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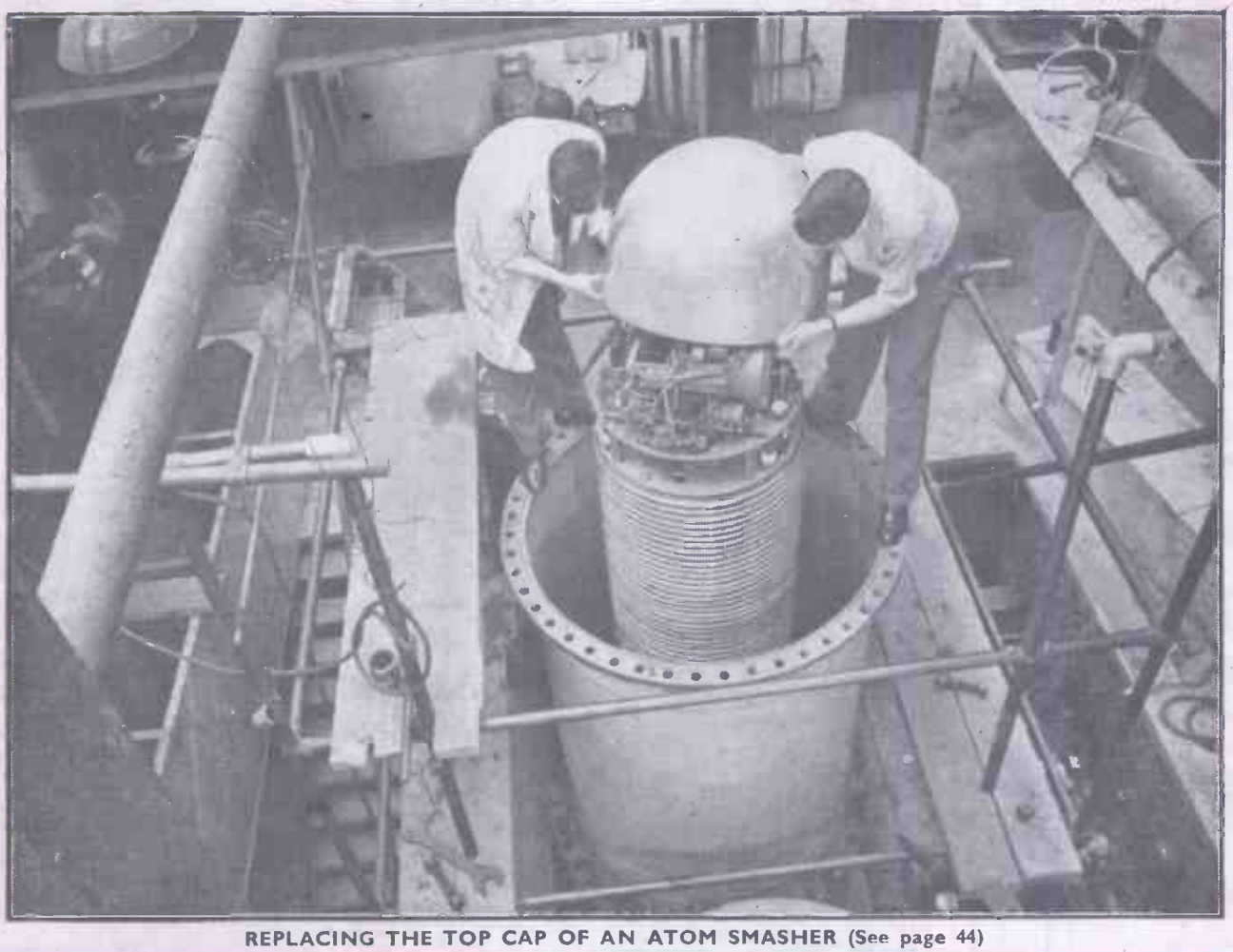
PRACTICAL MECHANICS

9D

EDITOR : F. J. CAMM

NOVEMBER 1948



REPLACING THE TOP CAP OF AN ATOM SMASHER (See page 44)

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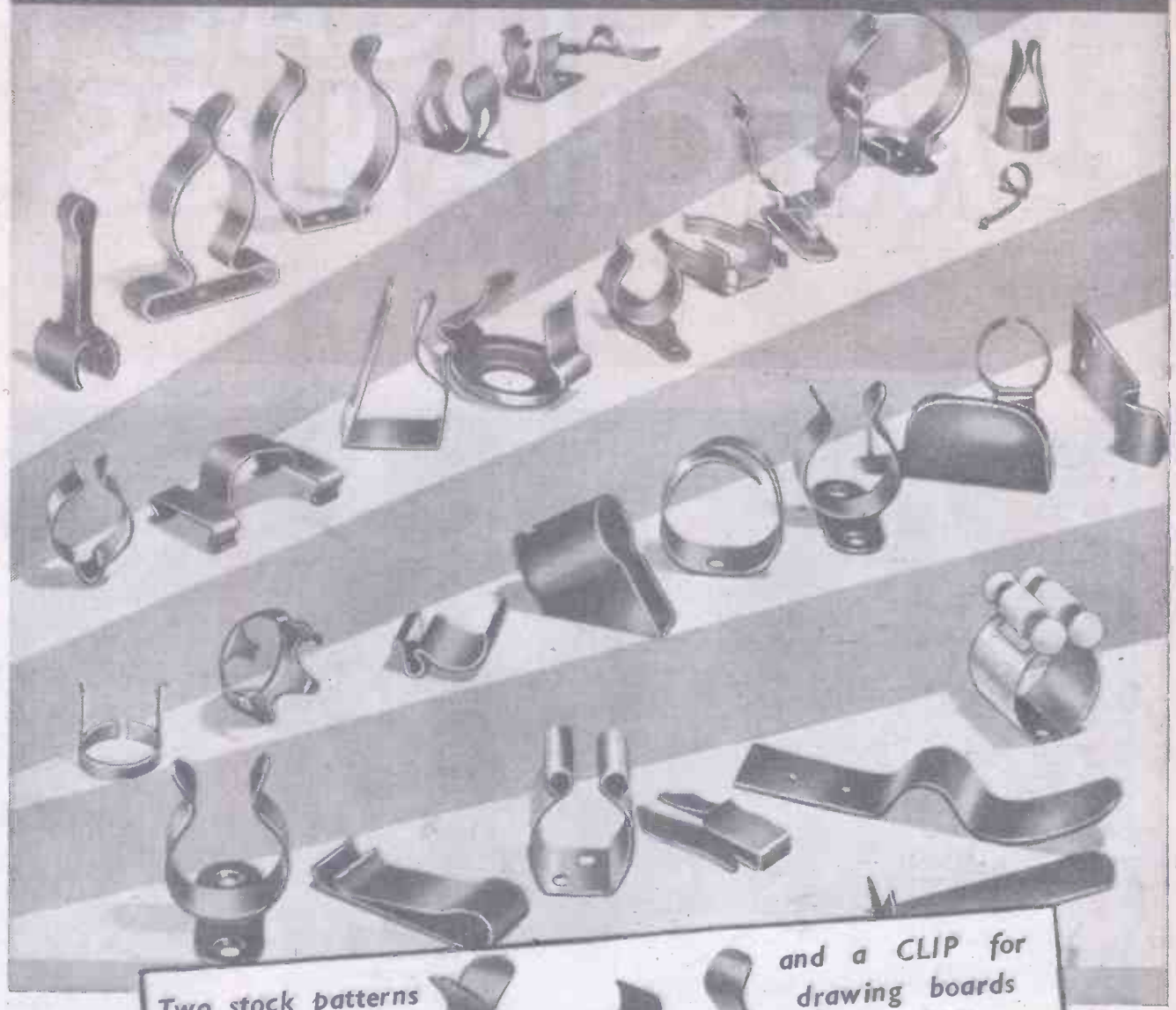

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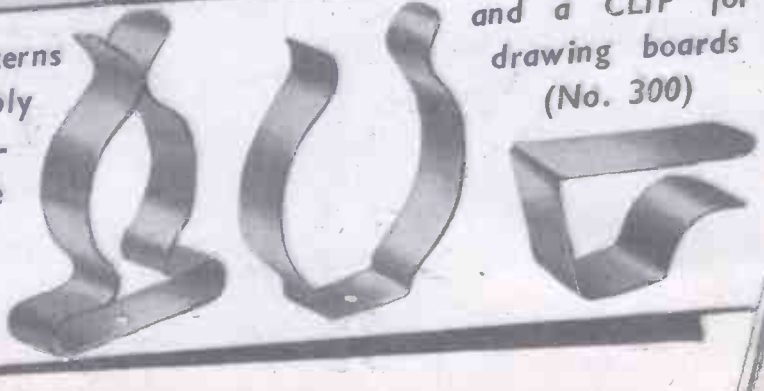

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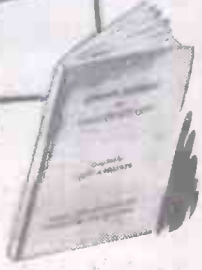

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PRACTICAL MECHANICS

Owing to the paper shortage "The Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

Editor: F. J. CAMM

VOL. XVI NOVEMBER, 1948 No. 181

FAIR COMMENT

By THE EDITOR

Television Development

THE 405-line definition and other technical characteristics, including the latest developments of the B.B.C. television broadcasting system, have recently been examined by the Television Advisory Committee under the chairmanship of Lord Trefgarne. On their advice the Postmaster General has authorised preparatory work on further extensions using this system. He proposes that the number of lines should not be altered for some years to come. This view has been formed in the light of information about television systems of various foreign countries and those with which British manufacturers have been experimenting. He considers, however, that the improvements in the quality of the picture in any of these systems noticeable to the ordinary viewer are very slight and not sufficient to justify a change of system which would make all the present British receiving sets obsolete. Moreover, any change of system of this character (say by adding another 100 or 200 lines only) would prejudice more substantial improvements at a later date which might include colour. Such developments need prolonged further research before they can be realised in practice, and so far as can be foreseen this will take several years.

For these reasons the London television station will continue to operate for a number of years on the 405-line system and the same system is being adopted for the Midlands station and is proposed for other British stations.

Work on the Midlands station is being pressed ahead, and it is hoped to open it in the autumn of 1949. The station, although working on the same basic system of 405 lines as that at Alexandra Palace, will incorporate various improvements. The power of the vision transmitter will be twice as great, and that of the sound transmitter four times as great.

The frequencies for vision and sound will be in the neighbourhood of 60 megacycles per second. The station which is being built at Hill Village, Sutton Coldfield, will have a mast 750ft. high to support a new and improved design of transmitting aerial. The range cannot be predicted exactly and will vary slightly in different directions, but it will be approximately fifty miles, and it is expected that some six million people will be brought within the range of the new station.

The Post Office is providing alternative radio and cable links to bring the programmes from London to Sutton Coldfield.

The B.B.C. are working out proposals for further television stations on the 405-line system so as to make television ultimately available to the greater part of the population. It is intended that the next station after Sutton Coldfield shall be in the North of England, although in view of present shortages in manpower and materials, particularly for building, it cannot be foreseen when work on this station can be started.

Wanted—An Improved Fountain Pen

THERE are many excellent fountain pens on the market, but most of those we have tried suffer from the disadvantage that they do not hold sufficient ink and many of them leak. Too much attention has been given to the styling and too little to the purpose for which a pen is intended, namely to write for reasonable periods without refilling. It is annoying when, in the middle of a sentence, the pen runs out, or you find upon removing the pen from your pocket that your hands are soiled with the ink which has syphoned out into the cap due to the heat of the body. We therefore invite our readers to submit to us any ideas they may have for an improved fountain pen which must have the following features. It must hold ink up to two-thirds of the barrel capacity, it must not leak, it must be easy to manufacture, reasonable in size and pleasing in appearance. We offer a prize of ten guineas for the best design submitted. Entries must be received not later than November 30th, and should be enclosed in an envelope with the word "Pen" in the top left-hand corner. The successful design will be submitted to pen manufacturers, unless the competitor states that he does not wish this.

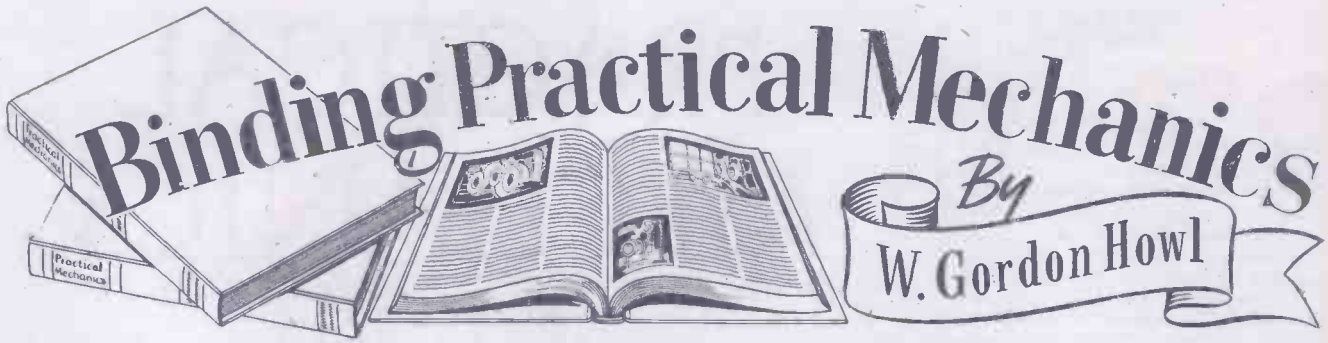
Redistribution of Wavelengths

A Conference of European nations agreed at Copenhagen on September 15th on a redistribution of long and medium wavelengths used for broadcasting.

The last effective Plan of these wavelengths was made at Lucerne in 1933 and since then the claims of many countries, particularly those which were in 1933 less technically advanced, have greatly increased. But the number of wavelengths available for distribution now is practically the same as the Lucerne Conference and is considerably less than the total needed to meet the requirements of all countries. Consequently, agreement has only been made possible by nations from all parts of Europe accepting less than their full requirements.

