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THE IRISH PLUMBER & HEATING CONTRACTOR

VOLUME 1. NUMBER 7.

OCTOBER, 1961

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Vol. 1. No. 7.

The new publication in Ireland for the craftsman plumber and contractor, the heating, ventilation and insulation engineer and contractor, the electrical contractor, supplier, manufacturer and wholesaler of fittings and equipment for the trades.

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OCTOBER, 1961.

THE IRISH PLUMBER & HEATING CONTRACTOR

IN THIS ISSUE

Due to space limitations, we have been unable to include a third, and final, article by A. L. Townsend under the heading of thermal insulation, which would have dealt with computation of values, in this issue. We hope to publish this contribution next month.—Ed.

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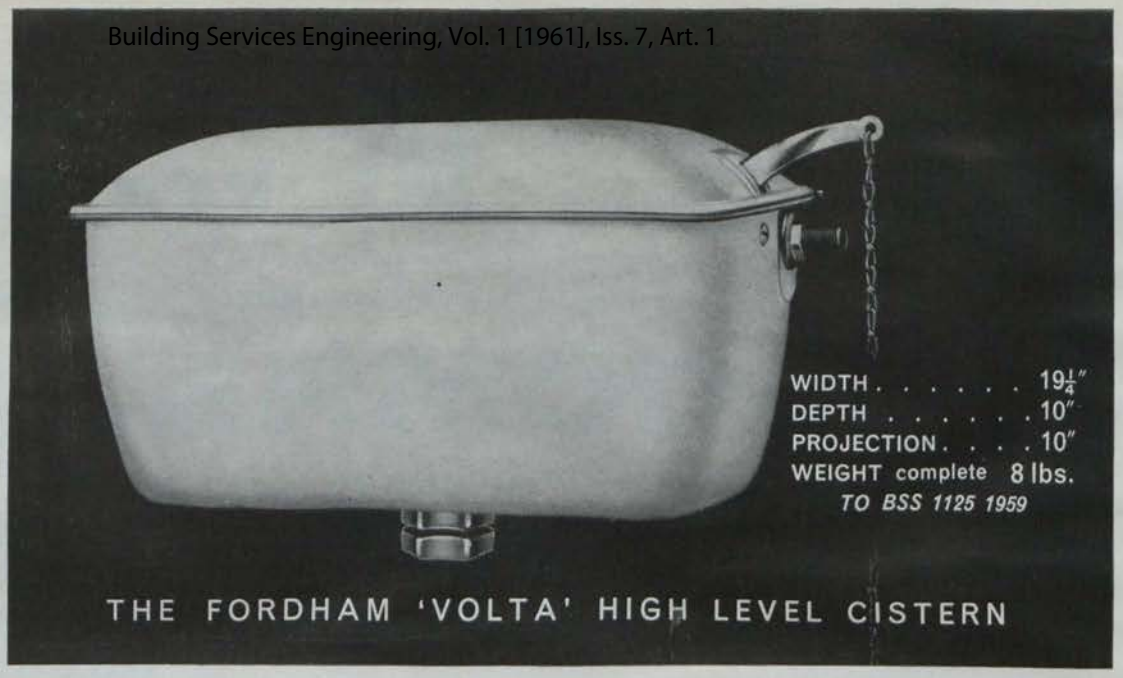

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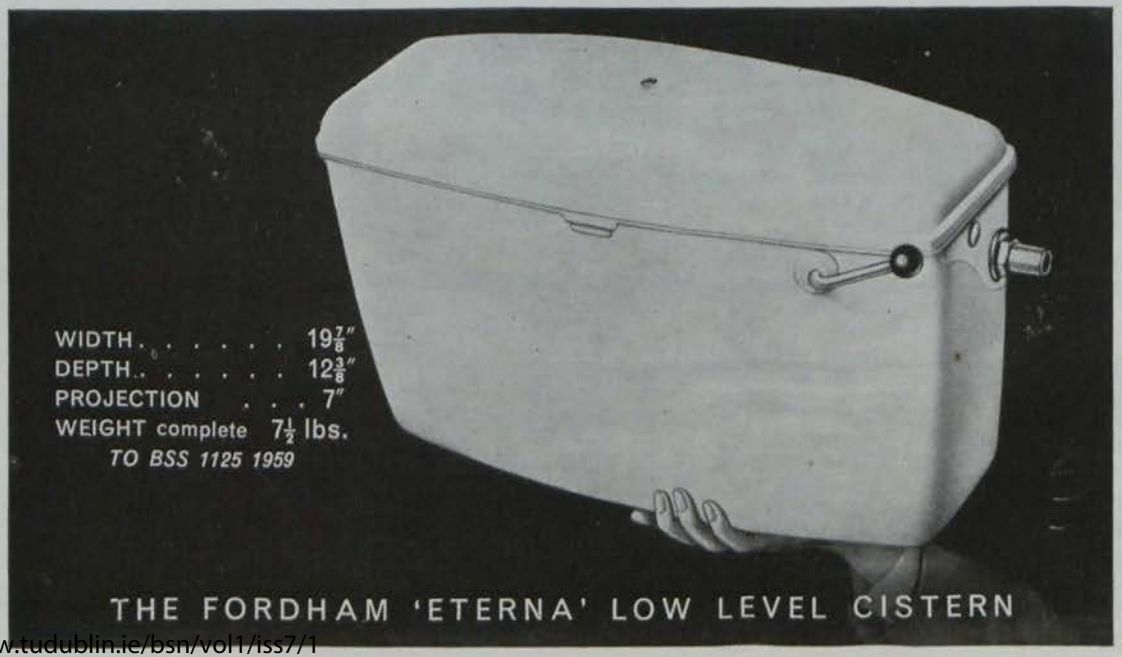

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hot water systems for bungalow dwellings

the author

JOHN G. BOLTON, Lecturer in Plumbing and Heating at the College of Technology, Bolton Street, Dublin.

IN our last issue we dealt with the gradual development of the modern domestic hot-water installation.

It was shown then that for general use the normal cylinder system provides satisfactory results and is free from danger. Its installation in the average two-storied dwellinghouse presents little dfficulty as it is usual to put the cylinder on the upper floor, thereby having a straight run for the circulation pipes from the boiler on the ground floor.

When, however, we come to the bungalow dwelling we have to meet a totally different situation. Here we may have the boiler grate in the livingroom and across the hallway or corridor the bathroom with its cylinder. The problem then arises as to how we will run the flow and return pipes from boiler to cylinder so that satisfactory circulation will take place. There are several ways of overcoming this difficulty, but the design illustrated in Fig. 1 will give very good results.

Pitched-roof bungalows

WHEN installing this system, and indeed all bungalow systems, the first point to keep in mind is to try and increase the static head. This is usually done by raising the store tank as high as possible in the roof space. A point to watch here is that a normal tank of, say, 50 gallons capacity, will weigh when filled about 500 lbs.—nearly ¼ ton—so that substantial support must be provided, otherwise trouble can be expected!

The next point to watch, and it is of primary importance, is to keep the centre line of the cylinder at least 2ft. higher than the boiler centre line, otherwise poor circulation will result.

It will be seen from the sketch that the circulation pipes rise from the boiler into the roof space and are fitted with open vents on each pipe. From the tee connections (sweep tees) the pipes will continue in a gradual fall and then drop to the cylinder.

It is recommended that these circulation pipes be not less than 1in. diameter so as to reduce friction loss to a minimum. The vents, if desired, can be reduced to ¾in. bore.

With this system it is very important to insulate all pipes in the roof space, otherwise heat-loss will be very high. This may be done by wrapping with glass silk strip or hair felt, taking particular care that no gaps are left, especially at bends, etc.

In a job of this type, where static head is low, another very important point arises with the provision of draw-offs to fittings. Due to the low-pressure involved, the main draw-off pipe should always be taken from the vent pipe at a point as close to the crown of the cyclinder as possible, even if it should mean that the draw-off has to be raised to a higher level further on.

On the other hand, should the branch be taken off near ceiling level it will be found that the flow from the hot taps will be very erratic—mainly consisting of a mixture of water and air bubbles. The lower draw-off connection will prevent this sucking in of air from the open expansion pipe.

Proved very satisfactory

THIS design has proved very satisfactory in many jobs, and where installed properly with correct pipe sizes as recommended, will give a 40°F temperature drop between flow and return, so ensuring brisk circulation.

Another variation of the cylinder system for bungalow installation is shown in Fig. 2. Here we have the

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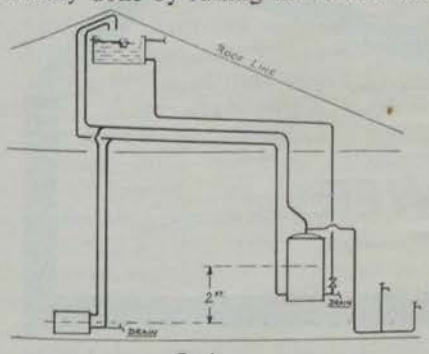

Fig. 1

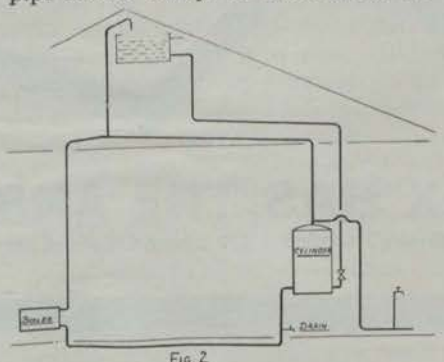

Fig. 2

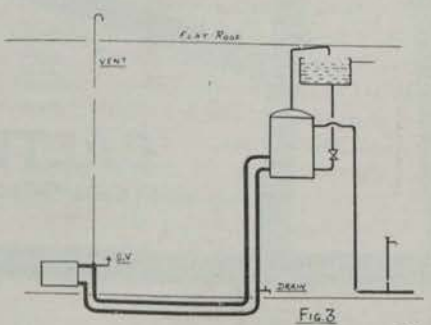

Fig. 3

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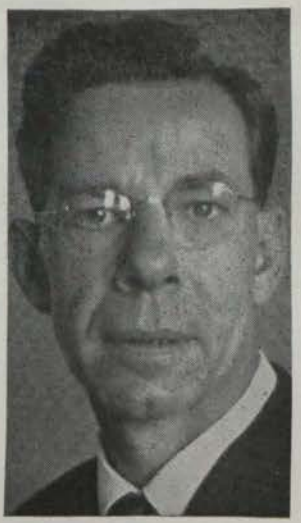
HEAT

ITS EFFECT ON PLUMBING MATERIALS



FACULTY OF PLUMBING . . . A. L. Townsend, M.R.P., M.R.S.H., a Lecturer at the Oxford College of Technology continues 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.

