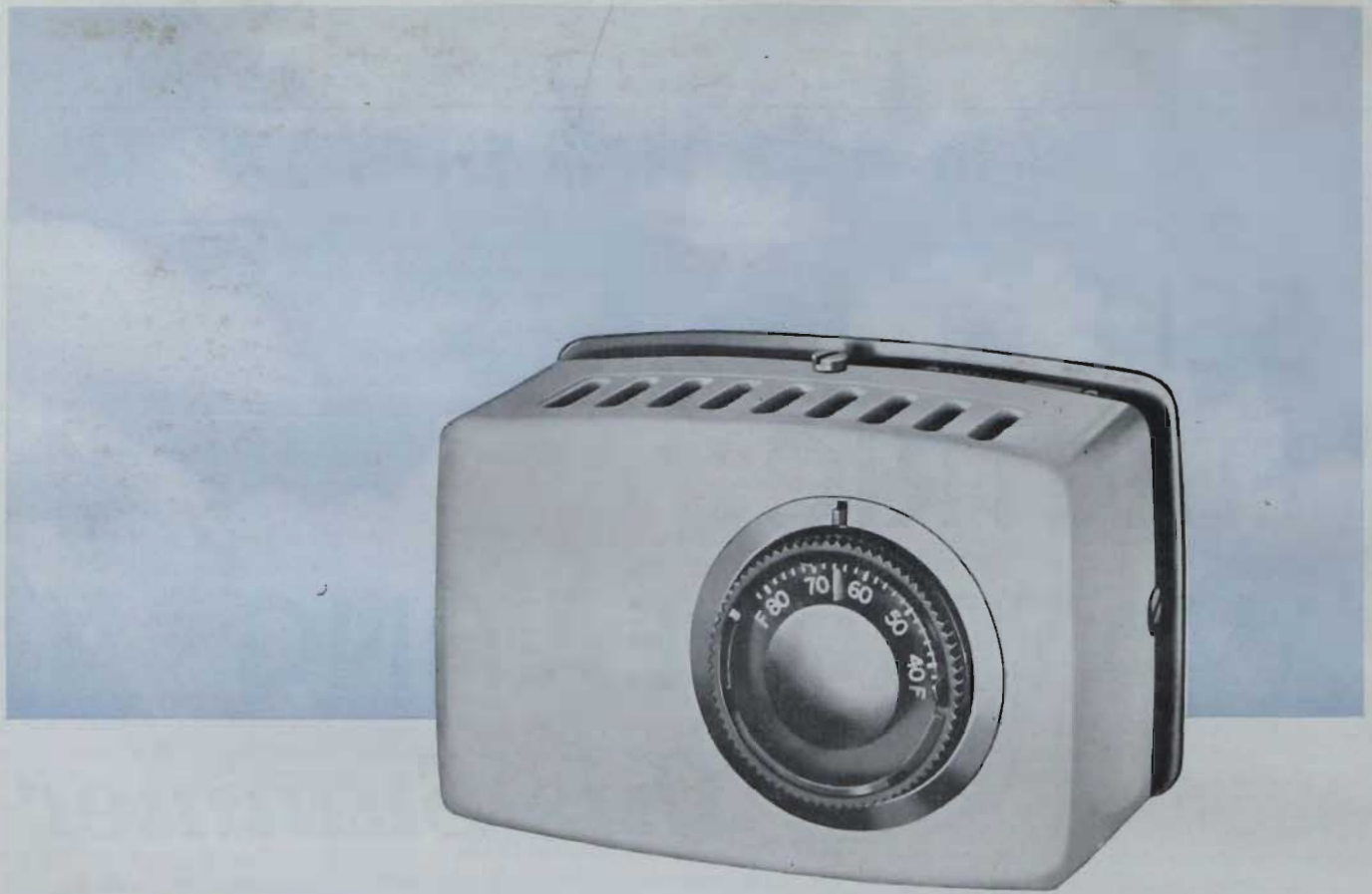
Where an exceptional amount of heat is required for airing purposes, a section of the insulating jacket may be folded back so as to expose part of the cylinder. Alternatively, a small 100 watt cupboard heater may be installed. This may be bought cheaply and will run for 10 hours on one unit of electricity.

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