The Lucerne Plan gave the United Kingdom one long and 10 medium wavelengths. The present B.B.C. services have only been carried on by taking into temporary use one additional long and two additional medium wavelengths allocated at Lucerne to other countries. The new Copenhagen Plan gives the United Kingdom one long and 13 medium wavelengths and in some cases increased power may be used. The alterations are sufficient to ensure that the B.B.C.'s programmes can be carried on as substantially as they are at present, though most of the transmitters will have to change their wavelengths. These changes, however, will not be made until the new Plan is introduced in March, 1950.

The agreement reached at the Conference represents a considerable achievement in international co-operation.



Quick but Efficient Method Simply Explained

As last month's issue completed Volume XV it is an appropriate time to bind your volume of PRACTICAL MECHANICS.

Most busy mechanics have little time to spare for binding, hence a method has been evolved which will allow this valuable reference work to be bound with simplicity and speed, without forfeiting durability or appearance, although flexibility to a degree will have to be sacrificed.

As a departure from the usual procedure the sections are wired together instead of the arduous method of sewing and the covering methods have been modified.

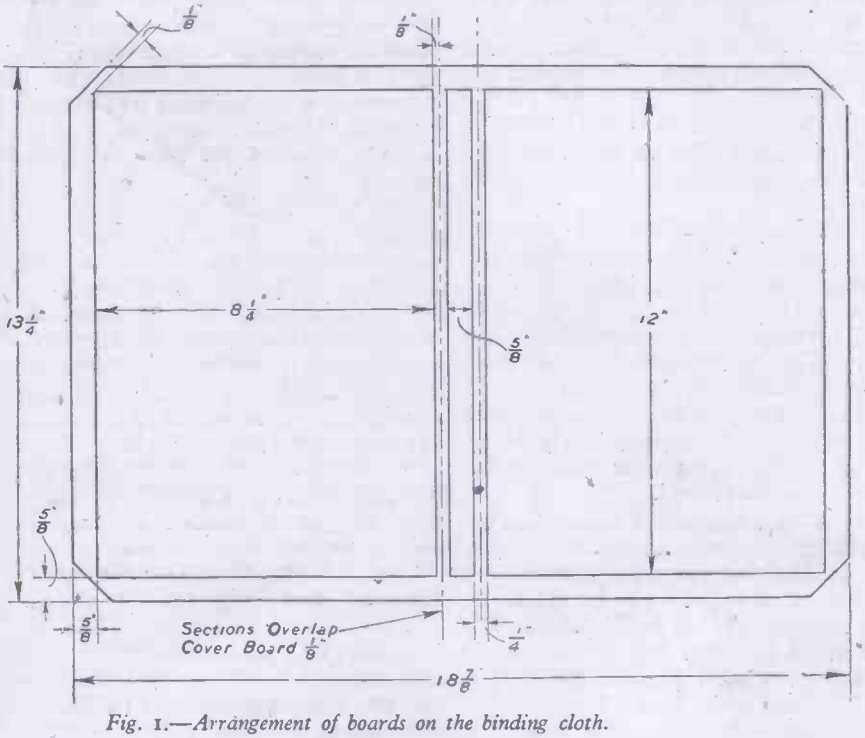


Fig. 1.—Arrangement of boards on the binding cloth.

The finished volume will look indistinguishable from the sewn volume, in the bookcase.

Making the Cover

Obtain a piece of buckram linen or similar binding cloth 13¼in. by 18⅞in. and cut it as shown in Fig. 1. Pieces of strawboard about 3/32in. thick are cut to 8¼in. by 12in. to form the sides, and a piece ⅝in. wide by 12in. will make the back.

Set the boards on the cloth as shown and mark round with pencil.

Before pasting, the pressing boards should be at hand. Any two boards of sufficient width and length will be suitable.

Place the cloth on one of the boards and apply the paste all over the cloth, then carefully fix the boards with a firm pressure. Turn the edges of the cloth over the boards. Place a piece of newspaper over the whole to prevent the cover adhering to the boards.

The top pressing board now surmounts the whole, and is suitably weighted to put the cover under pressure. A bucket of sand or soil will serve as a ready and adequate weight.

If the following paste formula is used it will be serviceable as a very strong adhesive for this type of work and will dry in a matter of twelve hours:

White covering paste: 2 ozs. flour, ¼oz. powdered alum. Mix well with enough water to form a thin paste. Add a pint of cold water and heat gently in an enamelled saucepan and keep stirring until it boils and then stir for a further five minutes. Should the paste become too thick it can be thinned to a consistency of cream by the addition of a little water. Allow to cool before use.

Making End Papers

With simplicity and speed still in mind, the end papers shown in Fig. 2 will be found the most suitable to use and should be made next in preparation for the covering.

The end papers are made from a good quality strong paper. Cartridge paper is admirable for the purpose.

The paper A and B is folded and cut to the same size as a copy of PRACTICAL MECHANICS, i.e., 8¼in. by 11⅛in. The third paper (C) is folded forward and back as shown ⅛in. and gummed to the fold of paper (A, B) to allow the cover to open without any strain on the binding.

The Volume Index is gummed into the ⅛in. fold, as indicated, after the binding is complete.

A set of end papers will be needed, both for the front and rear of the book.

These can now be set aside to dry, while the sections are being bound.

Making the Press

A simple, effective binding press is shown in Fig. 3. It consists of two pieces of wood 9in. by ⅝in. by 13¼in. bored at the centres of 11⅞in. by 6in. to give clearance to four ⅛in. Whit. by 2½in. Hex. bolts.

The pressure is applied by four ⅜in. Whit. wingnuts, with washers to prevent them bedding into the wood.

The edge of the top board is bevelled to give a clear view when marking out.

A series of sawcuts 1/16in. deep is provided along the bevelled edge to facilitate setting the section and marking the wire positions.

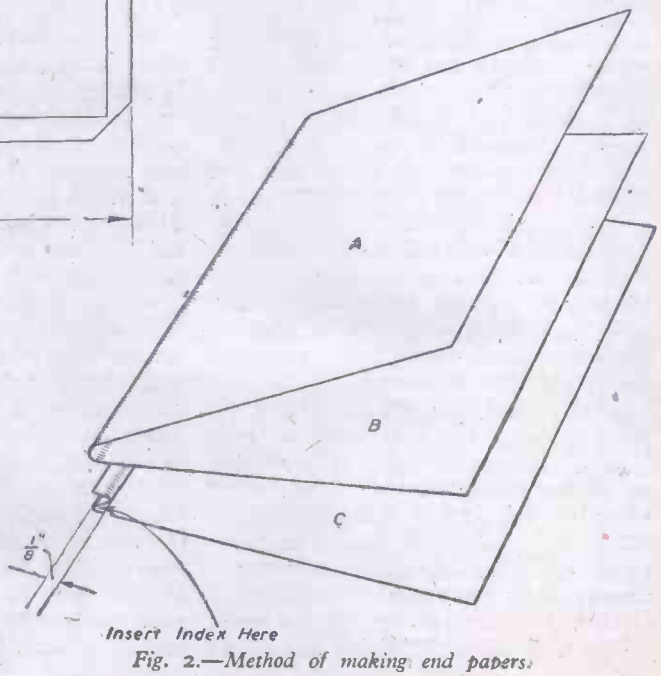


Fig. 2.—Method of making end papers.

The two far sawcuts mark the position of the edge of the book and the others the positions of the wire holes.

Setting and Wiring Sections

A section of a volume is one set of folded pages, in this case one copy of PRACTICAL MECHANICS. Thus we have twelve sections per volume.

Take each section in order and strip off the cover and advertisement matter as far as the editorial, leaving in the wire clips. Open each section at the middle page and close up the wire clips to compensate for the pages which have been removed.

Put all the sections together in proper sequence and tap the edges as flush as possible, making sure that the folds at the back are perfectly flush. Care must be taken in the next operation to ensure that the sections do not move.

Carefully place the sections in the press, with the top and bottom edges matching up to the far sawcuts and the back protruding $\frac{1}{8}$in. out from the press. Using the sawcuts to mark the positions, drill five 5/64in. diameter holes vertical with the back of the book.

Leaving the sections still clamped in the press, you can begin wiring them together.

It is imperative that a non-ferrous metal wire be used and double-cotton covered copper wire 18 S.W.G. will be found most suitable.

It will be noted that the diameter of the drilled hole is less than twice the diameter of the wire, thus the wire must be forced through the hole to elongate it and allow the two thicknesses of wire to be gripped tightly.

Take a piece of 18-gauge wire 30in. long and thread it through the first hole (Fig. 4) leaving an equal amount of wire protuding either side of the book. Make sure that the back of the sections are cramped as tightly as possible (pinch with a pair of snub-nosed pliers if they are not) and bend the wire at right angles flat with the book.

Cramp the sections as before and lace the two ends of the wire through the second hole. Bend the wire tight and square and continue to complete the lacing. Twist the two free ends of the wire tightly together at the back of the sections and cut off the excessive wire. Hammer down the twist to complete the lacing.

Before gluing, the edges of the leaves must be trimmed smooth.

Clamp the sections in the press, leaving the uneven excess edges of the leaves protruding beyond the back of the press and remove with a hack-saw. Trim all three edges in turn and smooth with fine glass-paper.

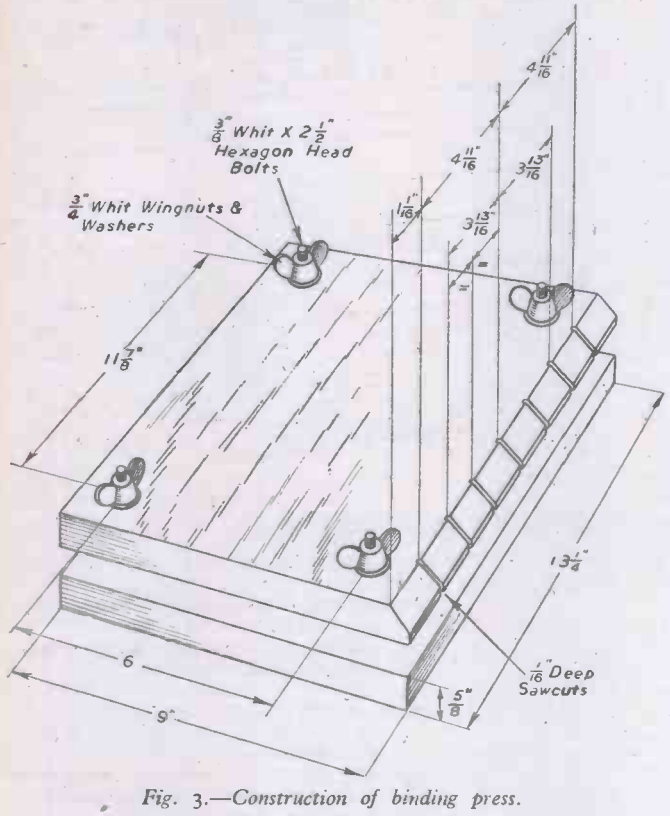


Fig. 3.—Construction of binding press.

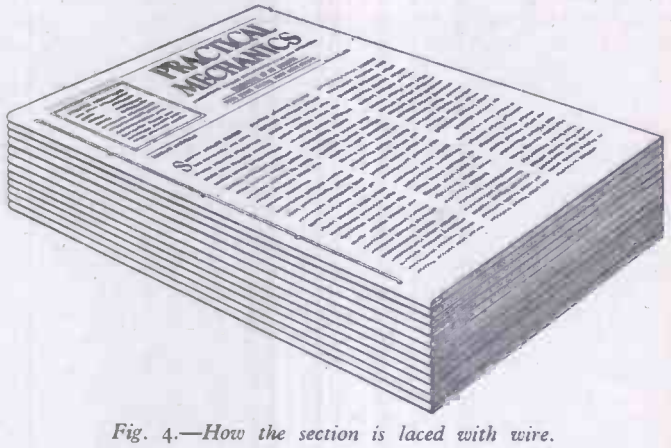


Fig. 4.—How the section is laced with wire.

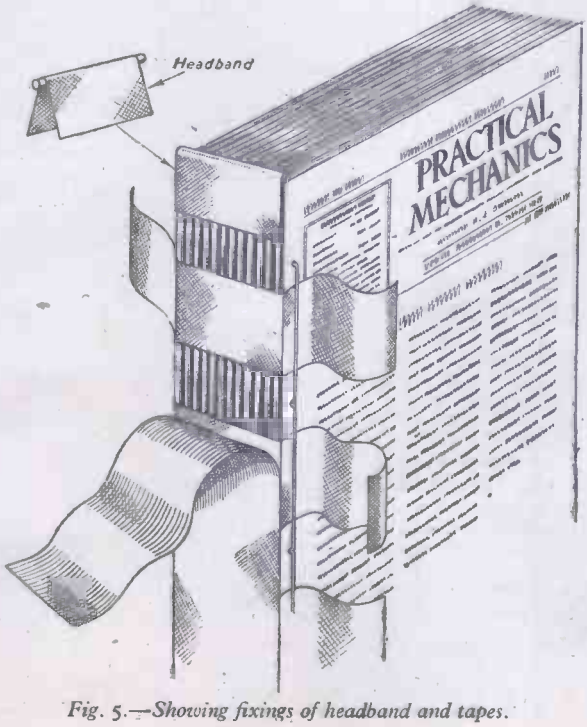


Fig. 5.—Showing fixings of headband and tapes.

If it is desirable to stipple the edges of the leaves, let them remain in the press to protect the sides of the pages.

Dip the edge of the bristles of an old toothbrush in water colour paint, or ink, and flip the colour on the edge of the book by drawing a penknife towards you along the bristles.

A good strong fish glue is necessary for gluing up the sections.

Remove the book from the press and work the glue well into the back of the sections and then thread a piece of 1½in. by 4in. long bandage through each loop of wire (Fig. 5). While the glue is still wet the head-bands can be fixed. These are made by gluing a piece of linen around a length of thin string and fixing at the head and foot at the back of the book.

Complete the binding of the sections by gluing a length of bandage down the back of the book to secure tapes and head-bands.