THE following effects of heat on materials have now been noted in my earlier articles:—

- It can bring about a change of state.
- It can hasten or bring about a chemical change.
- As a result of the first or second points above, the appearance, properties and behaviour of the material is very much altered.

There is another equally important effect of heat on materials; one in which they change in size according to their heat content. It is well known that when a substance or material is heated it gets larger, or expands; and when it cools it gets smaller, or contracts. In other words, material "moves" as its temperature varies and this is called the heat movement or the thermal movement of materials.

Why do materials expand when heated and contract on cooling?

Imagine the space taken up by a group of people standing fairly still. Now, if all these people started to rock-'n-roll, they would jostle and push one another about, and in doing so take up more space. The separate molecules which go to make up a material are always on the move, vibrating to and fro at a rate depending upon the amount of heat energy they have. When cold, their heat energy is small and they keep fairly still and close to one another, and they take up as little space as possible. When the material is heated, its molecules gain energy and start to "dance" with increasing vigour and so, of course, they take up more space. An increase in the size of the material is the result; that is, the material expands on being heated.

When the material cools down it loses heat energy, the molecules slow down the rate of their vibratory "dances," and a reduction in size, or contraction of the material, results.

Coefficient of thermal expansion

How much does it expand? This depends upon the material; whether it is in a solid, liquid or gas state; and, of course, upon its heat content.

The amount that solids will expand for each extra degree of temperature rise is easily measured and is fairly constant. To whatever extent a solid expands or contracts for one degree change in temperature, it will expand or contract ten times as much for ten degrees change in temperature.

Liquids and gases do not behave quite so conveniently, and water in particular behaves in a most unexpected manner, as has already been shown.

For the time being let us consider the effect of thermal movement on solid materials such as pipes, boilers, sheet metal and roof coverings. Thermal movement affects all the dimensions of a material. Length, width, and thickness all increase as the temperature of the material increases.

Since most of the materials the plumber deals with—for example, pipes, and bays of sheet metal on roofs—are so much longer than they are wide or thick, it will be convenient to examine only the more readily seen effects of heat on the length of material.

Reference will be made to the "linear coefficients of thermal expansion." The word "linear" means lengthwise and "coefficient" means fraction; so the term really defines that fraction by which a given or unit length of material will expand when its temperature is increased by one degree, or will contract when its temperature decreases by one degree.

The unit length can be measured by any convenient scale. It may be one inch, one foot, one yard or one mile; but whatever the unit lengths used, then the fraction that the material expands for one degree will also be measured on a fraction of that inch, foot, yard or mile.

Nearly twice as much

One degree Centigrade is 9/5ths or nearly twice as big as one degree Fahrenheit. Consequently, a material heated one degree Centigrade will "move" nearly twice as much as it would if heated one degree Fahrenheit. Watch this point, and take care to use coefficients of thermal expansion which are correct for the temperature scale in use. Table A. gives the coefficients for the commonly used plumbing materials.

The table shows that lead "moves," or expands and contracts, nearly twice as much as does copper.

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HOT WATER SYSTEMS FOR BUNGALOWS

flow pipe rising into the roof space and vented over the store tank. It then drops and connects to the cylinder at the crown. From the lower connection on the cylinder the return drops below floor level and then gradually rises to the boiler.

Draw-off branches will again be taken off as near the crown of the cylinder as possible in order to give a good flow of water from the hot taps.

As in the previous system, 1in. diameter flow return, and cold feed pipes are necessary for satisfactory results. Pipes under the floor and in the roof space should be insulated as already mentioned.

A problem which occasionally arises with this type of design is for reverse circulation to take place, particularly when the water is just beginning to heat. This defect may rectify itself when the water becomes warmer or when someone opens a hot water tap, the change of circulation being accompanied sometimes by a loud rumbling noise, but is not, however dangerous.

The reason why this reversal of circulation may occur is due to the fact that the heated water in the boiler tends to take the shortest route to the cylinder, and in a bungalow lay-out of the type mentioned, this may well prove to be the return pipe under the floor.

Some contractors attempt to prevent or rectify this by fitting a non-return or one-way valve on the pipe going to the boiler, but this should always be avoided as it may become jammed with silt, etc., and so prove dangerous.

A much better plan is to arrange the pipe lay-out so that the flow pipe is, if anything, slightly shorter than the return and that all bends on it are of easy sweep.

In a system such as Fig. 2 this shortening of the flow pipe may be done by raising the cylinder to a higher level.

Flat-roofed bungalows

IN the systems already described it was assumed that the bungalow dyelling had a pitched roof, so allowing for easy installation of the store tank and circulation pipes, but what if the dwelling has a flat roof, and the cylinder is in a bathroom on the opposite side of a hallway from the boiler!

This is a most difficult installation from any point of view. The tank could, of course, be placed on the flat roof, but this is not good practice as it is out in the open, and even if well insulated, may in time, through neglect, become a potential frost victim. From the architectural viewpoint it is also a bad job as the tank on the roof makes the building look unsightly.

It is usual, in most cases, to put the tank inside and as close to the ceiling as possible (allowing for ball-cock repairs).

The cylinder will have to be placed near to it as in Fig. 3. The circulation pipes cannot be run at ceiling level as they would be over the water line

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Plumber's solder also expands less than lead. There is very little difference between them, but it is enough to set up damaging stresses between sheets of lead and the solder used to join them. This occurs especially where such solder joints are exposed to a wide variation in temperature such as that between day and night summer temperatures on a roof. The difference in the expansion coefficients of solder and copper are even greater. For this reason it is not considered good practice to use solder to join sheets of metal used for roof weathering.

Notice that mercury expands a good deal more than the other materials. For a small change in temperature there will be a visible change in the length of a mercury column, and this is another reason why mercury is so useful for measuring temperatures in a thermometer.

Now that "plastic" materials are more widely used in plumbing, it is worthwhile noting the comparatively high coefficient of expansion of polythene.

TABLE A.

Linear Coefficients of Thermal Expansion.

Material.	Variation per unit length for one degree temperature variation. Fahrenheit.	Centigrade.
Solid metal elements:		
Lead	0.000016	0.000029
Zinc	0.000016	0.000029
Aluminium	0.000015	0.000026
Tin	0.000012	0.000021
Copper	0.000009	0.000016
Iron	0.0000063	0.000011
Solid metal mixtures or alloys:		
Plumber's solder	0.000014	0.000025
Cast iron	0.000006	0.000011
Mild steel	0.000006	0.000011
Liquid metal element:		
Mercury	0.00003	0.00005
Non-metal:		
Polythene ("plastics") over its normal working range, 40°F to 140°F.	0.0001	0.00018

Note:—

Superficial (area) Coefficient of expansion = Linear Coefficient. x 2.

Cubic (volumetric) ditto. = Linear Coefficient. x 3.

Change in Length. (Heated it expands and increases in length. Cooled it contracts and reduces in length.) = Length of Material (in convenient unit lengths usually feet). x Temperature change in material. x Coefficient of Linear Expansion

Note—Coefficient **must** be in same scale as the temperature change of the material.

A few examples will show how this rule can be usefully applied to plumber's work.

Example i. A copper hot water pipe, 100 feet long, is filled and tested with water at 50°F. By how much will the length of this pipe increase when it carries hot water at 150°F?

The question tells you the length of the pipe, the temperature change to which it is subject, and the temperature scale used. From Table A you know that copper's linear coefficient of expansion is 0.000009 Fahrenheit.

Increase in length = 100 feet x (150°F − 50°F) x 0.000009 Fahrenheit.
= 10000 x 0.000009
= 0.09 Feet or 0.09 x 12 = **1.08 inches increase in length.**

Example ii. If the same hot water pipe is cooled from 65.5°C to 10°C how much will it shorten or contract?

Decrease in length = 100 feet x (65.5°C − 10°C) x 0.000016 Centigrade.
= 5550 x 0.000016
= 0.0888 Feet, say **0.09 Feet or 1.08 inches decrease in length.**

If you refer to the temperature conversion graph (September) you will see that 65.5°C and 10°C are equivalent to 150°F and 50°F. Example ii therefore shows that temperature change will make a material contract at the same rate as it will expand; and that the same amount of expansion is found in the Centigrade as in the Fahrenheit scales of working.

Example iii. A polythene waste pipe at 60°F receives a discharge of hot water at 120°F. If the waste pipe is 10 feet long, how much will this temperature increase cause it to lengthen?

Increase in length = 10 feet x (120°F − 60°F) x 0.0001 Fahrenheit.
= 600 x 0.001
= **0.06 Feet** or 0.06 x 12 = **0.72 Inches,** nearly ¾".

Using the coefficients given in Table and the rule on the left, it is possible to find out just how much a given length of material will alter for a given change in its temperature:

Work out how much a 10 feet long copper waste pipe would have expanded for the same temperature rise, and you will appreciate just how much more polythene expands than copper. You will also realise just how important a knowledge of thermal movement in materials is in the design and fixing of pipes used to convey hot water.

Thermal movement of pipework: application

Small as these changes in material size may appear to be, the fact remains that they are irresistable and can exert a considerable push or pull on anything which tends to restrain their movement. Unless suitable precautions are taken to accommodate thermal movement in pipework, one or other of the following troubles will arise:—

walls.

i. The tube will buckle or "snake" if its ends are restrained from movement by being solidly built into walls.

ii. If the tube is of such diameter

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● *A section of the new Baxendale Showrooms at Capel Street.*

BAXENDALES OPEN NEW SHOWROOMS THIS MONTH

BY
A CONTRACTOR REPORTER

THE most recent innovations and economical methods of domestic heating will take pride of place in a new and extensive Show Room which Baxendale & Co. Ltd., in conjunction with Irish Shell Ltd., will open on October 18 next at their premises in Capel St., Dublin.