Carefully clamp the section in the press, between two pieces of newspaper and leave until dry.

Covering

There should now be in your possession three completed component parts of the book, viz., the cover, the end papers and the bound sections.

Lay the cover flat on a table and paste down the tapes while holding the sections vertically in position.

Allow an assistant to maintain the book in this position while you paste down the end papers (A) Fig. 2 to the cover and with a little paste running between the joint of the sections to the cover. Finally, fix the Index between the folds of the front end papers (C) as indicated in Fig. 3.

Place a piece of newspaper between all the pages where paste is liable to squeeze out, and clamp in the press.

Conclusion

Suitably titled with PRACTICAL MECHANICS, Volume XV, and "Editor, F. J. Camm," this volume with past and subsequent volumes will present a pleasing appearance to enhance your bookshelf.

The encyclopedic information on mechanics, science and homecraft contained in the volumes will also form an invaluable accessory to your reference works.

A Ballast Garden Roller

How to Make an Inexpensive Garden Appliance

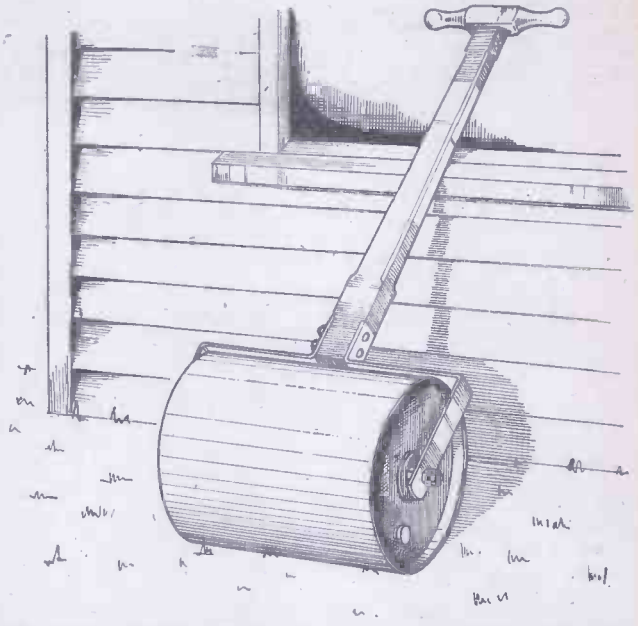
By R. J. CHAMBERLAIN

A TROUBLE with ordinary garden rollers is their heaviness. They are not easily transported from one place to another, unless rolled. This is not the case with a ballast roller, as the water or sand can be dumped to make the roller lighter in weight. If necessary it could be carried.

While this is a good feature with a garden roller, the main point about a ballast roller is that it is easily made. All that is needed is an empty oil drum or paint drum of adequate dimensions. These drums may vary somewhat in diameter and length.

The sizes given are based on an oil drum measuring 14ins. in diameter by 18ins. in length. This might be unobtainable in some cases, however, so details of a simple drum, made from wood and sheet metal, are provided. Thus, if you want a small, inexpensive garden roller, but find it difficult to obtain a drum, the alternative type can be made.

Readers fortunate enough to secure a fair-sized oil drum or paint drum which differs from the dimensions shown, should work to the particular size of drum obtained. This article shows the best way to incorporate it with a shafting. The completed roller is quite practical and should last for years.



The completed roller, which can be weighted with water or dry sand.

Preparing the Roller

The roller, being the main requirement, can be prepared first. Assuming a drum has been obtained, study it and inspect it for leaks. It is sure to have a bung hole or outlet hole, with cap. That is one desirable feature, as it simplifies filling the drum with sand or water and blocking it. The drum may be fitted with a carrying handle. This is unwanted and must be carefully removed.

The handle should be cut off at the lugs with a hacksaw, or, if this is awkward, the handle may be parted at the centre and the metal bent off. If the handle is affixed with rivets, the heads of these could be filed down and the handle worked off; this, however, leaves holes which will require to be covered. It is wiser, therefore, to leave the lugs fixed on the drum end, knocking them flat with taps from a hammer, provided that the end of the drum is sturdy enough to withstand light hammering without denting inwards.

A suitable bearing, for the axle rod, needs to be attached to the drum. This means boring, or cutting, a central hole at each end of the drum. Iron pipe, or tubular brass rod, could be used as a bearing. Curtain rod material would do, this being a cased rod, i.e., made of sheet iron covered with a thin layer of brass, or brass coated. Tubular rod ½in. in diameter will suffice, the length depending on the length of the drum, with a 1in. projection at each end to give clearance, as shown in Figs. 1 and 2.

Having centre-popped the drum ends, bore ⅜in. holes. This will facilitate the drilling of ½in. holes for the bearing rod. The rod should be a neat force fit. Once through and projecting evenly at each end, it is soldered or brazed in position. To reinforce the ends of the drum a circular brass or iron plate, drilled to take the hollow bearing rod, is soldered in place, as indicated in Fig. 2.

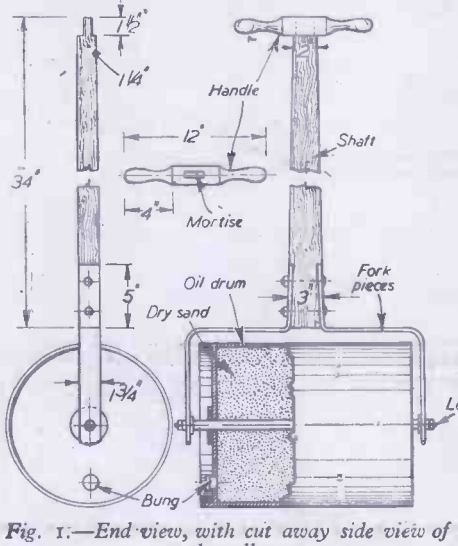


Fig. 1.—End view, with cut away side view of the roller.

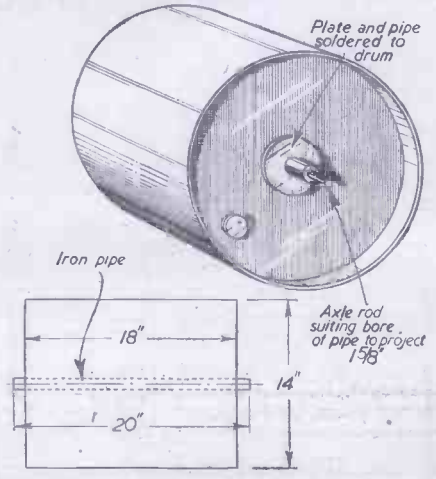


Fig. 2.—Approximate dimensions of oil drum, showing how metal pipe is affixed through the centre of the roller.

The Axle Rod

The axle rod is a length of solid rod fitting neatly into the bore of the bearing rod. When inserted, it should project about 1¼in. at each end of the bearing. Both ends are threaded for locking nuts, these being a couple of ordinary nuts which are tightened against each other to lock them.

Cut the thread about 1in. deep at each end. Apply a thick oil to the axle and work it into its bearing, or, alternatively, drop some oil down the bearing and twist the axle into same so that it is well spread. A piston rod fit, of course, is not necessary. There may be a fair amount but not too much slackness.

A Home-made Drum

If you have to make the drum, full details are given in Fig. 3. Three discs of wood 14in. by ⅞in. thick will be required. Deal could be used, joining two 7in.-wide pieces together with glue and dowels, then scribing the diameter with the compasses and cutting to shape with a bowsaw or padsaw, finally spokeshaving the roughness from the edges.

The three discs need to be notched for cross-pieces and a 1in. diameter hole bored in the centre of each with a centre bit. The notches are cut 2in. by about ¾in. deep, spaced equidistantly (Fig. 3). If the wood, at the beginning, is marked 14in. square, then divided into four, the notches can be easily marked identically.

You also need two end-plates 6in. diameter by ¼in. thick. The bearing rod is a length of birch dowelling 20in. long by 1in. in diameter. The three discs are glued on this rod, keeping one in the centre, and the others about 1in. inwards from the ends. The four cross-pieces, which measure 18in. by 2in. by ⅞in., are attached with glue and oval nails.

Sink the nail heads with a punch, as it will be necessary to plane the cross-pieces to conform with the diameter of the discs. These discs, or end-plates, are glued and screwed over the bearing rod, as in Fig. 3. The wooden framework is then covered with a strip of sheet zinc 18in. wide by about 48in. long by ⅛in. thick. This is done so that the

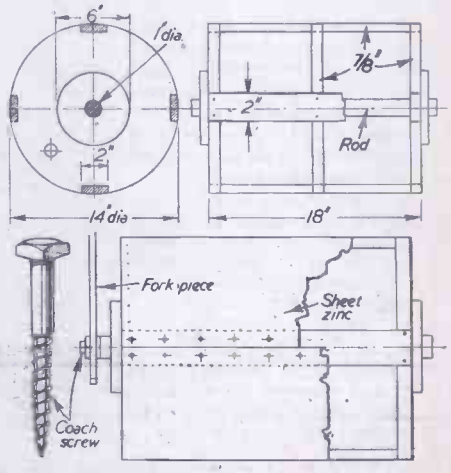


Fig. 3.—Alternative type of roller, made from wood and sheet metal.

join is central on one of the cross-pieces, as depicted in Fig. 3. Small round-headed nails or flat-headed screws should be used, and the joint should be as neat as possible. Any sharpness at the edges can be smoothed with a file. Projected screw heads should be filed flush.

Although the drum consists of wood and thin metal sheeting, it is sturdy and quite serviceable. When packed tightly with fine, dry sand, it will assume a fair amount of solidness and will not be easily dented. Note, incidentally, that this drum is connected to the shaft fork pieces with a coach screw. Washers should be placed on each side of the forks, and be sure that the coach-screw holes (to be bored) in the bearing rod ends are central and of a size which enables the screws to be fixed in tightly, using a spanner. Allow some side-play, and apply a thick oil. The screws, being pivots, turn with the drum. Owing to the central disc, an inlet hole, 1in. diameter, is bored in both end-discs so that each compartment can be filled with sand. These holes are bunged with a cork or wooden plug.

Shaft and Fork Pieces

The shaft and its handle are best made from a hardwood such as oak, birch, beech or ash. However, a softwood, like deal or red cedar, will serve the purpose. A piece 34in. or 36in. long by 3in. by 1¾in. will be needed. An old clothes-line post or door post could be utilised, if available. There is no need to have the shaft 3in. wide. A width of 2in. would suffice, without any taper.

The thickest end of the shaft is recessed for the fork pieces so that these lie flush, as detailed in Fig. 4. The upper end has a tenon to which the handle is glued and wedged. The handle is prepared from wood 12in. by 1¼in. square. Cut the mortise first prior to attending to the shape. When the handle has been shaped, make saw cuts down the tenon, glue the handle on its tenon, then drive home the wedges. Any projection is cut off flush and the joint glass-papered.

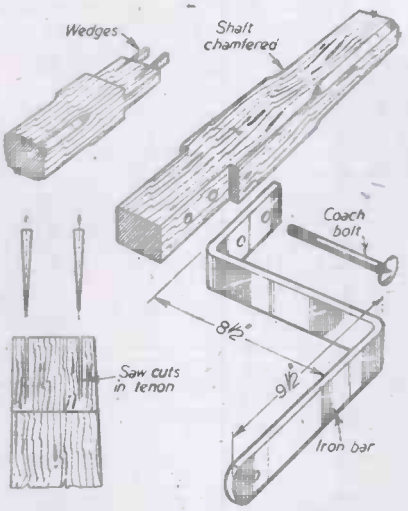


Fig 4.—Shaft and fork details.

The fork pieces are bent to shape from mild steel or iron bar 1¾in. wide by ¼in. thick. This bar should be obtainable at the store of a local ironmonger. If you cannot get it the width stated, make do with the nearest size.

The bar is bent to the dimensions given, then drilled for the fixing bolts and axle rod. Fix the fork pieces with a couple of hexagon-headed coach bolts of suitable length which allows for the nuts. Bolts about ¼in. thick should be used.

Attaching the Drum

In order to attach the drum between the fork, one of the fork pieces is removed. Insert the drum axle through the hole in the remaining fork piece, then tighten up the lock nuts. Bring the second fork piece into position, with the axle rod running through it, then secure with the lock nuts sufficient to allow some freedom for the drum. Have a washer between the bearing and the fork pieces to facilitate movement.

To complete the roller, chamfer the shaft in the manner indicated in Fig. 4, then apply a coat of green enamel paint to the shafting and fork pieces. When dry, rub down lightly and apply a second coat, which should dry with a good gloss. The drum should be enamelled black all over, the ends being painted bright red. All that remains is to fill the drum to full capacity with water or fine, dry sand. The wooden drum can, of course, only be filled with sand.

If desired, both types of drums could be filled with a sand-cement mixture containing light gravel. This mixture, when set, makes a very solid, heavy roller. It takes a long time to dry, and its use is not recommended in view of the fact that, once put in, it cannot be taken out, which spoils the idea of having a "portable" garden roller!

Gas Water Heaters—3

Water Pressure : Body Construction : Coil Spacing and Installation

By C. LANGFORD

(*Concluded from page 393, September issue*)

WE now pass to consideration of the body, which functions to turn heat from the town's burnt gas into heat in the water. The degree of success achieved in doing this depends upon many factors such as whether the body is condensing or non-condensing, the water pressure, the number of fins, the distance between burner and fins, and, finally, disposal of flue gases.

Some explanation of these remarks is perhaps desirable. Take first the matter of a condensing body; this is a brief way of saying that some water vapour in the flue gases is condensed by impingement upon part of the body. If condensation is allowed, some means for its removal must be included in the design, i.e., a drainaway of some sort must be available. This often causes trouble when installing the heater, apart from such troubles as chemical attack on body and extra first cost in provision of the drainaway. This is rather a pity, because if condensation is allowed a greater efficiency of operation can be achieved. That is, more of the heat in the flue gases can be converted to heat in the water. As might be expected from the above remarks, a non-condensing body is one which is so designed that impingement of the flue gases upon any part of the body does not result in separation of water vapour from the gases. Rather careful design and experiment are required to achieve this result in the first instance. More will be said on this when an actual design is discussed.