Extensive reconstruction work has been in progress for the past six weeks transforming what until recently was the Show Room of the plumbing department into a spacious, glass surrounded ground floor show piece demonstrating the latest in oil fired boilers and solid fuel boilers, as well as displaying a wide variety of tools of particular interest to the heating and plumbing trades, electrical goods, sanitary equipment, and ironmongery.

This latest addition, which brings Baxendale's total of Show Rooms to six, has been made at the instigation of Mr. J. P. Murphy, General Manager, who for a number of years has been a firm advocate of the desirability of having a first-class show room devoted to giving a comprehensive and tangible picture of the new role which modern heating can play, particularly when channelled to domestic purposes.

Baxendale's new Show Room has come as the culmination of Mr. Murphy's conviction that the increasing tendency of builders to incorporate central heating in new housing schemes is indicative of an already available lucrative market—a market which will become even more widespread as an ever increasing number of ordinary people come to the realisation that the installation and running costs of modern domestic central heating are well within the financial resources of the average householder.

Under direction

THE planning and organisation of the Show Room has been under the direction of Mr. P. O'Kelly, formerly of Baxendale's Ironmongery Department, and now head of the heating section of the Plumbing Department, who has spent a considerable period studying the technical aspects of this new branch.

Mr. S. Kiernan, Manager of the Plumbing Department, has also given considerable assistance in the designing and planning necessitated by the new venture.

The ground floor show room will

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be officially opened by "Mrs. 1970," and Baxendale's have issued a cordial invitation to all connected with and interested in the trade to go along and inspect the numerous exhibits and witness the demonstrations of the oil fired boilers. The date is October 18 and the time—6 p.m., for the opening ceremony at 6.30 p.m. Light refreshments will be served.

With the emphasis on central heating, a complete section has been devoted entirely to it—it is of interest to note that among the oil fired boilers on view will be:—

- REDFYRE,
- CENTROMATIC,
- WILSON,
- PAULOMATIC,
- JANITOR.

A number of solid fuel boilers on display will include:—

- WATTS,
- TRIANCO,
- IDEAL,
- CRANE,
- AMANDA.

Several of the oil fired boilers will be kept in continual operation, which will have the dual advantage of demonstration, and provision of a warm even temperature, ensuring the com-

from page eleven

"MRS. 1970" TO OPEN NEW SHOWROOMS

fort of the general public, who will at all times be most welcome to inspect the Show Room.

New unit

OF more than ordinary interest to visitors to the Show Room will be the new "Beanco Home Heating Unit," which has just been released on the Irish Market.

It has been accurately described as an economical method of warming a home, and ensuring that it is comfortable and damp free. Baxendale's, and in particular Mr. P. O'Kelly of the heating section of the plumbing department, would appreciate the opportunity of discussing details, and answering enquiries from members of the trade about the new system, when they attend the opening of the Show Room.

This efficient and open-fire heating system consists of a special back boiler and vitreous enamel slow burning fire; four radiators with screw-on brackets; one C.P. towel rail and one circulating pump. In addition there are ten easy clean radiator valves; 30-gallon indirect cylinder and 10-gallon heating system feed tank with cock and ball.

The unit provides very satisfactory background heating in the home. The radiators may be fitted where desired, for example—one in the hall, one in the lounge or sittingroom, and one in each of the two main bedrooms, the towel rail being fitted in the bathroom, thus distributing extra heat throughout the home.

In a standard house the back boiler, usually fitted in the living room, has a heating capacity only sufficient to provide domestic hot water, whereas,

continued overleaf

• Mr. Dermot Luke (extreme right) shows the new heater to a group of traders.

THERMODARE INTRODUCE NEW HEATER

THE latest addition to the Thermodare home heating plan is a new and revolutionary heater specifically designed to meet the requirements of domestic central heating. Launched on the export market with great success last March, Model D. 25, pictured here, is now available in Ireland, and can boast of two unique "firsts"—it being the first and only storage heater with thermostatic control, and also the first and only storage heater with a built-in thermal link.

The basis on which the new heater has been built is the domestic storage system, which uses electricity mainly during the night at specially low "off-peak" rates to produce heat which by new methods of storage and release radiates a comfortable overall warmth in every room throughout the twenty-four period.

The new Thermodare heater has five selected comfort positions as well as a positive off-switch on the control knob. Once the regulator has been set to give the required comfort conditions, no further adjustment is necessary. The heater is fitted with a safety thermal link which will fuse if any accidental overheating takes place.

Available in two-tone finish of either fawn and light grey or dark brown and light grey, Model D.25 has a loading of 2.5 Kws. Its dimensions are 23" x 12" x 31".

Designed and manufactured by Unidare Ltd., Finglas, Dublin, the new heater is selling at £17 15s. 0d.

The heater, which meets fully the requirements of the Clean Air Act and is easily transferable from one house to another, was recently introduced to electrical and heating contractors at a reception in Unidare by Mr. Dermot Luke, Manager, Heating Division, Unidare Ltd., and attended by Mr. P. H. Greer, General Manager.

from previous page

Baxendale showrooms

the special back boiler supplied with the Beanco Home Heat Unit is very much larger than the standard back boiler, and this extra capacity is sufficient to provide the heat necessary to warm the radiators, thus using heat that would otherwise escape up the chimney.

Incorporated in the unit, which may be fitted in an existing home or in a house in the course of construction, is the Redfyre Bacboiler No. 4A, with 60 C.B. fire. And Baxendale's are also in a position to supply equipment to provide full central heating—fully automatic boilers either solid fuel or oil operated—of the most modern type.

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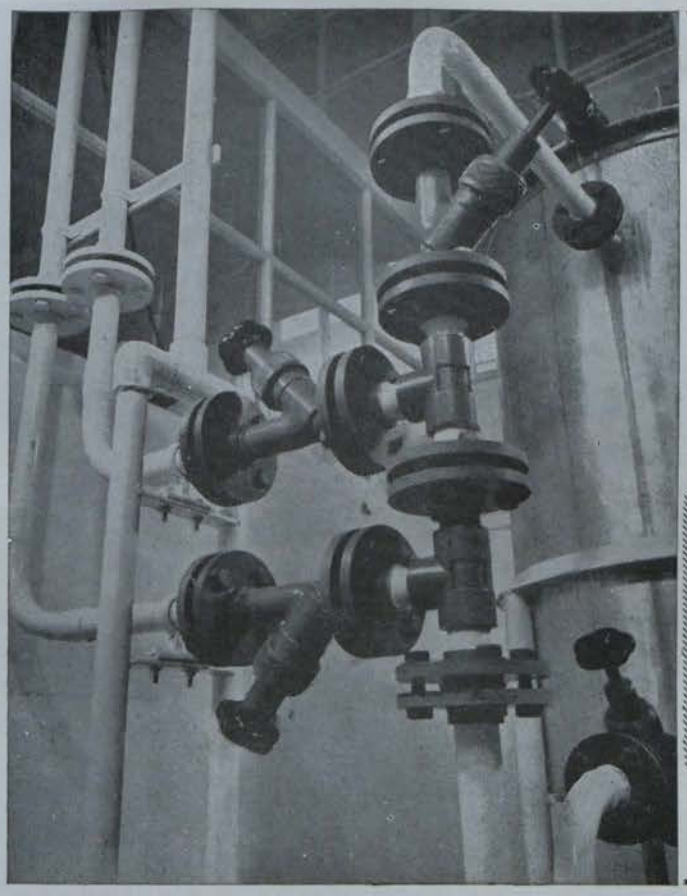


We chose Wavin PVC...

AT CASTLEFORBES WORKS

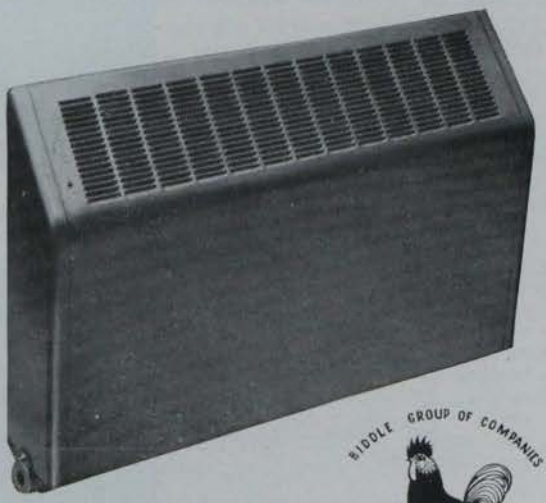
Castleforbes Works had a problem! A highly corrosive chemical, used in their modern manufacturing process in Dublin made very short work of conventional pipes. This could mean frequent renewal of the pipe-lines, with consequent loss of production and the risk of dangerous bursts—but they chose Wavin PVC because Wavin PVC Pipes are immune to chemical attack. They are also inexpensive and easy to instal, with a *complete* range of PVC fittings. And they solved their problem efficiently and cheaply.

If you have a problem in pipework, why not consult Wavin—the pioneers of PVC in Ireland.

wavin

WAVIN PIPES LIMITED
CIAN PARK, DRUMCONDRA, DUBLIN 9
Telephone : 48000 or 373614/6

Keep Warm with VECTAIR 45



Warmth in every corner of the room . . . when you install Vectair 45. Your customers will thank you for introducing them to this unique Convector and here's why:—

• Attractive contemporary appearance. • Superior heat distribution and air movement at a price comparable with an ordinary radiator. • Occupies less space than an ordinary radiator due to high capacity element. • Rapid warm-up but no danger of burns. • Cabinets removeable for protection during decoration, and for access to elements. • Cleaning only requires a wipe with a damp cloth — no dust traps.

Quadrant Engineers **6 Mount Street Crescent, Dublin, 2.**

Agents for F. H. Biddle Ltd., London.

● **Pictured at HEVAC by a Contractor cameraman . . . . Full product picture report next month.**

HEVAC EXHIBITION OPENED AT OLYMPIA

MR. C. J. ATKINS, M.I. Plant E., Chairman of the first International Heating, Ventilating and Air Conditioning Exhibition, told a press conference at Olympia, London, last month that the exhibition opened at a moment when our industry is reaching unprecedented production achievements and at a time when the importance of a clean atmosphere to public health is in the news.

There was an important fact that should be emphasised. HEVAC would show not only that equipment usually associated with the title but also that concerned with industrial air treatment and handling such as filtration, dust, grit, fume collection and mechanical draught, and all ancillary equipment applied to the wider industrial field.

HEVAC was therefore directly concerned not only with heating, ventilation and air conditioning from the comfort aspect but also with improvement of working conditions in factories, clean air and atmospheric pollution.

The exhibition would show vital new technical advances, particularly in fuel economy, which significantly affect the basic economy of the whole country—helping both the suburban housewife who is concerned with reducing her fuel bills and the industrialist who has the same anxieties but in a much bigger way.

"As I have mentioned," said Mr. Atkins, "the greater part of our business is in industrial equipment and it must be realised that almost every product that comes on the market, from aspirins to atomic power stations, require air treatment equipment of some sort such as heating, cooling, filtering, drying or humidifying in the manufacturing process itself. The more modern the process, the greater the need and the pace is ever increasing."

● *Mr. R. Brown (left), Sales Manager, British Steam Specialities Ltd., Leicester, discussing the new Ventalarm Tank Fill Signal Device, at the first International Heating, Ventilation and Air Conditioning Exhibition at Olympia, London, with Mr. Charles Fitzsimmons, Manager, London Branch, which caters for the Irish market. Mr. Fitzsimmons is a former manager of the firm's Dublin Branch.*

● *Messrs. A. Nocton, London Director, and G. Hanson, Technical Manager, discussing the "Del-Flo" heating valve with Mr. W. H. Leech (left) who is the Irish representative for Hattersley (Ormskirk Ltd.), at Olympia.*

● *Mr. Pat Noone (left), Heatovent Ltd., Irish agents for Trianco Ltd., with Mr. J. Hussey, of Thomas Heiton and Co. Ltd., Dublin, inspecting one of the solid fuel boilers from the Trianco range of Solid fuel and oil fired boilers on view at the Hevac Exhibition.*

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Questions Answered

Each month this column will solve some of the everyday problems of the plumbing and heating engineer when our consultants deal with queries directed to "Questions Answered." All queries will be replied to and the most interesting published.

Several of our clients have suffered costly renewal of furred up and burned out heat exchanger units of their gas water heaters. We wonder if it is possible to offer some kind of maintenance descalent service. Your comments would be appreciated.

THE plumber can undertake chemical descaling of scaled gas water heat exchangers without a great deal of trouble. The outer casing of the appliance is removed to reveal the tubed heater body. At the top end of this is the finned heat exchanger where the greatest heat transfer from fuel to water occurs and therefore the most stubborn scale deposits will be found. Reference to the appliance maker's maintenance instruction manual will be a useful guide to this dismantling procedure though not essential if one proceeds with care and in a systematic manner.

Disconnection of the unions to the inlet and outlet water pipes will, in most makes of appliance, enable the removal of the heater body from the appliance.

Transferring the heater body to a convenient working place, the unioned return bends are disconnected from the finned element. The entire body is then turned upside down into a plastic bowl containing the chemical descalent. The quantity of descalent should be just sufficient to cover the fins of the heat exchanger when immersed. The descalent can then attack the scale through the tubes from which the return bends have been removed. The secondary heating tubes which spiral down the outside of the body can be treated by pouring descalent from the bowl into the tube ends so that it gravitates through them back into the bowl.. The return bends are simply treated by immersion in the bowl of descalent.

A useful and effective descalent can be made from a 5 to 1 dilution of water and commercial hydrochloric acid (Spirits of Salts). Vigorous effervescence will occur at first when the descalent contacts the lime deposit in the tubes. This is the customary reaction of the acid with the alkaline scale. When effervescence ceases, either the acid descalent will have become neutralised and will need replacing with fresh, or if the tubes have been cleared, then the stopping of the bubbling will indicate that all lime deposits have been dissolved.

A thorough hose rinse with clean fresh running water will remove all traces of the corrosive descalent. The return bends can be replaced to the heater and it can be refixed into the appliance.

Care is essential to avoid spilling of the acid on to floors, walls, furnishings, or clothing. It is wise to undertake this job out of doors if at all possible.

Prevention is better than cure and in districts where the water supply has a high Temporary Hardness figure **a water softener** can be recommended to give immediate comfort and economic improvement for water users and immunity from scaled heating appliance troubles.

Although it can be shown that water softeners offer remarkable savings in soap, beverage, and fuel consumptions, it is not the easiest thing to convince all clients of this.

Scale reducers of the chemical type offer a simple, cheap and effective preventive of furring troubles in water heaters of this kind.

Easily fitted into the cold water feed to the heater, the scale reducer, which contains a cartridge of Sodium-hexametaphosphate, will so affect the character of the scale as it forms that it will not adhere to the heater tubes and so create blockage or reduced heat transfer. Technically, it may be said that the scale reducer affects the molecular lattice structure of the precipitated scale. More simply, one might say that the scale reducer causes the tiny particles of furr to be rounded instead of rough and irregular in shape. Being rounded, the particles of lime do not stick together to form a hard mass but are flushed through the appliance as it is used. After a period of use which will depend upon the hardness of the water, the amount of water used, and the temperature to which it is heated, the reducer cartridge will need renewal. A period of about six months appears a sound general rule. The cartridge length is about five inches and it is fitted into the reducer body simply by unscrewing an end cap, removing the exhausted cartridge and replacing it with a new one.

* * *

The question 'Where shall I fit the safety valve?' caused a heated argument on one of our jobs. Some said 'on the boiler' others 'on the flow pipe'. Since no real agreement was reached can we have your views please?

THE function of a safety valve is to relieve any pressure within the system greater than that for which it is designed to withstand. Domestic hot water systems of the boiler-cylinder, or similar types are subject to water pressures caused by the head of water in the cold feed cistern above any point of consideration below. At roughly half a pound per sq. in. for each foot head a boiler

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situated some 16 feet below the water level in the feed cistern will be subject to a pressure of about eight pounds per sq. in.

The same applies to L.P.H.W. central heating systems but since water is not continuously drawn from these and replaced by fresh water bearing hardness forming salts of calcium or magnesium, "furring" of the boiler and partial blockages of circulatory pipework—the most frequent cause of excess pressure in boilers is avoided and the safety valve is seldom, if ever, called upon to relieve excess pressures.

Direct D.H.W. systems operated in temporary hard water districts are quite a different kettle of fish. If the water is overheated persistently or if used in copious amounts, excessive "furring" may be expected. Not only will the "furr' settle on all horizontal lodgments in the boiler and so reduce the water capacity of the boiler and hence its water heating capacity, the "furr" will adhere to the boiler walls and so insulate the water content from these hot boiler walls and thus reduce the heat transfer from fire to water with serious loss in thermal efficiency and consequent wasteful increase in fuel consumption. "Furr" blockage of circulatory pipework will retard the flow of water around the system. This aggravates the condition within the boiler because the slow moving water is bound to overheat and this leads to increased "furr" deposition in the boiler. In really severe cases the boiler plates will become so heavily coated that cooling water contact is so reduced by the "furr" coating that the boiler metal just burns away.

If the flow pipe develops a partial blockage boiler pressure will rise but not so much as when a complete blockage eventually occurs. At this stage one relies upon the relief action of **the safety valve and where it is placed** in the system relative to the boiler has a bearing on how effective it can be.

Pressure on an enclosed volume of water (as for example in a boiler connected to a blocked flow pipe) is transmitted equally and undiminished in **all** directions. Therefore, any excess pressure in a boiler tends to exert itself up the return pipe with virtually the same force as it tends to push its way up the flow pipe.

Suppose a safety valve has been fitted on a flow pipe some distance beyond the first bend off the boiler. If this first bend gets blocked with "furr" the safety valve will be inoperative since the pressures being generated within the boiler cannot pass the blockage to relieve themselves at the valve.

"Furr" deposits increase in volume the more water is heated. The hottest water in the system will be found at the top of the boiler. Therefore, to place a safety valve on top of the boiler is to invite blockage of the valve waterways and again it might become inoperative.

The return pipe of a domestic H.W. system is frequently flushed as cold water falls into the system to replace the hot water drawn off. The return pipe is generally a good deal cooler than the boiler top or the flow pipe and for this reason is less liable to "furr" deposit. It follows, therefore, and experience of boiler cleaning and flow and return pipe inspections will bear this out, the return pipe seldom blocks with "furr" and is most likely to present a pressure relief route.

We submit, therefore, that the best place for the relief valve is on the return pipe and as close to the boiler as possible.

In Reply . . .

Last month, in a letter to the Editor, Mr. J. C. Parry-Jones, of Killiney, pointed out that in a "Questions Answered" feature on cold water pipe condensation, we made no mention of the "correct use of vapour barriers." In reply our consultant had this to say:—

Mr. Parry-Jones' discerning and helpful observation regarding the importance of suitable vapour barrier incorporation with insulant antidotes is gratefully acknowledged.

The term 'vapour barrier' was avoided in the reply to the question on this problem of condensation on cold water pipes because it is not commonly used by the trades. The reply as given did refer the reader to other articles which appeared or had appeared in the Journal. These did point out the need for care to avoid moisture penetration of insulants (page 6 Aug. issue and page 19 July issue). It was considered, as Mr. Perry-Jones has demonstrated, that readers would thereby realise the need for some over-wrap to prevent undue absorbtion resulting in deep seated condensation.

● **The tabulated figures below are a revision of those which appeared in the June issue in connection with the second instalment of "Plastics in Plumbing." The revised table contains a number of alterations which should be carefully noted.**

DETAILS OF PIPE SIZES IN ACCORDANCE WITH L.G.D. PROVISIONAL SPECIFICATION—JUNE, 1958.

Nominal Size of Pipe. Ins.	CLASS B.		CLASS C.		CLASS D.	
	Wall Thickness. Ins.	Internal Diameter. Ins.	Wall Thickness. Ins.	Internal Diameter. Ins.	Wall Thickness. Ins.	Internal Diameter. Ins.
⅜" ...			0.04	0.39		
½" ...			0.045	0.54		
⅝" ...			0.055	0.68		
¾" ...			0.065	0.85		
1" ...			0.085	1.09		
1¼" ...			0.105	1.36		
1½" ...			0.12	1.73		
2" ...	.090	2.30	.126	2.23	.165	2.15
2½" ...	.106	2.74	.153	2.64	.197	2.56
3" ...	.126	3.29	.181	3.18	.236	3.07
3½" ...	.142	3.65	.200	3.53	.260	3.42
4" ...	.153	4.02	.224	3.88	.287	3.76
4½" ...	.173	4.57	.252	4.41	.326	4.27
5" ...	.197	5.12	.283	4.94	.365	4.78
6" ...	.224	5.85	.323	5.65	.417	5.46

CLASS "B"—Suitable for Working Pressure of 87 pounds per square inch.
CLASS "C"—Suitable for Working Pressure of 130 pounds per square inch.
CLASS "D"—Suitable for Working Pressure of 173 pounds per square inch.

from America comes news of a

NEW CENTRIFUGAL HEAT PUMP

WHAT is claimed to be "the world's first centrifugal heat pump using outside air as a source of heat in winter," has been put into operation at the Masland Duraleather Co.'s new £300,000 plant in North Carolina.