Water Pressure

The next matter for explanation comes under the heading of water pressure. How does water pressure affect the body of a gas water heater, you may well ask? Well, it all depends on the water pressure, and on the type of body used with a certain water pressure. To become more explicit, the annular type of body shown in Fig. 10 is a good one providing water pressure does not exceed about 50 lbs. per sq. in. Above that there is danger of trouble in service due to bursting. This trouble arises because of the high temperature stresses set up when the heater is working and the fatigue of metal to which this gives rise. Another cause is chemical attack due to formation of acids which eat into and weaken the inner wall of the body. There are also other reasons for this trouble due to bursting. Without going into too much detail these are: Formation of flake-like products of combustion which adhere to the fins and cause local overheating; eccentricity of body relative to burner, again causing local overheating.

It was for these reasons that many active minds began to look for an improved type of body which would overcome most of these difficulties. A type which has been tried and has passed very rigorous tests is shown in Fig. 11. Obviously the great weakness of area under pressure has been overcome by the use of a coiled pipe. The idea may seem simple, but there are quite a few production and operational difficulties which arise when it is put into practice.

Body Construction

Before saying any more on this matter it is necessary to refer to the materials used in the body. The main items, i.e., the combustion chamber, the heat exchanger and (where applicable) the coil, are made of annealed deoxidised copper. The cap is a mild steel pressing. The body bends, not shown in the illustrations, are best made from brass pipe. With the knowledge that most of

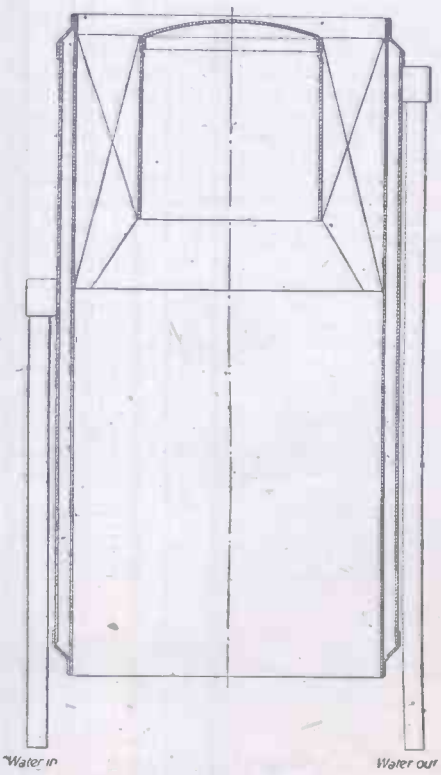


Fig. 10.—The annular body.

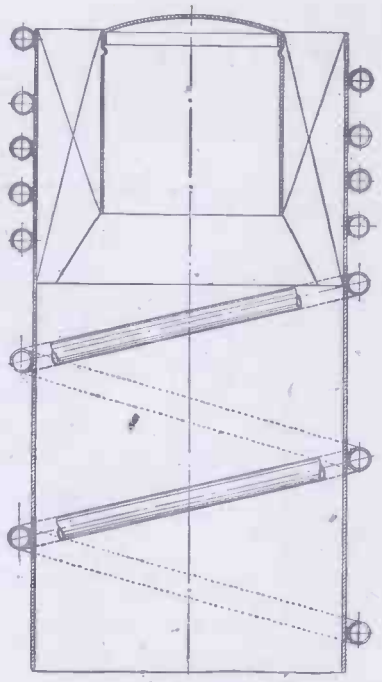


Fig. 11.—Coil-type body.

the components are of copper, and quite thin copper at that, we are faced with the problem of forming and joining them. Referring specifically to Fig. 11, and taking the combustion chamber, we have first a sheet of copper which must be rolled and seamed (or riveted) after which the heat exchanger is inserted and brazed inside the top, together with a small tubular shell called a diverter. Soldering has been used for this assembly, but the high temperature gradients which often occur during heat transfer have led to a general adoption of a brazing operation in the lower range of brazing temperatures. The heat exchanger can be constructed in two ways. The fins can be made singly or in one long formed strip. Size of heater and production facilities available may be deciding factors as to which type of construction is used. In certain cases finned pipes can be made use of (see Fig. 12). The copper pipe is formed before sliding on to the combustion-chamber shell. At certain points the coils are then riveted in position prior to brazing. This brazing operation is not easy; the difficulties arise due to heat dispersion, expansion of components and the thin nature of the material. A special-purpose machine has been found to be the best solution to the problem. After the body has been brazed it is dipped in solder to give protection against corrosion. The body bends and cap are added and the finished body is then ready for assembly to the automatic valve.

No reference has yet been made to fin area and their position relative to the burner. Fin area can be taken as approximately 8 sq. ins. per cub. ft./hr. of input gas, but proportion of fins and their spacing are equally important. They should be far enough from the burner to ensure that the flames cannot damage them. An approximate figure for the sink-heater body is 8 inches.

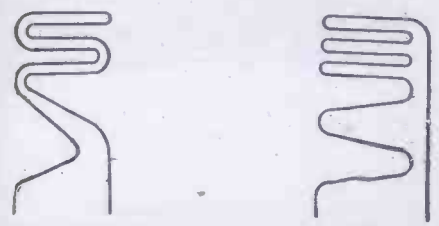


Fig. 13 (a).—and (b). Diagrams of coil arrangements.

Spacing the Coils

Just a few words now about the coil. Bore of pipe depends upon the pressure required to drive water through the length of pipe, upon weight and upon cost. Spacing of the coil is arranged in two stages. Stage 1 is where the water receives heat from the heat exchanger; stage 2 is where the water is used to cool the combustion chamber and prevent it from overheating. Stage 1 calls for the close spacing shown in Fig. 11 at the top. Stage 2 calls for delicate spacing and positioning because of the need for preventing condensation of water vapour in the flue gases and also of preventing overheating and possible burning of combustion chamber.

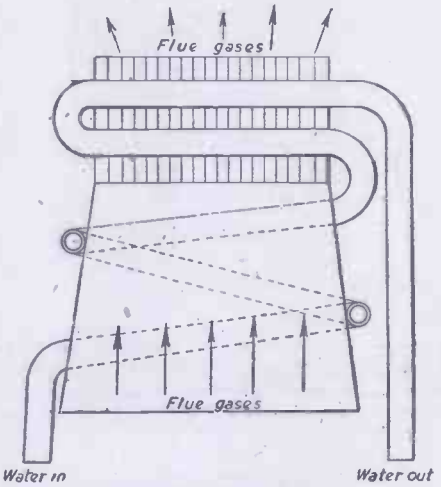


Fig. 12.—An example of a body with finned pipe heat exchanger.

The inlet and outlet arrangements for the coil can be as shown in the diagrams in Fig. 13 (a) and 13 (b), which shows inlet and outlet at the bottom.

At this stage some reference should be made to the composition of the flue gases passing through the body. These mainly consist of H_2O, CO and CO_2. The constituents whose limits must be carefully controlled are CO (carbon monoxide) and CO_2 (carbon dioxide). Useful information on the flue gases passing through gas water heaters is contained in BSS. 717.

Installation

Let us turn finally to the installation of these heaters. The main points to be certain of are the size of supply pipes (in the case of tank water, available head pressure is of importance; this is height from top of water in tank to line of water section) and capacity of gas meter. Positioning of the pipes to facilitate installation is not difficult as a rule. Different makes of heater require different positions of the supply pipes, but individual manufacturers are pleased to advise customers about particular installations. On the delivery side it is desirable to use runs of copper pipe if possible. The room where the heater is installed should have reasonable air inlet facilities. In those cases where a draught diverter and flue gas outlet are required they must be provided.

After the heater has been piped up there is the question of regulation of gas and water. That is where the gas and water throttles are of use. The householder can obtain quite good results simply by checking his gas meter against a pocket watch, and also by taking the time required to fill a two-gallon pail. Temperature rise can be determined by any mercury in glass thermometer reading to 212 deg. F. Once they have been set the gas and water throttles need not again be touched. A useful table relating to pipe size, water flow, gas flow and temperature rise of water for sink and bath heaters is given in the above table.

Type of Heater	Gas Inlet	Gas Rate	Water Inlet	Water Rate	Temp. Rise
Sink heater ..	½in. B.S.P.	60–80 cu./ft./hr.	½in. B.S.P.	30–60 galls./hr.	50–110 deg. F.
Bath heater ..	¾in. B.S.P.	180–200 cu./ft./hr.	¾in. B.S.P.	90–180 galls./hr.	50–110 deg. F.

Table of Pipe sizes and temperature.

Automaton Inspector

A Machine Which Counts Accurately to 1 in 1,000,000

A NOVEL automatic device for inspecting bicycle valve plugs was shown at work on the stand of the Sigma Instrument Company at the recent Machine Tool and Engineering Exhibition at Olympia. Part of a unit installed at Dunlop's Tyseley works which inspects valve stems at the rate of 2,500 an hour, it checks up the continuity of the air hole, and at once rejects any blind plugs.

The parts are automatically dropped on to a 3-way conveyor and those accepted as correct are carried to the end of the line, electronically counted, and dropped into bags which only need to be tied up for dispatch. Each bag holds 3,000 parts and the count is accurate to one in a million. When one bag is filled supplies are automatically transferred to the next. Rejected parts are swept into appropriate containers.

The machines, set by master gauges, will reject parts only one thousandth of an inch outside the drawing limits.

Our Cover Subject

GIANT machines, some attractive, some ugly, but all of them awe-inspiring to the layman, and producing enormous energies, are going into the laboratories and hospitals of Britain. They are the atom-smashers, man's latest and most dangerous tool, designed to help him unravel the secrets of the universe, for the atom is the new source of energy, the application of which can take one of two roads—destruction or new beneficent forms of power.

Our illustration shows two experts, perched high up on the scaffolding surrounding a Van de Graaff generator—another form of atom-smasher—at the Imperial College of Science, replacing the aluminium hemisphere which covers the ion source, controlling mechanism and power supply.

The Electron Microscope

Its History and Underlying Principles.

By FRANK W. COUSINS, A.M.I.E.E.

(*Concluded from page 10, October issue*)

According to the manufacturer's descriptive leaflet 436/1–1, it is shown to consist of three principal components, the main tube comprising the electron gun of the hot cathode type mounted on a pedestal and connected by armoured cable to a castor-mounted control cubicle, and a 50 kV. D.C. set, oil immersed, arranged in an adjacent bench cupboard. Focusing of the electron beam is effected magnetically by iron-shrouded solenoids. The condenser lens is situated immediately below the electron gun and the position of both gun and lens is easily adjustable. The gun and lens may also be tilted, thereby permitting regulation of the direction of the electron beam. Ingenious mechanisms are incorporated to facilitate positioning of the specimen holder within the main tube, an air lock being provided so that the high vacuum of the main tube is not destroyed when the specimen holder is inserted or withdrawn.

The objective lens gives a magnification of some 60 to 100 times and forms an intermediate image which can be viewed on an intermediate fluorescent screen. The central portion of the beam passes through a small hole in the said intermediate screen and is focused by the projector lens, which gives a further magnification of 150 to 200 times on the final fluorescent screen which is viewed through binocular viewing windows. Fig. 10 shows a general view of the instrument, Fig. 11 is a cross-sectional diagram of the instrument and Fig. 11A is a front elevation; the important parts being referred to by the key.

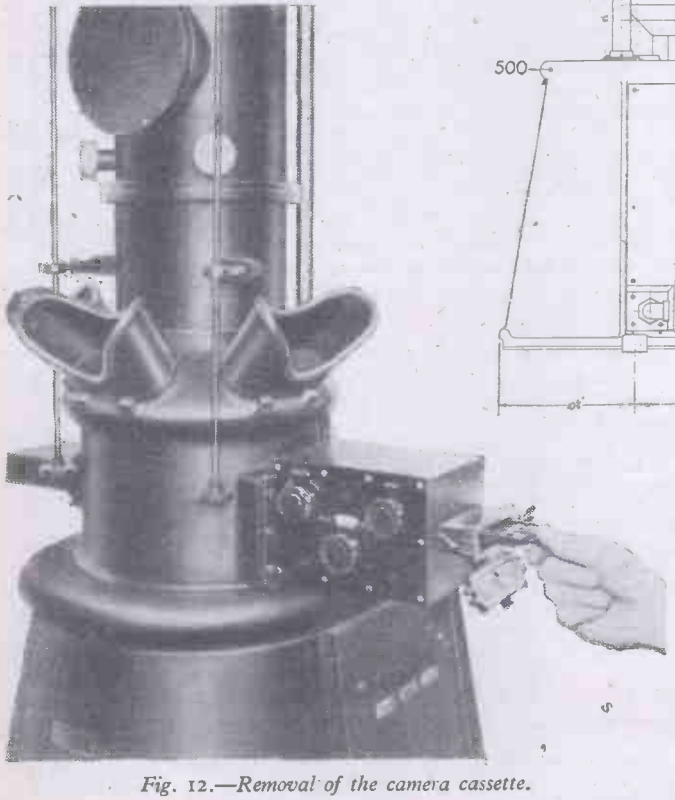
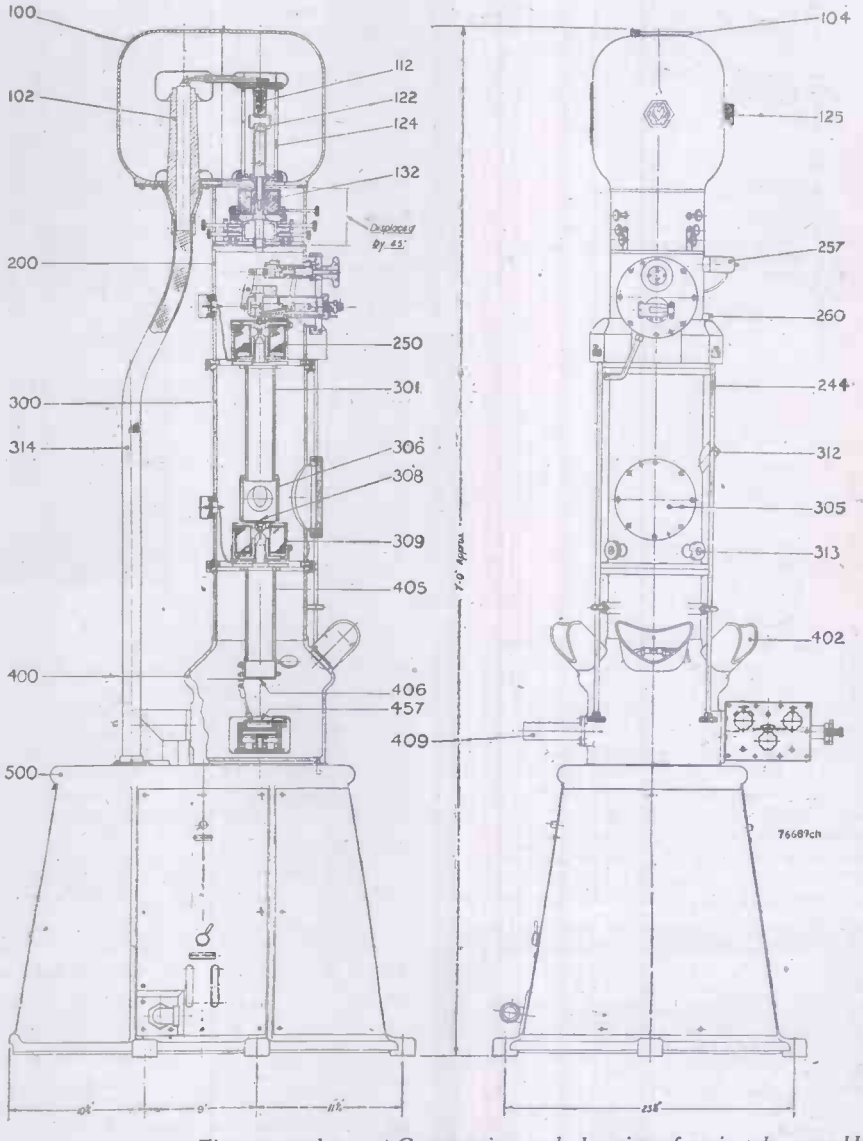