Russell Gray, President of Carrier Air Conditioning Co., which built the equipment, said the new system has a cooling capacity of 280 tons. He predicted the installation would mark the start of a trend toward far greater use of outside air-source heat pump equipment in large buildings as a means of reducing heating and cooling costs.

Gray noted that, prior to the installation at Masland Duraleather, large capacity air-source heat pumps used a number of reciprocating units or a combination of reciprocating and centrifugal compressors. This installation uses only centrifugal units.

Gray said the operating cost of the Masland system is expected to be only half as high as that for a conventional system with separate heating and cooling plants.

The new system for the 140,000 sq. ft. plant consists of two electrically-driven centrifugal chillers. The larger unit has a cooling capacity of 200 tons, the other provides 80 tons' cooling capacity for process chilling.

"In summer, the larger machines remove heat from interior spaces and transfers it to the outside through a cooling tower," it was explained. "In winter the cycle is reversed. Heat from cold outside air will be extracted as the air is pulled through a large coil containing antifreeze. Heat from a process load obtained by the smaller chiller will supplement the winter heating system as an economy measure.

"During the plant's two-shift operations, conditions of 80° and 50% relative humidity in summer and 72° in winter will be maintained."

Heat and cold will be transported in a closed water-piping circuit between the heat pump and air conditioning equipment spaced about the building, he said.

NEWTON CHAMBERS SHOW NEW BOILER

TO be shown for the first time at the London Building Exhibition by Newton Chambers & Co., Thorncliffe, Sheffield, are the new fully automatic oil-fired central heating boilers—the Redfyre Centramatic 35, one of the 1961 Design Centre Award winners, and the Redfyre Centramatic 50 Series II. (Contractor, July).

The Series II. which is just on the market, is in size and shape an exact replica of the Centramatic 50, which was the first oil-fired boiler designed to standard kitchen equipment size (36 ins. high, 24 ins. wide, and 21 ins. deep). Completely insulated, the Centramatic 50 Series II. may be safely installed between other kitchen units, and provides an additional working surface of 504 inches. Irish Agents: Baxendale & Co. Ltd., Capel St., Dublin.

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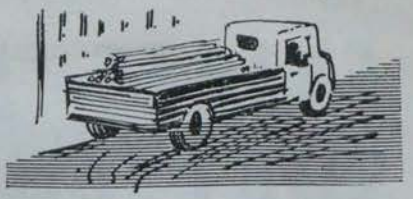
Increasingly the plumber uses plastics in his day-to-day work and this series of articles propose to deal thoroughly with their applications to the trade.



PLASTICS IN PLUMBING

PART FOUR

IN the last article of this series we dealt with the type of joints generally in use for both small and large bore hard PVC pipes, and for the small bore polythene pipes. It is now proposed to say something on the question of the laying of watermains and then the connection of service pipes to them.

Laying of hard PVC watermains

Excavation:

The extremely light weight of hard PVC pipes and fittings and the methods of jointing them advocated by Wavin Pipes Limited make it possible to use a narrower trench than that required for pipes of traditional materials. It should be noted especially that no joint holes are necessary other than at points where valves or hydrants are required on the line. Very considerable savings in the cost of excavation can be effected by using a narrow bucket on the excavator. The cost of reinstatement is also greatly reduced due to the narrower trench.

The usual precautions must be observed in the preparation of the bed of the trench. The bed or bottom of the trench should be free from points of rock, stones or other hard and sharp objects. Where the pipe must be laid through rocks, it should be placed on a bed of fine material at least 3" thick and surrounded with at least a similar thickness of fine material. Hard PVC pipes should not be laid in direct contact with other pipes or rigid structures such as manholes. They should be prevented from coming in contact with such fixtures by means of a layer of 3" or more of soft material.

By

D. C. COYLE

M.E., M.I.C.E.I.

M.I.P.H.E., A.M.I.C.E., A.M.I.W.E.*

**Technical Manager, Wavin Pipes Limited, Dublin.*

Backfilling.

The backfilling of the trench should be carried out in the normal way used for pipes of other materials—a layer of 6" to 9" of the softest material from the excavation being placed over the pipes in the first instance and rammed down well on either side of them. Care should be taken to ensure that no boulders or hard objects are dropped onto the pipes in the trench.

Where pipes are connected to valves, teepieces, or are otherwise rigidly held, care must be taken to consolidate the backfill under and around the pipes, so that they are fully supported and not subject to loading due to settlement of the filling over or under the pipe. The use of machinery for backfilling the trench, other than the initial layer of soft material, is quite in order.

Valves and hydrants

ALL valves and hydrants tees in the pipeline must be rigidly held or fixed in position, so that no bending or twisting of the pipes occurs when the valve is either opened or shut. This anchoring may be accomplished by means of a mass of concrete covering part of the metal casting and well rammed between it and the side of the trench or valve chamber. Such concrete should not be allowed to interfere in any way with the bolting of connections to the valve or teepiece.

Where valves and hydrants are enclosed in chambers ,it may be possible to support the valve or hydrant by strutting it from the walls of the chamber. Where the pipelines pass through the wall of the valve or hydrant chamber, it should be surrounded with a layer of felt or other material.

Anchoring of Bends.

All bends on the line of a watermain must be adequately anchored to resist the thrust due to the pressure of the water in the pipe. It is desirable therefore that the trench should be kept narrow at bends and not allowed to become a large and irregular hole. The actual anchoring may then be accomplished by means of a mass of concrete under and around the pipe and between it and the side of the trench on the outside of the bend. The pipes on either side of the concrete must be supported on well rammed material, otherwise, differential settlement of the bend and the filling material over the pipe will place undue stress on the pipe at the point where it leaves the concrete.

Testing of pipelines

WHEN testing hard PVC pipelines, the blank ends of the mains must be braced in the usual way to prevent pulling or opening of the joints when the pipe is being subjected to the water pressure test. This applies especially to joints of the shrink type, which whilst they are able to withstand considerable longtitudinal pull, will nevertheless move or open if the end of the pipeline is not rigidly braced.

The test pressure should be applied in the usual way and to the limits set down by the Specification. It is usual to test pipelines to 1½ to 2 times the working pressure, for the particular class of pipe being used.

The details set out above show that the laying of hard PVC watermains does not involve any special precautions, other than those taken when laying a pipe of cast iron or asbestos cement. The ease of handling of the very light hard PVC pipe results, of

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PLASTICS IN PLUMBING

course, in very much reduced transport cost and ease of handling on site. The cost of transporting pipe to the site is approximately one quarter or less the equivalent cost for cast iron pipe.

Installation of hard PVC service pipes

For connection of the service pipe to the watermain, some form of tapping saddle or strengthening ring around the pipe is required. Owing to the thin wall of the PVC watermain it is not possible to screw ferrules directly into the hole tapped in the wall of the pipe. A procedure somewhat similar to that used when making connections to asbestos cement pipes is necessary.

For the making of service connections to hard PVC watermains a number of saddle connections have been proposed. The most outstanding of these is the WAVIN PATENT ALL HARD PVC SADDLE.

Hard PVC tapping saddle

THE Wavin hard PVC saddle consists of 4 pieces—top and bottom sections, shaped to fit the outer diameter of the pipe and two wedge pieces, which slide over suitably shaped ledges on the top and bottom section, thus clamping the saddle tightly to the main.

The upper section of the saddle is provided with a boss, which in turn is tapped with a B.S.P. taper form thread. A rubber ring is partly recessed into a saddle top under and surrounding the tapped boss. The wedges are pushed home, thus clamping the top and bottom sections together tightly onto the main. The rubber ring is compressed between the top of the pipe and the top section of the saddle, thus giving a watertight joint.

Making a connection to a dry main

THE procedure in making a connection to a dry main is as follows:—

(1) Mark on the top of the main the position of the proposed tapping and cut a hole of the required size in the hard PVC pipe, using a carpenter's brace and a tank cutter—or an ordinary wing type cutter. Remove all burrs from the edges of the hole by means of a knife or file.

(2) Place the top and bottom sections of the saddle on the main—making sure that the tapers, on either side of each item, face in the same direction. Ensure that the outlet in the saddle boss is accurately positioned over the hole in the pipe. Then with the saddle bottom directly under the top section slide the wedges into place on either side of the saddle.

As pointed out previously, the rubber ring which is provided around the outlet hole in the upper saddle section is compressed between the pipe and the saddle top, thus ensuring a watertight joint between saddle and pipe.

The ferrule of whatever type you require is then screwed into the saddle boss. A smooth and grit free jointing paste should be used. It is preferable, however, to use PTFE jointing tape, which is now readily available from a number of manufacturers throughout this country.

Connections to main under pressure

FOR the making of branch connections to hard PVC watermains which are actually full of water under pressure, Wavin have developed a patent hard PVC main Self Tapping Ferrule. This ferrule is used in conjunction with the saddle referred to in the previous paragraph.

The self tapping ferrule consists of hard PVC body with the outlet or section for connection to the saddle screwed with a B.S.P. taper form thread. The self tapping ferrule is screwed into a suitably sized saddle boss using, as in the case of any other type of ferrule, a good jointing paste or PTFE tape. The ferrule contains a plug of non-ferrous material which has a cutter formed on the bottom of it. The outlet from the ferrule consists of a screw tail or branch with a B.S.P. form paralled male thread. Wavin have a full range of fittings for connecting hard PVC pipes to the tail of the ferrule.

When the service pipe has been connected to the ferrule the combined plug and cutting head is screwed down inside the body of the ferrule and cuts through the wall of the pipe. The piece of hard PVC cut from the watermain is retained inside the cutter. The combined plug and cutter is then screwed up inside the upper body section of the ferrule so that it does not obstruct the outlet water passageway. The cap is then replaced on the ferrule.

The water may now pass freely from the main to the service pipe or branch connection—and may be cut off at any time by simply screwing down the combined plug and cutter to plug the hole in the wall of the hard PVC watermain.

In the next article of this series we will deal with the question of laying of service pipes, both of Polythene and hard PVC, and the general domestic installation.

AN ARMITAGE WARE 'FIRST'

ARMITAGE ware has been seen at Olympia many times but 1961 marks the first occasion on which Armitage Ware Ltd. has exhibited at the Building Exhibition with a stand of their own.

Pioneers in the field of coloured sanitary fixtures, Armitage Ware show amongst their exhibits pieces in ten different colours, including the recently introduced orchid and sky blue. Other colours to be seen are cream blue, light coral, green, grey, primrose, turquoise and fawn.

Represented

Genuine vitreous china plumbing fixtures are represented mainly by the modern and very attractive "Nuastyle" Series three patterns.

Exhibits include the new "Salonex" hairdressers' basin in vitreous china complete with hot tap for pre-heated water with flexible tube and nylon handspray and the redesigned "Aqualon" drinking fountain.

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HEAT: ITS EFFECT ON PLUMBING MATERIALS

and wall thickness that it resists the tendency to buckle, then the expansion and contraction forces will impose severe and damaging strains upon walls into which the pipe is built.

iii. Thermal movement of tubes through tight wall openings will give rise to unpleasant scraping noises, which will be transmitted throughout the pipework system.

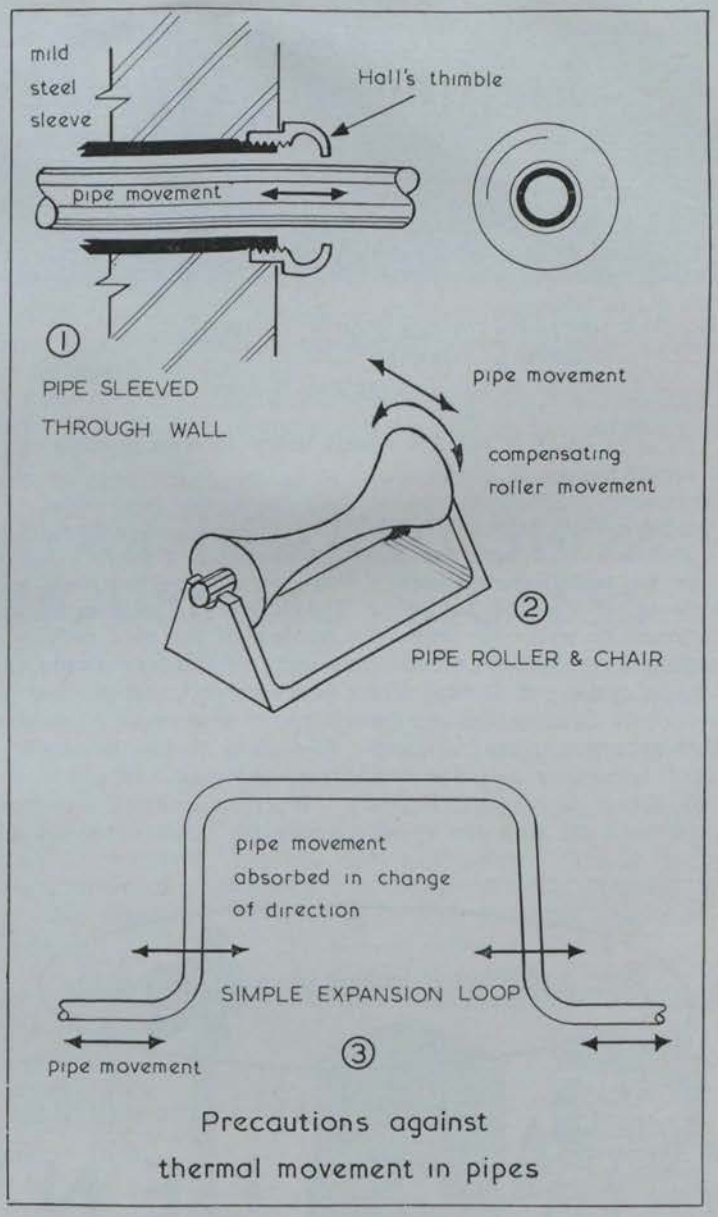
Precautions

The precautions taken generally include:—

i. The provision of purpose made pipe sleeves. These are cut from odd lengths of mild steel tube, and are built into the wall. The smaller pipe is then passed through the sleeve, and is thus given freedom of movement.

ii. The provision of some form of expansion absorber at some point on a long pipeline which is liable to be affected by large variations of temperature. In some cases a simple loop is formed in the pipe. This can be frequently done by means of fittings and a simple diversion of the pipe route. Sometimes special expansion loops in the shape of a horseshoe are employed. Take note that all expansion loops should be fitted in the horizontal plane, i.e., in line with the ceiling or floor, in order that sludge or air pockets should be avoided. As an alternative to loops, specially made expansion fittings can be inserted in the pipelines where necessary.

Cast iron smoke pipes from boilers are often wrongly built solid into the flue wall. When the boiler is lit the smoke pipe gets very hot and expands, often to a degree sufficient to fracture the brickwork of the flue. A good dodge in such cases is to wrap the cast iron pipe with two thicknesses of stout paper before building it into the brickwork. As the pipe heats up the paper scorches away, and the small gap which it leaves will generally be enough to accommodate the increase in pipe diameter on heating up.



Precautions against thermal movement in pipes

FIG. 1 illustrates the effects of heat movement on pipes and fixings, and shows some types of precautionary measures against expansion which are commonly employed.

Temperatures of up to 140°F have been recorded on the surface of metal roof coverings in this country. The difference between this temperature, which is caused by heat from the summer sun, and the freezing and below freezing temperatures of winter, are considerable. Cleary, some precautions against the effect of thermal movement in metal roof coverings is essential. Even the inevitable variation of temperature between day and night can give rise to serious troubles unless simple, common-sense measures are taken to accommodate the expansion and contraction or roofing metals.

What thermal movement should be expected and how can one best guard against its bad effects?

Here is an example. Imagine a roof 100 feet long by 50 feet wide, covered by one sheet of lead. Then suppose that this impossible but imaginary roof acquires a temperature of 120°F during the day but cools to 60°F at night. What sort of movement might one expect?

continued overleaf

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HEAT: ITS EFFECT ON PLUMBING MATERIALS

Its length increase would be: 100 feet x 60°F Temp. Diff. x 0.000016 Fah.
=0.096 feet.
=say 0.1 feet or **1.2 inches.**

Its width, being half the length would expand just over half an inch. Its superficial (area) expansion could be found by multiplying its area in square feet by the temperature rise, and again by the linear coefficient of expansion x 2 as follows:—

100 feet x 50 feet x 60°F x 0.000016 x 2.
=60000 x 0.000016.
=0.96 Square feet increase in area
or
0.96 x 144 **138 square inches increase in area.**

What would happen in the case of such expansion? Either the metal would push the extra length over the edge of the roof, if it were flat and there were no restrictions to such a movement; or, if it could not move along its length or width, the sheet of lead would rise up to form a hollow mound in its centre. If it were free to move in one direction but not the other, then expansion in the free direction would take place over the roof edge, but the expansion the other way would make the lead rise up all along the centre line of the sheet, parallel to the fixed edges.

If the sheet were free to move in all directions it would push outwards as it expanded, but on cooling it would have to pull back again. The friction of the roof decking and the weight of the lead would resist this backward pull, and the lead would be subject to severe tensile strains. Eventually it would stretch, become thin, and tear.

Where restriction of movement causes the sheet to rise up when expanded by heat, it will return to flat on cooling. If these movements are repeated, as they would be with each temperature change, the lead would become "tired" or fatigued, just as a piece of wire can be brought to fatigue by being sent back and forth. The wire will break. In the same way the fatigued lead sheet will split and crack at the points where it has risen and fallen.

All other roofing materials would behave in the same way—lead is merely an example. The only possible difference between the behaviour of lead and materials like copper, aluminium or zinc would be that the lighter weight of these would almost certainly reduce the tendency to "creep," that is, to move forward on expansion but resist returning to normal on cooling. Apart from this all metal roof sheets are liable to fatigue cracking, unless suitable precautions are taken to reduce the inevitable effects of heat movement.

What are these precautions? An obvious one is to reduce the area of the pieces of metal used to cover a roof area. By this means the overall area expansion is divided among a large number of smaller sheets or

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HOT WATER FOR BUNGALOW DWELLINGS

in the tank, so we have no alternative but to run them under the floor.

From the drawing it will be seen that this leads to a trapped circulation, and so provision must be made for air release from the boiler. If at all possible, this should be an open vent of ¼in. bore running up to project over the roof, but if this is not possible, an air release valve such as those made by Spirax, etc., must be used.

It is also advisable to fit a good quality safety or pressure-relief valve on the flow pipe as near the boiler as possible.

As the head pressure in this job will be very low, and as circulation will tend to be sluggish, especially when the fire is started in the morning, it is strongly recommended that 1¼in. diameter pipes be installed for the flow and return circuits and 1in. for the cold feed from the store tank.

As in previous systems, the draw-off to the hot-water taps needs special attention so as to prevent air being drawn in when the taps are opened.

Again, the connection should be taken from the outlet at the crown of the cylinder, or in this particular case, it would be even better to take it at a point about 6in. down from the top rim of the cylinder, using, if necessary, a Coleman's connection if a boss is not already fitted.

Sometimes suggested

WITH a system of this type it is sometimes suggested that a pump be fitted on the return pipe to assist circulation. This is quite feasible and the pipe sizes could then be reduced to ¼in. or even less, but should pump failure occur, it would be necessary to draw the fire as gravity circulation would be very poor or even non-existent. It is recommended, however, that a pump be only installed if all other means of obtaining circulation have proved useless.

Finally, I would like to mention as a matter of interest a hot-water system which I saw some years ago near

continued overleaf

● *MR. DUNCAN PRATT, Chairman Ryax, chatting with Colr. Robert Briscoe, Lord Mayor of Dublin, at the Ryax-Donnelly's reception to mark the opening of the Raheny showhouse.*

Included are—Mr. H. V. Lamb, General Manager of Donnellys; Mr. P. G. Morris, Builder; Mr. Eugene Timmons, Deputy Lord Mayor; and Mr. S. Walsh, Atlas Furnishing Company.