Fig. 12.—Removal of the camera cassette.

A camera attachment is provided so that permanent records may be obtained on a photographic plate, and this is clearly illustrated in Fig. 12.

The vacuum system of the microscope is shown diagrammatically in Fig. 13, and it comprises an oil diffusion pump backed by a rotary pump, together with a phosphorus pentoxide drying trap. The 50 kV. supply is obtained from a 50 c.p.s. half-wave rectifier unit, which also provides an A.C. supply for heating the filament of the electron gun.



Figs. 11 and 11a.—Cross-section and elevation of main tube assembly.

KEY TO ITEM NUMBERS

100—Gun protective cover
102—H.T. bushing
104—Earthing bar
112—Cathode assembly
122—Anode assembly
124—Glass cylinder
125—Gun cover latch
132—Condenser lens
200—Object chamber
244—Mechanical stage driving shaft
250—Objective lens
257—Object chamber illuminator
260—Viewing port
300—Intermediate tube
301—Mumetal screening tube
305—Access port
306—Mumetal screening tube
308—Intermediate screen
309—Projector lens
312—Intermediate screen viewing port
313—Projector lens adjustor
314—Tube for H.T. cable
400—Viewing chamber
402—Binocular viewing window
405—Mumetal screening tube
406—Masking device
409—Camera sealing box
457—Final viewing screen
500—Pedestal

Notes on Specimen Mounting

The preparation of specimens for the electron microscope is an art in itself upon which a great amount of material has been written. It is to be kept in mind that the

glass slide of the optical microscope must be dispensed with and replaced by a substitute which is transparent to the electron beam. The substitute consists of very thin films such as collodion, having a thickness of 100 A° approximately, and this film is often supported on a grid which is capable of good heat dissipation since the electron beam energy intensity may be of the order of 20-30 kW/in.^{2}

Although specimen preparation is a most detailed subject it is desirable here to say that at first a few objects only, such as bacteria, viruses and fine particulate materials, were available for study at high magnification, many subjects, however, could not be examined since the principal difficulty was caused by the low penetrating power of the electron beam, necessitating cross sections of a fraction of a micron. Such thin sections needed an entirely new microtome and this was based upon the theory of O'Brien and McKinley. A high-speed microtome for the electron microscope has been fully described by E. F. Fullam and A. E. Gessler in "The Review of Scientific Instruments," Vol. 17, No. 1, pp. 23-35, January, 1946. The preparation of powdered materials also set some difficult problems for suitable observation in the electron beam, and for advice on this aspect of specimen mounting reference may be had to Mary C. Schuster and E. F. Fullam's article in the Analytical Edition, "Industrial and Engineering Chemistry," Vol. 18, p. 653, October, 1946.

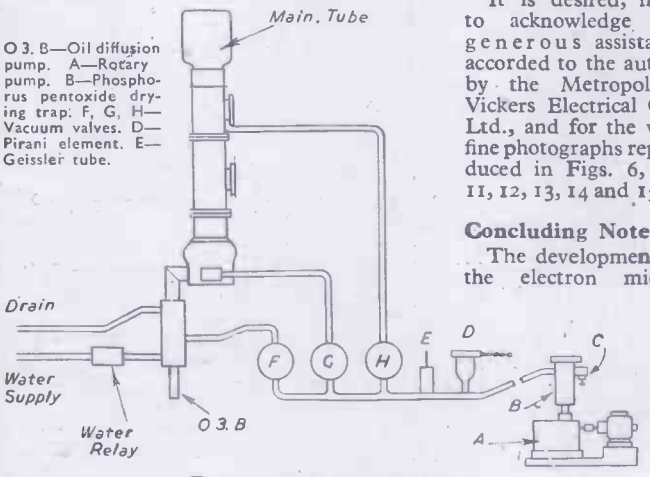


Fig. 13.—The vacuum system.

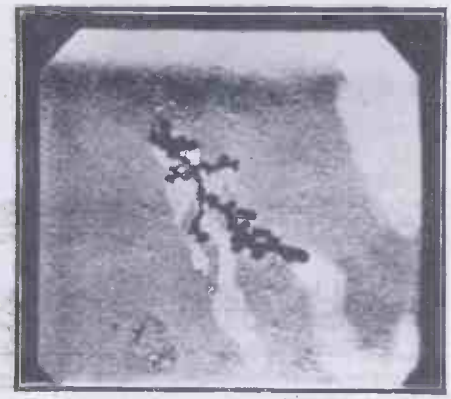


Fig. 14.—Magnesium oxide smoke. Shadow cast with gold at 45 deg. Magnification × 21,000 enlarged from × 10,000.

A micrograph, taken by modern shadow-casting technique to show the surface topography of the specimen, is shown in Fig. 14. The white portions of the micrograph show the "shadow"—that is, the area on which the gold particles used in the process have not fallen. Finally, a new microscope of the electron type has recently been announced by the same company; it is a 100 kV. instrument known as the Type EM3, a picture of which is shown in Fig. 15. This instrument has been designed to give a magnification of 50,000 at the above-noted voltage of 100 kV. and the possibility of increasing this is under investigation.

It is desired, here, to acknowledge the generous assistance accorded to the author by the Metropolitan Vickers Electrical Co., Ltd., and for the very fine photographs reproduced in Figs. 6, 10, 11, 12, 13, 14 and 15.

Concluding Note

The development of the electron microscope does not herald the swan song of the optical microscope. The two instruments are each in their own specialised class. The light microscope will always be the more generally useful, although it is unwise to be dogmatic here in that both instruments operate in such different fields. The most useful field of the electron microscope lies just beyond the resolving power of the optical instrument.

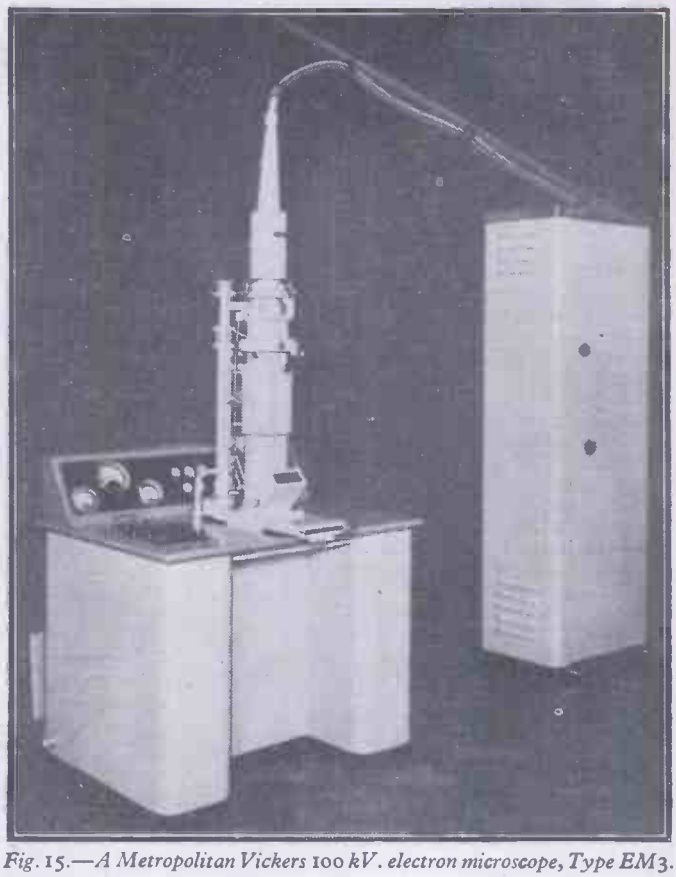


Fig. 15.—A Metropolitan Vickers 100 kV. electron microscope, Type EM3.

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"Bristol" Aircraft's Tour of India

FLOWN by B.A.C. Assistant Chief Test Pilot Mr. Dick Northway, "Bristol" Freighter G-AIFF has returned to Bristol after a two-months demonstration tour of India and Pakistan.

It was one of the most arduous tours yet undertaken by a Type 170 aircraft, either of the new or earlier type. G-AIFF was flying for approximately 170 hours and covered nearly 30,000 miles. From the moment of arrival in India until the aircraft left Karachi for the homeward journey the crew worked almost continuously in monsoon conditions—pouring rain, violent thunderstorms and temperatures which varied between 90 deg. and 110 deg.

The aircraft's itinerary covered most of the important towns and cities in both India and Pakistan.

Most important demonstration in Pakistan was given at the main Army headquarters at Rawalpindi, before senior Army officers and about 500 troops. Here, static loading trials with all types of military equipment were followed by single-engine demonstrations with between thirty and forty troops on board.

At Mauripur, troop-carrying loads reached their peak and on one occasion the aircraft took off with no less than 107 Pakistan Army personnel in the hold.

In India the aircraft spent nearly a week with the Indian Army and Air Force and demonstrated the new Type 170's capabilities with a round tour from Delhi to Delhi via Agra, Bombay, and Madras, flying regularly at 40,000lb. all-up weight and on one occasion taking off at 41,000lb.

Various Cargoes

Cargo carrying for civil airlines included a Rolls-Royce from Delhi to Bombay, varying consignments from Delhi to Madras and Bombay to Calcutta—both flights of roughly 1,000 miles—and an 8,800lb. load of linen goods from Calcutta to Kumbigram—a derelict landing strip 400 miles due east in the Assam jungle, with no servicing or re-fuelling facilities.

Throughout the tour the Hercules engines operated faultlessly under tropical conditions. Great care was necessary at all times to avoid flying into dangerously turbulent cumulo-nimbus cloud formations.

New Coil-spring Wire Motor

Further Particulars of a Novel Spring-driven Unit

IN the August issue of PRACTICAL MECHANICS a description was given of a new spring-driven unit for driving models and other appliances. Further applications of this patent spring motor are described and illustrated in this article.

Model Loco Power Unit

One application of the new unit is shown in Fig. 1, which depicts an arrangement particularly suited to model railway engines.

The spring A is disposed lengthways in the boiler barrel and is wound from the front through the smokebox door. The step-up gearing is arranged within the firebox space and comprises a straightforward system of gears turning freely on fixed axles attached directly to the front and back plates of the firebox as indicated at B, the train of gears including a tumbler reverse system C and a final bevel drive D to the main driving axle.

Control of the reverse gear is by means of a reversing lever E in the customary manner and position and may, when required, be linked up to a trip at the underside of the firebox for automatic reversing from the track. Stop-start is controlled by the regulator handle G which co-operates with a governor gear F driven through a step-up gear in the usual way. The governor fly-bob is controlled by a trailing and curved spring and engages the surface of an adjustable ring which is compressed or reduced in diameter when the regulator lever is moved in a clockwise direction, a cam H on the regulator spindle presses on the governor ring and by reducing its free diameter restrains the governor.

The result is that the speed of the model can be regulated from zero to full speed by very easy stages—just as if driving a steam locomotive, but there will be a fall in the torque with the drop in speed.

The available spring power obtainable by locating it lengthways in the boiler, instead of being limited to the narrow space between the main frames, is obvious, and in a No. 0 gauge motor, could comprise, for example, 32 turns when the spring is inert and the travelling ratchet is in the position J (shown dotted). Two pre-loading turns are then given to the spring—leaving 14 turns available to fill the space when the ratchet has reached K, its fully wound-up position. With a gear ratio of about 80 to 1—an effective length of run of about 300 feet would be obtained with ample load hauling powers.

Naturally, in serious model railway work, the gear ratio, the gauge of wire and the diameter of coil and length ratio, are chosen to suit the varying kinds of loads or duties expected from different types of locomotive, and the diameter of the driving wheels.

Obviously such a clockwork mechanism is comparatively expensive, but we understand that arrangements are being made for supplies of a mechanism on these general lines to be on the British market within a reasonable time, and at a price that will compare favourably with any motor now on the market.

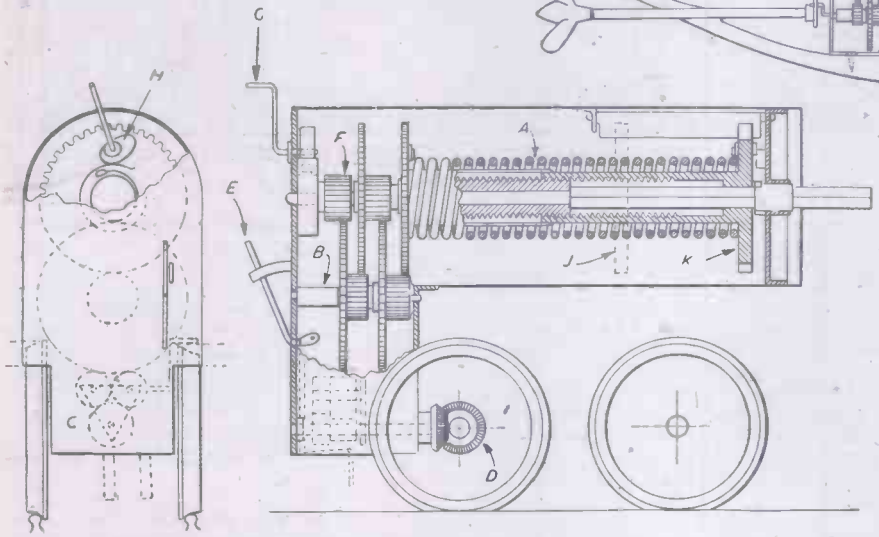


Fig. 1.—New spring-wire motor with reverse gear and speed control.

For Driving Toy Cars

A simple form of the new coil spring mechanism is shown in Fig. 2, and is particularly suited for driving model toys and cars of many types.

A simple form of box frame A, which can be assembled either in the way shown by full lines in Fig. 2 or by turning the bars outwards, is indicated by dotted lines.

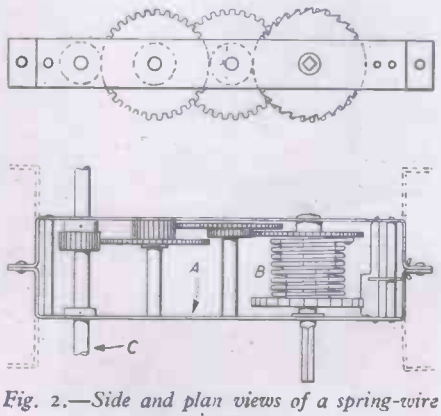


Fig. 2.—Side and plan views of a spring-wire traction motor.

No alteration whatever is made either in the mechanism or the spindles when effecting this change. The expanding spring drum is shown at B, set transversely in the frame, and comprises 10 turns of the spring when inert and allowing 3 turns of the winding key after pre-loading one turn; this, with a gear ratio of about 38 to 1 driving 2in.-diameter road wheels on the back axle C, gives a run of about 35 feet with a load of about 1lb. 2oz.

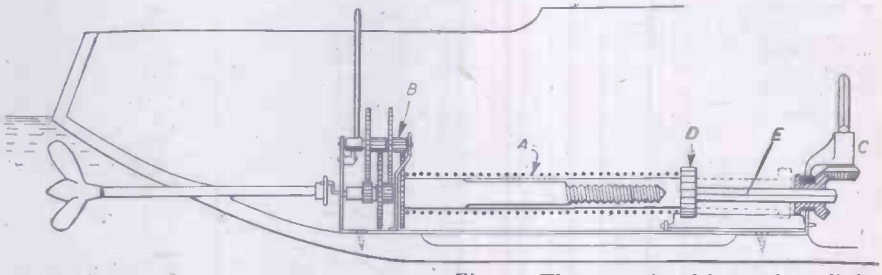


Fig. 3.—The new spring-driven unit applied as a boat motor

This mechanism is readily adaptable for many purposes; for example, it could be used in a model paddle boat, or for a winding or driving gear when a reverse is not needed.

An interesting feature of these mechanisms is that when "run down" they can still be rotated freely in the direction of drive as the drum being closed is virtually solid and the whole thing revolves on its axle and merely overruns the rachet.

For Model Boats

For model boat work where a long run under a light load is the outstanding requirement, the arrangement shown in Fig. 3 is particularly advantageous.

Here, the spring A is long relatively to its diameter and allows for upwards of 20 winding turns, which, with the simple step-up gearing shown at B, enables a run of about 100 feet.

The disposition of the lay-shaft in the gear system B enables a straight through drive, keeps all the weight low, and the propeller shaft can be substantially horizontal—all features that add to the overall efficiency of a model boat and conduce to a high performance.

For convenience, a bevel gear C is provided to enable a vertical wind, and the detail arrangement of the sliding ratchet is such that the square drive shaft E moves longitudinally through the drive bevel gear.

A simple frame connects the bevel winding gearing system to the gear box and enables the mechanism to be screwed or bolted directly to the bottom of the boat.

A similar mechanism set vertically and having a bevel drive to a horizontal shaft forms an ideal form of ventilating fan motor.

Finally, it may be pointed out that these types of coil-spring motor lend themselves admirably to the use of light metal alloys, thus greatly improving the power-weight ratio which by reducing the dead weight of the mechanism improves the performance and length of run of any machine powered by one of these new units.

Further particulars can be obtained from G. Oxenford and Company, Fulwood House, Fulwood Place, High Holborn, W.C.1.

New Series

World Air News

The New F-86 Jet-fighter : Flying Aircraft Carriers : The Neptune Rocket

By KENNETH W. GATLAND

FOLLOWING swiftly on the news that the Bell XS-1 has flown faster-than-sound comes a report that a prototype of the North American F-86 has also exceeded sonic velocity during diving trials. This machine is the first operational U.S. fighter to embody swept-back wing and tail surfaces and is powered by the new 5,000lb. static thrust J-47A turbo-jet manufactured by General Electric. The fuselage length and wing span are both 37 feet (Figs. 1 and 2).

A pressurised cabin permits operation at over 40,000 feet altitude, whilst the range is officially said to be better than 1,000 miles. No more precise speed estimate has been given than the familiar " in excess of 600 m.p.h."

Under the revised National Defence Programme, 195 machines are scheduled for delivery this year with several hundred more contracted.

Fig. 1.—The North American F-86 jet-fighter. A prototype has exceeded the speed-of-sound in a power dive.

Flying Aircraft Carriers

If experiments now being carried out in California succeed, America's long-range bombers will soon be taking jet-fighter escorts with them—*inside the fuselage*. The machine chosen as the mother craft is the new six-engined B-36 sky-giant which will carry up to three of the special McDonnell XF-85 " parasite " fighters.

The tiny interceptor, designed for operation at high altitude, has no undercarriage and fits snugly inside the bomb bay with its wings folded. For launching, it swings down on an arm below the fuselage, the wings extend and it is released with the engine roaring.

A stubby appearance derives from the fact that the fuselage length has been limited to 15 feet by the dimensions of the B-36 bomb bay and makes the cabin, which bulges above the centre portion, seem unduly large. The engine is a J-34 Westinghouse turbo-jet producing 3,000lb. static thrust, with a nose intake and exhaust outlet from the tail.

The small proportions of the machine permit fuel for only a few minutes' combat in the vicinity of the parent, but the performance is likely to be more impressive than any present fighter. Armament—so far unspecified—is grouped around the intake.

The low-set wings span 21 feet, are power-folding and incorporate considerable sweep-back, whilst the tail-plane is unique in having a short-span " X " configuration to give the required surface area without the need for folding.

" Sky-hooks "

The parent 'plane performs the same function as a Naval aircraft carrier and in long-range service is expected to operate in close formation with heavy bombers, itself having no bomb-load.

At conclusion of mission, the interceptor is intended to land by regulating its speed to that of the bomber while flying level beneath it, latching on to the extended arm by means of an upward-pointing arrester-hook. With the wings folded, it will then be hauled back into the bomb bay, re-fuelled and re-armed and, if necessary, flown off again. Limited mechanical repairs will also be possible.

High Altitude Research

The Neptune rocket, soon to be tested by the U.S. Navy, is expected to beat the record altitude of 114 miles set up by an American

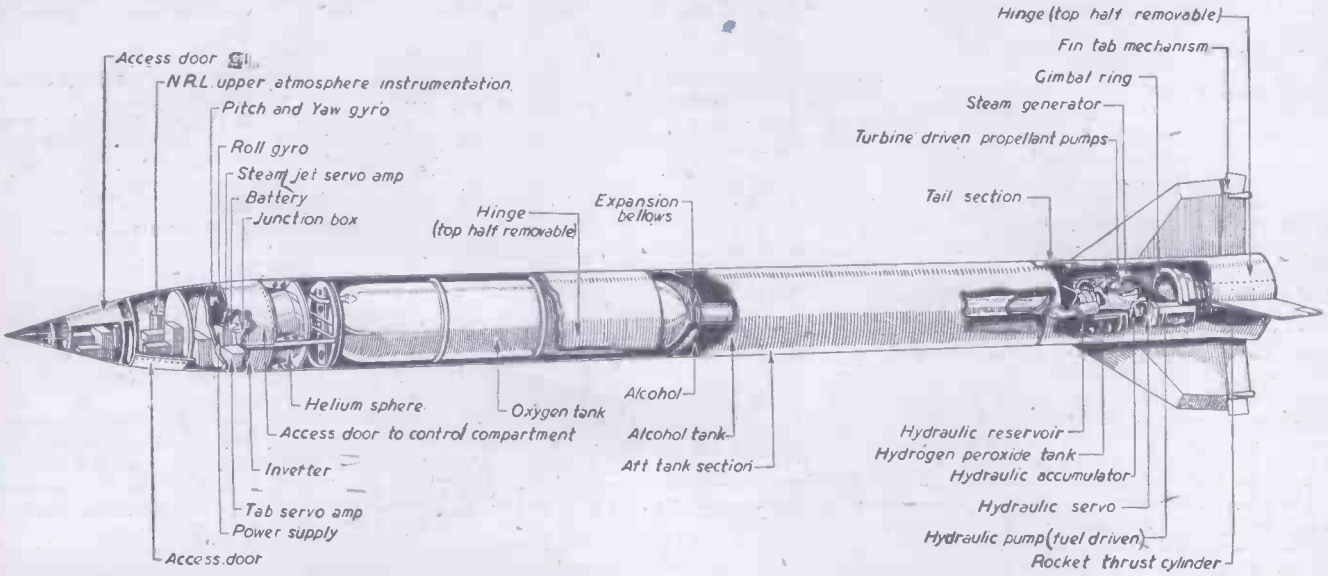


Fig. 3.—Internal particulars of the Neptune rocket. It is 45ft. long with a diameter of 2ft. 8in., weighs six tons and develops a thrust of 11½ tons.

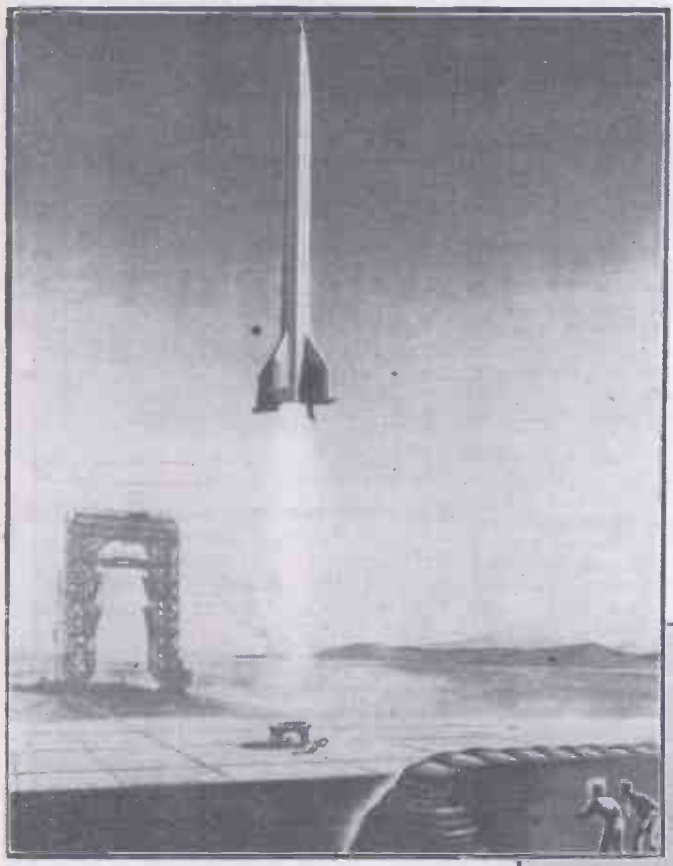


Fig. 4 (above).—An artist's impression of the Neptune rocket, designed to carry research instruments more than 200 miles above the earth's surface.

unit (chamber and nozzle) instead of the previous method of vanes impinging in the exhaust stream. Both systems work in conjunction with pitch and azimuth gyroscopes, and the effect is, of course, the same in that the jet is momentarily deflected—and the thrust consequently offset—to oppose any deviation of the rocket from true course. The "pivoting motor" has been adopted for three main reasons: First, there is a saving in weight of 275lb.; second, instability due to burn-out of efflux control vanes (as sometimes happened in the V2) is eliminated, and third, there is no thrust loss due to vanes.

Other interesting features are its very high fineness ratio (the Neptune is just one foot shorter than V2 although only half the diameter), and the fact that roll correction is provided by releasing exhaust from the peroxide pump turbine through valves which increase the steam jets on the sides opposing the roll.

Turbo-pump Injection

The turbo-pump propellant injection system is incorporated because of the low weight of this installation in relation to a pressure-fed system, alcohol being used as fuel with liquid oxygen at a mixture ratio of 0.9 to 1.0 alcohol to liquid oxygen. A specific impulse of 210 seconds is anticipated at ground level.

While on the subject of rockets, it can be stated that a *piloted* rocket is now under development in the U.S. No details are yet available.