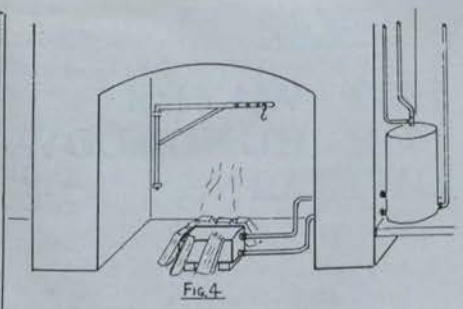
RYAX HEATING SHOW HOUSE BIG SUCCESS

SINCE its opening by the Lord Mayor of Dublin, Councillor Robert Briscoe, on September 23 last, the Show House of Messrs. P. Donnelly & Sons Ltd., 20 Georges Quay, at 120 Edenmore Road, demonstrating the "Ryax-Warmhouse" System, has attracted tremendous interest. More than one thousand visitors were shown over the house on the first "Open Sunday."

The Lord Mayor was received by Mr. H. V. Lamb, Managing Director; M/s. Donnelly, who have been appointed Irish Agents for Ryax Heating Ltd., Manchester; Mr. Duncan Prat, Chairman, Ryax Ltd., and Mr. Norman Wilkes, Manager, Agency Department, Messrs. Donnelly. A bouquet of flowers was presented to the Lady Mayoress by Miss N. Meehan, Agency Department, Messrs. Donnelly.

The "Warmhouse" system is a packaged small bore central heating system with an installation cost of approximately £160. All components are designed to ensure speedy and easy installation.

Messrs. Donnelly are now particularly anxious to contact suitably qualified fitters and plumbers who would be willing to work installing the new system. Those interested should contact Mr. Norman Wilkes at 20 Georges Quay, Dublin.



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HOT WATER FOR BUNGALOW DWELLINGS

Kilkelly, Co. Mayo. The bungalow—a modern structure with red-tiled roof and yellow washed walls—had an open fireplace to burn turf and was complete with crane to hold pots. Resting on two firebricks on the hearth floor was an ordinary copper back boiler connected by light gauge copper pipes to a copper cylinder fitted in a recess at the side of the fireplace.

The turf fire was built up in the usual manner around the boiler, so that a glowing mass of hot ash and flame surrounded it and so gave a very plentiful supply of hot water. From the cylinder a connection was taken to supply a modern enclosed bath, wash-basin, and sink.

Water supply from rainfall

The bathroom also contained a low-level W.C. suite connected to a septic tank. All the water supply was obtained from rainfall and was stored in a large underground tank made of concrete and protected from pollution. From this tank the water was pumped to a higher level for domestic use.

Although the bungalow was situated in a sparsely populated district at the edge of a bog, all modern amenities, including electricity, were available, and shows what can be achieved in rural areas, where local conditions require special consideration.

The sketch, Fig. 4, will give some idea as to how the boiler installation was arranged.

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AN IRISH PLUMBER & HEATING CONTRACTOR SPECIAL SURVEY

PLUMBERS METALS & TOOLS WELDING EQUIPMENT

LEAD: THE TRADITIONAL PLUMBERS MATERIAL

LEAD is the traditional plumber's material. Its endurance through many centuries testifies to its excellent lasting qualities.

Lead in milled sheet and pipe form (B.Ss. 1178 & 602) finds extensive specification where durability, ease of manipulation in situ. and some degree of flexibility are factors of some importance.

The weight of lead and its rather low mechanical strength, which demands greater thickness and therefore greater weight in compensation, is often quoted as a serious disadvantage of this metal. For certain light constructions this is not denied but for solidly designed buildings with some measure of permanence, these problems of weight are easily overcome by suitable substructure and support design.

Cast lead in sheet form is not commonly used nowadays but in restoration work one often finds it specified that the old cast lead be stripped off, re-cast and re-applied to the roof as before. One or two firms specialise in this class of work.

For flashings in lead, a recent innovation, milled sheet lead in coil form in widths of 6ins. to 24ins. offers facility in transport to site, ease of handling on the roof, and reduces material wastage in off-cuts. This is but one example of how manufacturers are meeting the current trend for labour and material economies aimed to securing higher productivity at reduced costs.

Lead welding, or leadburning as it is more commonly known, is one other example of the application of modern techniques to a material steeped in antiquity. Leadburning offers remarkable savings in time and material. **In soil pipe work,** for example, a wiped joint on 4in. lead soil branch to a brass ferrule needs some four lbs. of plumber"s solder. An equally effective joint can be produced by leadburning using scraps of milled lead as a filler rod. The labour constant remains much the same for both joints but the cost economy of four lbs. of solder on each joint is obvious.

In roofwork too the economic and productive use of welding equipment can be seen. A lead slate to weather a soil pipe penetration of a roof, for example, may occupy a plumber and mate in, say, a couple of hours of laborious bossing. By simple geometric development, cutting, forming and jointing by leadburning, the same detail can be produced effortlessly and in many ways better, in about 15 minutes.

The welding equipment is not expensive. A complete kit (except cylinders of Oxy-Acet.) will cost no more than £12. Alternatively, the torches, hoses, regulators, etc., may be purchased separately as manufacturers' catalogues will show. The initial outlay on this item of the up to date plumber's equipment will be quickly repaid within the course of a few hours' use on the job.

Modern leadburning techniques are quickly learned by the competent plumber. Those who have had little or no experience in this work might find attendance at a Technical College course both interesting and profitably instructive. All will find the Lead Development Council Bulletin 118, "Practical Notes on Leadburning," a very helpful guide. It is obtainable free of charge from 34 Berkeley Square, London, W.1.

There is a **noticeable trend** toward the usage of what are known as "hard" metals in plumber's work today. Copper, aluminium and zinc are being more frequently specified. This trend will continue where light

continued page thirty-three

This special survey—the fourth in a series on important aspects of the plumbing and heating trades—has been compiled by technical expert A. L. Townsend, M.R.S.H., M.I.P., R.P.

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PLUMBERS METALS & TOOLS WELDING EQUIPMENT

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Copper in sheet, coil, or tube forms are well established as plumber's metals.

The speed and ease with which light gauge copper tube to B.S.659 may be installed is well known. Soft copper tube for underground use to B.S.1386 finds increasing use in districts where corrosive soil conditions or plumbo solvent waters obtain. For particularly aggressive soils protected copper tubes are obtainable. The B.S.1386 coiled tube can be had sheated in the chemically inert polythene to combine the mechanical properties of copper with the corrosion resistant properties of polythene. For underground gas services which demand a truth of invert and hydraulic gradient for condensate drainage, can be laid in corrosive soil in the more rigid half hard B.S.659 tube protected by adherent sheathing of P.V.C.

Tools are mechanical aids. Mechanisation reduces labour fatigue and increases productivity. The careful selection and wise application of powered hand tools exercises the thoughts of all forward looking plumbers and heating engineers to-day. Tool manufacturers offer a bewildering range of equipment all designed to secure that desirable economy of labour and increased productivity.

Electric powered drills comprising a standard ⅜in. drill with a no-load speed of 300 r.p.m. will accommodate tipped drills bits up to 1½in. dia. and cored bits from 1in. to 2in. dia. The hollow cored bits remove less spoil and therefore offer a faster drilling rate. Such drills enable speedy, accurate and clean drilling of pipe-ways for heating, D.H.W., and sanitary pipework. They may seem expensive at first sight but their time saving potential, as with so many other modern power tools, is so great that the question becomes not "can we afford it?" but rather "can we afford not to have it?"

Power saws save time and provide more accurate and less disturbing cutting away for inset equipment or for chases for pipework. Abrasive discs attached to electric drill-like machines will saw into brick, stone, or even concrete at a quite rapid rate and with no more effort for the operator than supporting and controlling the tool.

A quick change of circular saw blade for the abrasive discs will convert the powered masonry saw to a wood saw. In this form it speeds the cutting for lifting of floorboards.

Percussion hammers speed the job of fixings to many different kinds of material. They also relieve labour from this boring task and free them for more productive work. Fixing tools of this kind have recently been very much improved on earlier patterns. The newer tools are more efficient and with added safeguards such as captive bolts and interlocking firing mechanisms.

Motorised pipe threading machines take the labour out of this irksome task. One recent innovation is an electric powered device which converts ordinary hand stocks to mechanised ones. In this form it is likely to appeal to plumbers and heating engineers dealing with the smaller diameter M.S. tubes.

Even electrically driven screw drivers to speed the screw are now quickly being adopted by progressive operatives and firms alike. One could go on for a long time outlining the many splendid developments which tool manufacturers have now to offer. One has only to look at any cutting job and question "is there a better and quicker way"—an examination of the powered tool range displayed by your nearest stockist will almost certainly show you that there is.

Welding Equipment has always found a place in the heating engineer's kit. With the decided trend toward "hard" metal usage in plumber's work it becomes increasingly necessary for the plumber to learn the basic principles and skills of welding and to come to regard the welding kit as a tool of the up-to-date plumber.

Its application in leadburning has already been mentioned. The increasing tendency toward ducted sanitary systems in light gauge copper tube results in a need for plumbers being able to bronze weld this material as so used in this important branch of plumbers' work. The basic kit as needed for leadburning can be used

continued overleaf

FROM KOSANGAS

McMULLANS KOSANGAS LTD., 28 Upper O'Connell St., Dublin, are marketing two high pressure torches, the Gun and Blow torch.

The high pressure gun type torch with adjustable gas inlet and adjustable air shutter, works with high pressure gas and must be connected with high pressure rubber hose and clips to high pressure regulator 2020 or Regio high pressure regulator. Designed for indoor work, the torch can be supplied with a variety of burner heads.

The high pressure blow torch, with needle control valve for gas adjustment, can be supplied with a burner head: "A" (large)—gas consumption approximately 6.6 cu. ft. per hour or burner head, "B" medium, with a gas consumption of approx. 3.5 cu. ft. per hour.