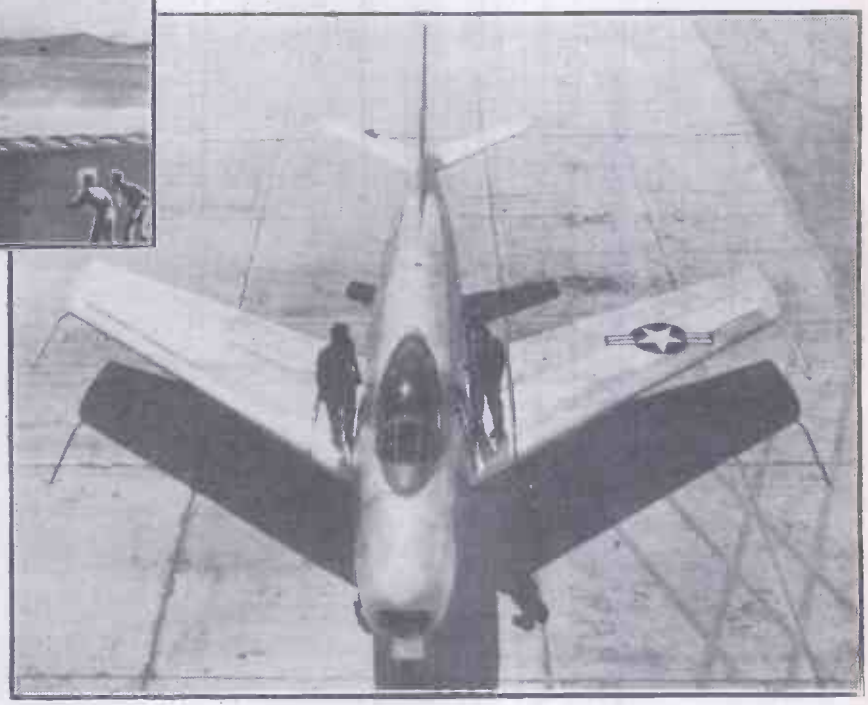


Fig. 2 (right).—The J47A, America's latest and most powerful jet-engine developing 5,000lb. s.t., is fitted in the North American F-86.

adapted V2 by a handsome margin. In fact, though the missile is only about half the weight of the German rocket, it has roughly *twice* the predicted altitude performance, and with a minimum payload of 100lb. should climb nearly 240 miles. (Figs. 3 and 4)

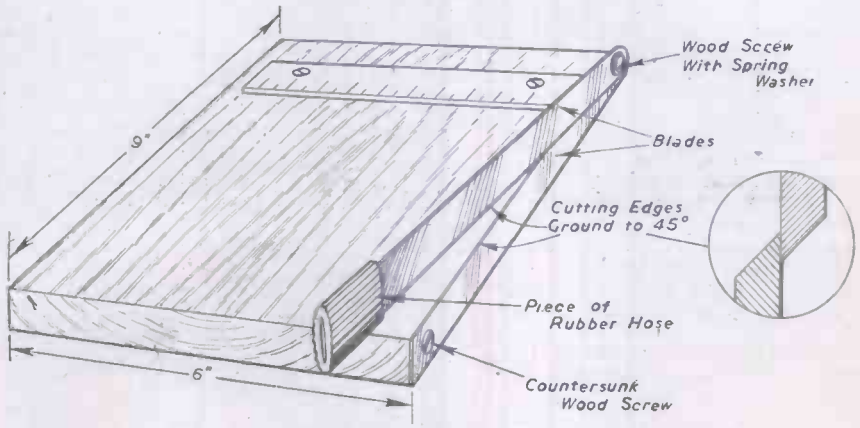
This new rocket, which has been under development at the Glenn L. Martin factory at Middle River, Maryland, for over a year, embodies several unique features. One is that control is obtained by tilting the entire thrust

A Small Print Trimmer

By G. H. PREECE

THE following details of a small guillotine I have made for trimming films and photographic prints may be of interest to other readers who are amateur photographers.

The base is made of wood and the size given was to suit my individual requirements, and will naturally depend on the size of photographs to be trimmed. The measuring scale is a flat piece of aluminium marked out in inches and parts of inches. I obtained two machine hacksaw blades (the normal hacksaw blades being too thin for the purpose), and ground the teeth off, and after heating same at the required length cut them with a chisel; the ends were then ground square. The hole for the pivot end is the original hole in the blade, but the other one was drilled and countersunk with an ordinary hand-drill. This was fairly simple as it had already been softened when it was cut to the required length. I then ground both edges to approximately 45 deg., finishing off with the oil-stone. A wood screw of suitable size with a spring washer is used for the pivot. A small piece of garden hose was then cut and forced on the end of the movable blade to form a handle.



A small print-trimmer and detail of cutting edges.

A Battery-operated Soundhead

Constructional Details of an Efficient Pre-amplifier Unit

By E. N. BRADLEY

SOUNDHEAD and pre-amplifier design must always follow the latest trends in radio technique and the advocation of a battery-powered soundhead may, at first, seem a retrograde step. The writer has found, nevertheless, that pre-amplifiers using even the most modern and suitable types of mains valves often leave a good deal to be desired from the point of view of hum suppression, whether the circuit is designed to operate from a microphone or photo-electric cell, and it was to ensure quiet operation that the two-stage pre-amplifier described in this article was developed. The theoretical circuit diagram is given in Fig. 1.

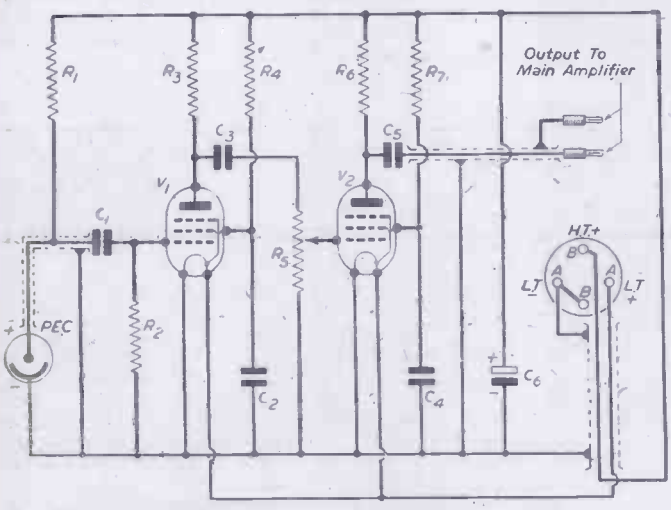


Fig. 1.—Circuit diagram of the battery pre-amplifier.

The gain of the pre-amplifier—well over 1,000 times—is such that the circuit may be used between practically any type of cell and any type of main amplifier. Tests were conducted, using an RCA Visitron cell in far from new condition, and sensitivity and output were found to be excellent.

Miniature Valves

The valve types chosen give many advantages. In the first place the valves are miniature and the soundhead size finally depends on the size of the photo-electric cell which is to be accommodated, this allowing a smaller head to be used with the immediate benefits of weight reduction, neatness, and, of great importance, efficient shielding of the internal circuits. The current demands of the pre-amplifier are extremely low, the total H.T. current being of the order of 1 mA., whilst the troublesome accumulator is no longer required since the valves need only .01 amp. at 1.4 volt for their total filament supply.

The maximum permissible anode voltage is 90 volts, so that a single battery containing both the H.T. and L.T. sections as made for modern portable receivers supplies all the pre-amplifier power and has, moreover, a life only a little shorter than the battery's shelf life. For the sound enthusiast whose apparatus is used no more than once or twice a week this represents a very real economy, yet the pre-amplifier can also be used regularly on, for example, a demonstration projector, and still show a saving in battery expense.

A further advantage is that the battery potential, 90 volts, suits the great majority of photo-electric cells so that the cell is supplied automatically, and with no need for voltage dropping and smoothing circuits. Both batteries and valves, together with all the other components, are in good supply, and if the American equivalent valves are used they can often be bought cheaply as war surplus stock.

The circuit is quite conventional. The output from the cell is fed via a small capacitor to the grid of a high gain diode-pentode, the diode section being disregarded, the output from this valve being fed in its turn to the grid of a second pentode, via a volume control. This volume control is "pre-set," that is, it is not a panel control in constant use, but a sound level control by means of which the input to the main amplifier is adjusted.

The main amplifier, on the test run, is set to full volume and the sound level control in the pre-amplifier is adjusted to feed the main amplifier until full volume with no distortion is obtained. The sound level control is left at this setting, and further volume changes made on the main amplifier.

The output from the pre-amplifier is taken to the main amplifier through a single-cored screened cable, and tests show that a long cable can be used before any instability or hum is introduced in this part of the circuit.

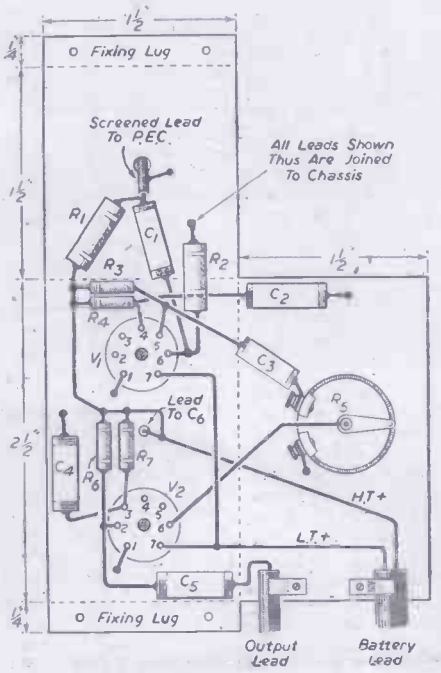


Fig. 3.—Under-chassis layout and wiring.

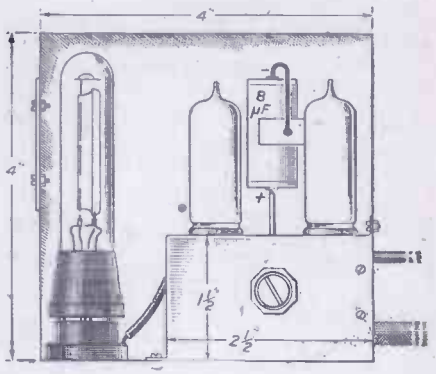


Fig. 2.—Interior view of soundhead, showing layout of components.

The battery may be mounted in any convenient position fairly near the soundhead, the battery leads also being shielded to prevent any chance of hum pick-up from the projector motor. The battery cable is, therefore, a two-cored screened cable, the screen acting as the negative H.T. and L.T. return.

Components

The capacitor C6 is not necessary to the working of the pre-amplifier, but is a precaution against instability as the battery ages. With increasing age the impedance of the battery rises so that there is a chance of feedback being set up across the battery. C6 provides an adequate bypass for audio frequencies no matter what the battery impedance might be.

Some difficulty may be encountered in obtaining a 150 volts working capacitor for C6, when an ordinary 450 volts working component must be used. The lower working voltage capacitor is desirable only on the score of a saving in space.

R5, the midget volume control, should be of the type having a very short spindle. No knob is required for the spindle is slotted, and adjustments are made by inserting a screwdriver blade into the slot in order that the spindle may be rotated. A volume control with a long, unslotted spindle can be converted to the desired type with a fretsaw or hacksaw in a matter of seconds.

The prototype soundhead was built up in a sheet iron case measuring 6½in. by 4in. by 2in., and is not illustrated, since it was

COMPONENTS LIST FOR THE PRE-AMPLIFIER
(Fig. 1)

R1	2.2 megohms, ½ watt.
R2	10 megohms, ½ watt.
R3	1 megohm, ½ watt.
R4	3.3 megohms, ½ watt.
R5	0.5 megohm variable, midget; sound level control.
R6	100,000 ohms, ½ watt.
R7	330,000 ohms, ½ watt.
C1	0.002 mfd. mica.
C2, C4	0.1 mfd., 150 v.w. Tubular.
C3, C5	0.01 mfd. 150 v.w. Tubular.
C6	8 mfds. 150 v.w. Electrolytic.
V1	American 1S5 or Mullard DAF91.
V2	American 1T4 or Mullard DF91.
2 B7G valveholders, ceramic, chassis mounting.	
1 90 volts photo-electric cell.	
1 Holder to suit cell.	
B 90 volts battery section.	
A 1.5 volt battery section.	
1 4-pin battery plug. (The base of an old British 4-pin valve may be used.)	
Wire, sleeving, solder, nuts, bolts, etc.	
Single core screened cable, 2 core screened cable.	

found that there was a good deal of waste space. Further experiments showed that the head (using the cell mentioned) could be built into a case 4in. square by 2in. deep, and this layout is shown diagrammatically in Figs. 2 and 3, although some difference in case design may be necessary if other types of cells are used. The Visitron cell is rather large and so was mounted by fastening a UX 4 pin valveholder to one wall of the case. Smaller cells could be mounted on the sub-chassis holding the two valves, this chassis then extending right across the soundhead instead of being only 2¼in. in length.

The soundhead case is made of sheet iron to provide magnetic as well as electrical shielding, and a small tin box is quite suitable, since there are no heavy parts which would drag thin metal walls out of shape. The cell and pre-amplifier are then mounted within the box, as shown in Fig. 2, and the box lid covers in the whole head.

The Light Slit

It will be seen that in operation the soundhead is mounted so that the cell and valves are lying horizontally, the slit being mounted at the end of the soundhead, as shown in Fig. 4.

Little can be said concerning the slit, for the exact details depend, once again, on the equipment with which the soundhead is to be used, The plates making the two slit edges may be cut from sheet brass, their edges being filed and ground to the necessary finish, but a pair of safety razor blades might also be tried, since these are bought with well finished and trued edges.

Slit width depends on the required frequency response and the magnification of the sound track image falling on this slit, the formula being

$$S = \frac{3.6\ M}{F}$$

where S is the slit width in inches, M is the sound track magnification and F is the maximum frequency response—often taken as 5,000 cycles. The slit width may be adjusted to the figure given by the equation by means of feeler gauges.

The electrical circuit may be built up by even a novice, for only the simplest tools and a knowledge of soldering are required. The components arrangement under the sub-chassis is shown in Fig. 3.