● HENDRON BROS. (Dublin) LTD., 37/39 Upper Dominick St., have five departments specially maintained for plumbing and heating engineers: 1—Front Stores which stock Ridgid pipe tools, Sievert blowlamps, Murex electrodes and Baddeley cutting torches; 2—The Fittings Department, which has a selection of Laco pipe bending machines and enormous stocks of Instantor and Crane fittings; 3—The Piping Department with its large stocks of steel, copper and plastic piping in all sizes; 4—The Main Stores, where Murex and Baddeley welding equipment is on display; and 5—The Pump Department, where Stork circulators can be inspected and discussed.

● Our picture shows MUREX equipment in use.

PLUMBERS METALS & TOOLS WELDING EQUIPMENT

from previous page

for bronze-welding simply by the addition of a higher capacity torch costing about £5. Thus equipped the plumber can not only leadburn and bronzeweld to profitable advantage but he can also use the same equipment to make M.S. brackets, etc., which are often needed but of necessity have to go to some specialist smithy to be made at considerable cost and frustrating waste of valuable time.

Up-to-date welding equipment is a great improvement on the older. Much thought has been given to equipment design to make it more resistant to site usage and to reduce operative fatigue. A glance through any up to the minute catalogue will offer convincing proof of this and will show that this inexpensive equipment is a "must" for the modern craftsman.

Plastic Welding Equipment for the jointing of Polythene and P.V.C. sheet or tubes is now readily available. Torches comprise a heating coil through which chemically inert Nitrogen gas passes to issue at the torch tip to heat, fuse, and exclude oxygen from the weld area. Torches with Acetylene heated coils or torches with electrically heated coils are obtainable according to choice. For site work the gas heated ones would seem to be more resistant to rough site usage.

Electric Arc Welding Equipment is bulky and on account of its function and design, rather costly. It is a somewhat specialised item of equipment which may be well known to heating engineers engaged on really large scale work, especially M.S. heating mains of large diameter where the heat input from Oxy-Acet. equipment tends to slow the welding rate. But in this field, too, considerable improvements have been made in equipment design and portability.

Availability of gases for welding does seem, in some areas, to frustrate the wish of many to engage in this modern technique of jointing. The 200 C.F. cylinder now seems to have become standardised. This is no doubt helpful to the gas suppliers and is no inconvenience to the extensive user. 200 C.F. cylinders are a bit cumbersome though and are not easily got on to a roof for plumber's leadburning in situ. This can be overcome by extending leads, though this is not desirable for several reasons. The cylinders can be hoisted—if a hoist is available. One wonders if we shall ever see the return of the older 60 F.C. cylinders which proved such a boom to the smaller consumer before the war.

from Hilti

IN his book, "Estimating for Building and Public Works," B. Price Davies shows that to drill one ½" diameter hole to a depth of one inch in good quality concrete, insert a plug and drive home a 24-gauge screw, takes in all approximately 15 minutes.

The makers of Hilti Rapid Fastening System now offer a fast, efficient, and safe alternative to this expensive procedure. Drilling is eliminated and by means of simple and inexpensive hand tools and specially designed nails and studs with external or internal threads, fixings are completed in a matter of moments. In this way up to 100 fixings an hour are obtainable without any great effort.

Hilti DX tools are safe to handle, and should not be confused with the older type Gun tools.

The efficiency of the Hilti System derives from the scientifically designed studs and nails.

With the smaller hand tools the anchorage value of a single stud or nail in good quality concrete can run as high as 2,000 lbs., while with the DX 500 tool, the pull-out force required to extract the fixing may be as high as 3,500 lbs.

The Hilti Representative in Ireland is the Calumet Trading Co. Ltd., 41 Upper Mount St., Dublin.

Rawlplug brochure

THE 31st edition of the "Fixing Devices Brochure" has been published by the Rawlplug Co. Ltd., Cromwell Rd., London.

It contains details covering fixing tools and devices suitable for the lightest need to the heaviest loading capacity likely to be required for industrial purposes.

Copies of the brochure may be had from the Company, and their Technical Service Department will be glad to give recommendations and advice on any fixing problems.

three units from B. & D.

● Three units manufactured by Black & Decker Ltd., Harmondsworth, Middlesex, in their power tools division are of particular interest.

The 7" H.D. Ripsnorter Saw, weighing only 11½lbs., develops 1 h.p. and runs at 4,200 r.p.m. It uses a 7¼" diameter blade giving a maximum depth of cut of 2.5/16" and with a small selection of blades can be used extensively. It sells at £27 10s. 0d.

The ⅜" Standard Drill has a no-load speed of 300 r.p.m. Ideal for masonry work, the high power and large chuck capacity enables it to drill holes up to 2" diameter. Price: £26 16s. 0d. (pictured here).

A completely new and versatile machine is the U9 Scrudrill, which can be used both as a drill and a screwdriver just by a turn of the collar. It weighs just over 3½lbs., has a ⅜" capacity chuck and runs at a no-load speed of 1,000 r.p.m. The price is £14.

Stanley hammer

STANLEY WORKS (G.B.) LTD., Rutland Road, Sheffield, have available a wide variety of plumbing tools.

The hammer illustrated is one of their range of Warrington hammers. Tough and versatile, its striking face and cross pein are hardened and tempered and rim chamfered to minimize chipping.

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HEAT: ITS EFFECT ON PLUMBING MATERIALS

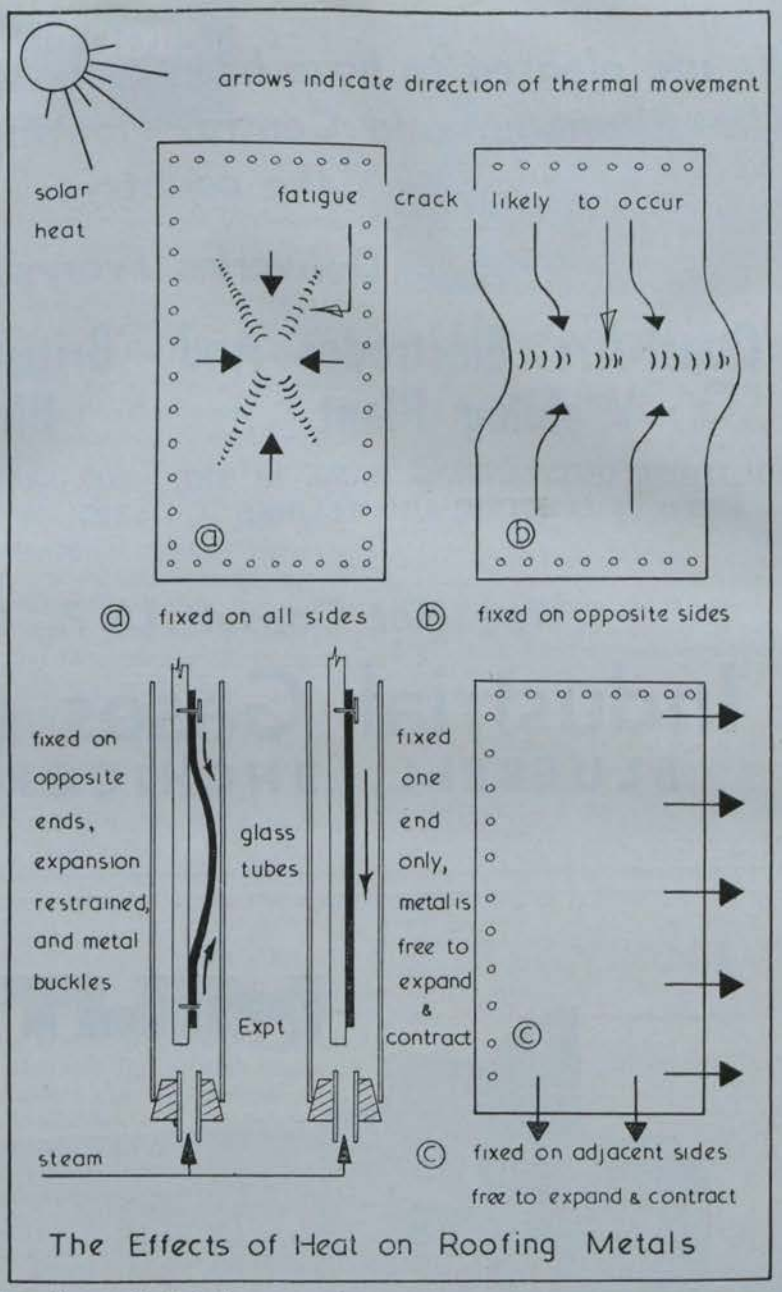
"bays." Thus the stress can be reduced to such reasonable amounts as can comfortably be accommodated within the fixing arrangements for each individual bay.

Secondly, care must be taken to ensure that the metal bays are free to move in both their length and width. Under no circumstances are they to be fixed on their opposite edges, or on all edges.

Thirdly, by providing good roof decking surfaces the thermal movement is "lubricated," so that once again the resulting freedom of movement will allow the metals to move when expanding and contracting without ill effect.

FIG. 2 shows some of these points. Lead bays should not exceed 24 square feet in size. On south facing roofs which get heat from the sun all day, it is a good plan to keep the bays to no more than 20 square feet in area.

Copper, aluminium and zinc bay sizes are commonly kept at no more than 14 sq. ft. super. This is largely because these lightweight materials need careful and adequate fixings to hold them down on the roof against the lift forces of strong winds. Smaller bays mean more bay joints, in which a greater number of fixings can be incorporated.



The Effects of Heat on Roofing Metals

To illustrate the advantages of smaller bay sizes, calculate the expansion of a 20 square foot bay of lead exposed to the same temperature change of 60°F as the "imaginery" one-piece roof covering.

Superficial Expansion = Area x Temperature Rise x Coefficient of Linear Expansion x 2.

Increase in area: = 20 square feet x 60 F x 0.000016 x 2
= 0.038 square feet increase in area,
Or 5.4 square inches increase in area.

This is considerably less than the increase of 138 square inch in the roof area of 100' x 50' previously considered, but even so, it still represents a considerable increase in size. This must be taken care of by careful roof planning and good plumbing practice if heat movement troubles are to be avoided.

No piece of lead fixed in roof work should exceed 10 feet in length. The expansion of such a length for any given temperature increase you can now easily work out for yourself.

Later on these precautionary measures and the way they are applied will be dealt with at greater length.

NEXT MONTH

Next month A. L. Townsend will deal with

HEAT: ITS EFFECT ON AIR AND WATER

TRANSMISSION OF HEAT

NEXT MONTH

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