The holes in which the small valveholders are mounted are §in. in diameter, and although these may be drilled or cut they are best formed by a proper §in. punch. A §in. hole drilled in the front panel provides the mounting for R5.

Note that the battery and output cables

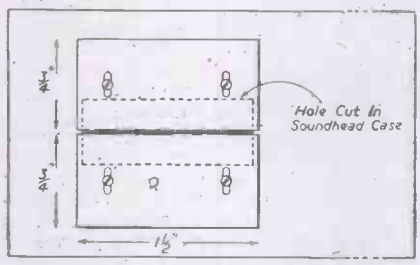


Fig. 4.—Details of slit, formed with ground-edge brass plates.

pass through holes in the end wall of the soundhead and are anchored to the sub-chassis by small clamps cut from sheet metal and bolted down to the chassis. If the two shielded cables have insulating coverings, these should be cut away so that the clamp makes direct connection with the metal shield of the cable, which is thus automatically grounded to the chassis. The connections between clamp and cable shield should be made perfect with a spot of solder, taking care that the cable is not overheated so that internal insulating coverings are damaged.

No switch is used, since this would require rather too much space below the chassis. The pre-amplifier is automatically switched on and off by inserting the battery plug into the battery socket and withdrawing it when the projector is shut down.

C6 is mounted above the chassis, and is shown in Fig. 2 clamped to the bottom of the soundhead case. The positive H.T. lead passes through a hole in the chassis to make contact with C6, the negative side of the capacitor being earthed through the clamp.

Under Chassis Wiring

A good deal of under chassis wiring is saved by making all negative connections (or "earth" connections) directly to the chassis. Thus the negative sides of the two filaments are connected directly to the chassis, as are the negative sides of the bypass capacitors C2 and C4, etc. The positive filament lead connecting the two No. 7 contacts of the valveholders with the battery supply cable must be perfectly insulated, as must the positive H.T. line.

Obviously, if the H.T. positive line contacts the positive filament line at any point the valve filaments will be "blown."

With the soundhead constructed and all the wiring checked, the two valves may be plugged in, the output cable connected to the main amplifier, and the battery plug inserted, the main amplifier being turned on to full volume and R5 in the soundhead being turned also to full volume (clockwise, with the connections as shown in Fig. 3).

The core of the output cable should be taken to the "live" input socket of the main amplifier, the outer screen being taken to the negative or "earth" input socket.

The slit of the soundhead is then illuminated by a lamp fed from the A.C. mains, when a loud hum should be heard in the loudspeaker. Covering and uncovering the slit will produce loud clicks.

When the soundhead is finally mounted and the slit receiving the image of the soundtrack, the sides of the slit must be masked to block stray illumination so that only the image of the sound track passes on to the photo-electric cell.

Whatever cell is used, it should be mounted in such a way that illumination from the slit falls directly on the cathode without being intercepted by the anode.

It is also a wise precaution to cover the cell with some opaque material such as insulating tape, leaving only an aperture for the slit illumination. The cell is then protected against stray light and reflections.

The Baltic Air Freight Market

A CONSIDERABLE amount of business in air freight has been transacted in the last few weeks, and although much of it is seasonal, the activity is, nevertheless, welcome and encouraging. Meantime the Baltic Air Freight Advisory Committee, in collaboration with the British Air Charter Association, is pressing on with the drawing up of an Air Freight Charter Party, which it is hoped will be generally accepted as an agreed document. As air charter business increases, so does the need for agreed forms of charter applicable to various trades become more and more desirable. The absence of such predetermined agreement on recognised terms and conditions must necessarily complicate and slow down the completion of transactions. Agreed proforma documents presuppose acceptance by all Parties concerned of the usual terms and conditions of the contract of affreightment and leave for negotiation only the bare essentials, such as the name or number of the aircraft, the geography of the flight, the weight and nature of the cargo, and the rate of freight. In short, a practice or custom of the trade is established, and the aircraft owner, the charterer and the owner of the cargo know precisely where they stand, the benefits they will derive, and the responsibilities they assume. Established practice means standardisation of conditions within a given trade, and air freight charter business to-day cries out for this. The task of drawing up proforma charter parties and other agreed documents is primarily one for the Air Charter Associations, but an exchange is the appropriate venue for ensuring adherence to established practice. The Baltic Air Freight Section is determined to attain the same degree of mutual confidence and understanding between the various parties and the same automatic compliance with agreed customs of trades as has been achieved in shipping. In so doing it will make a major contribution toward the development of the air freight industry.

Finding Cargoes

The Baltic air freight market has already made a start in finding cargoes for aircraft which might otherwise fly one way empty. The scope for building up business like this is enormous, but the task of acquainting all potential shippers of the facility and educating them as to the possibilities is a major one. It is pleasing to be able to record that the fullest co-operation in this matter is being afforded by various Government departments who are publicising, both at home and abroad, the inauguration of the Baltic Air Freight Market. Even so, it must be said that there are still many exporters and importers who have not yet appreciated the facilities and advantages which the Air Freight Market has to offer them, and those who have not applied to the secretary for a list of the member firms who are actively engaged in air freight broking would be well advised to do so. By nominating one of these firms to represent them, they will have established the necessary contact with the Air Freight Market and be kept informed of day to day opportunities of securing air freight space on the best possible terms. It is obvious that as more and more potential shippers are represented on the market, the cargo inquiry broadens.

Wireless Sets for Cairo

The point is perhaps best illustrated by quoting an example. A few weeks ago it was reported on the market that a 'plane was flying out empty from this side to carry out a charter from Aden to London. A broker on the Baltic who was aware of the potential shipping requirements of a British firm of wireless set manufacturers, immediately advised this firm of the opportunity which presented itself of an economic freight rate by air to any destination en route for Aden, and as a result the aircraft was filled outwards with wireless sets for Cairo. Two days later another 'plane was chartered from Aden, and again it was found possible to fill this 'plane with cargo for Egypt. Since then, further 'planes have been furnished with outward cargo which would otherwise have flown empty. Meantime, the wireless set manufacturers were more than pleased with their experience of shipping by air and found there was a definite saving in the lighter packing which was required and the lower rate of insurance.

The Machine Tool and Engineering Exhibition

Some of the Outstanding Features of the Modern Machine Tool Which Were to be Seen at Olympia

By C. G. BAINBRIDGE, M.I.Mech.E.

Fig. 1.—MT15 hobbing machine, by David Brown Machine Tools, Ltd., which made its first appearance at the Exhibition.

THE ever increasing demand for higher output per unit, coupled with reduced working hours and rising operating costs, makes it essential in all classes of machine operation to increase efficiency by eliminating or reducing non-productive work. This is especially the case with production engineering, and a visit to the machine tool exhibition showed that there is a vast difference between the machine tool of to-day and those shown at the last machine tool exhibition held in 1934—fourteen years ago. During this period there has been a continuous effort to increase the overall efficiency of machining operations, therefore the majority of developments in machine tool design are directed towards improvement in cutting tools, reduction of idle time, simplicity of operation and lessening of operating fatigue.

The most outstanding features of the modern machine tool are instantaneous direct reading dial settings for speeds and feeds, thus eliminating time lost in speed changing, and "finger-tip" control of the main movements by means of a single lever, knob or push-button. Many machines are also provided with quick power traverses and some with electrical reversing gear.

Electric Control Gear

Electric control gear has also been improved; for example, the electric operation of chucks on Herbert lathes (Stand No. 14) was an interesting feature; the system is simple to operate and provides extremely rapid chucking. The fitment of these chucks is also very simple since no auxiliary equipment is required, connection being made direct to the mains. Current is consumed only during the opening and closing operations.

There were several machines operating on the "all electric" system; as for example the Swift-Summerskill all-electric planer, and the electronically controlled contour tracing devices on George Richards' vertical Cincinnati hydraulically operated die-sinking machines on Stands 88 and 102. The smooth, effortless, infinitely variable and simple control so obtained is undoubtedly revolutionising the design of many machines and is probably the most interesting operational development to be seen.

Improved Construction Methods

So much for operational features; construction methods have also been considerably improved. The almost general use of carbide tools and the introduction of negative rake cutting, requiring high speeds and imposing heavy loads on the machine, has necessitated increased rigidity and durability. The use of strong and hard wearing alloy cast irons has been developed, and many machines have flame-hardened beds which almost eliminate wear and the need for the provision of adjusting strips. Ball and/or roller bearings are almost general practice for headstocks and gear boxes, with pressure lubrication to gears and bearings.

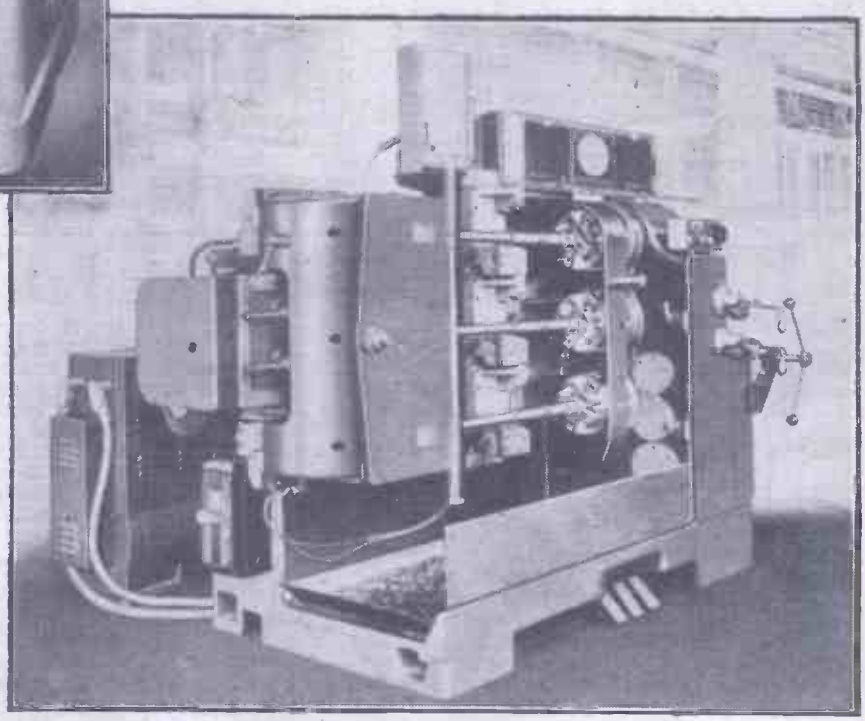


Fig. 2.—A Bullard three-spindle horizontal lathe (Buck and Hickman, Ltd.).

mills (Fig. 4) and on the Le Blond lathe which was exhibited.

Another development which is now rapidly extending its application to machine tools is the hydraulic operation of clutches, speed changes or reversing gear, for transmitting tracer movements to a cutting head and for the direct operation of feed movements. Examples were to be seen in the Churchill all-hydraulic lathe (Stand No. 125), the Webster and Bennet hydraulically controlled vertical boring mill, and the

Incidentally the great chip making potentialities of the carbide cutting tool has necessitated the design of special tools and other devices in order to control, or break, the chip.

The Herbert Carbicut lathe is an interesting example of a machine designed and produced solely for a limited type of high speed production, using carbide tools.

The influence of the "streamlining" cult was to be seen in a general smoothing of external surfaces and the enclosure of

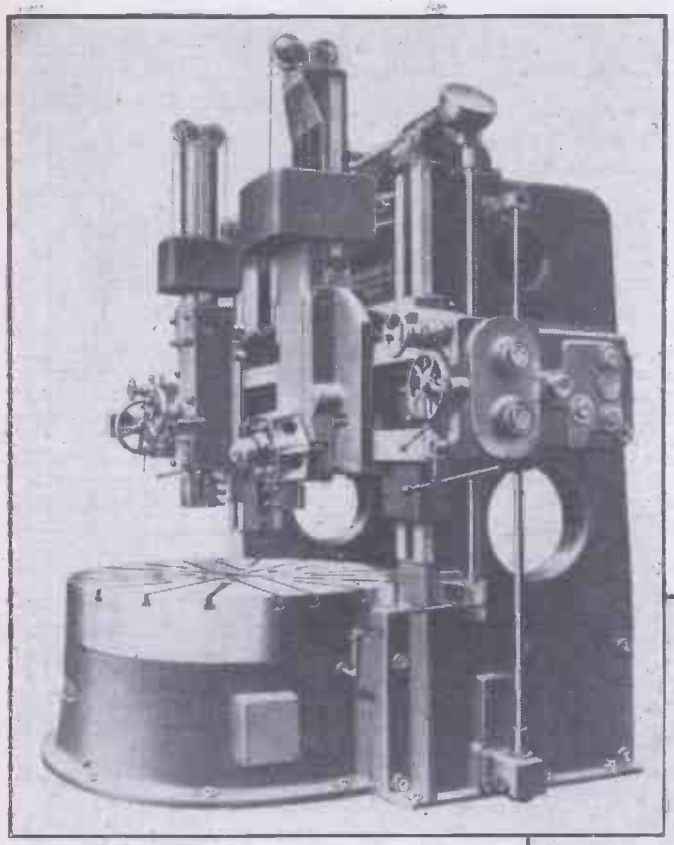


Fig. 4 (above).—A two-head vertical boring and turning mill (George Richards and Co., Ltd.).

motors, drives, gears, and electrical equipment. Improved appearance—as well as simpler operation—is also secured by the simplification and grouping of controls. The modern machine tool is, therefore, more pleasing to the eye than its predecessor, and there is no doubt that the careful design of external surfaces can include the advantages of greater rigidity, improved accessibility and easier cleaning, all of which tend to increase efficiency. Moreover, Messrs. David Brown Machine Tools, Ltd. claim that the "new look" of their gear cutting machines (Fig. 1) attracted substantial business from the Continent.

Precision Grinding

Some remarkable developments in precision grinding were to be seen on the Buck and Hickman stands, Nos. 15 to 19; on these machines spindle speeds as high as 100,000 R.P.M. are obtainable and holes as small as .040in. can be internally ground; arrangements are also available for electronic taper-setting and for grinding of circular form tools with complicated contours.

To the uninitiated the complexity of the automatic machine is always a matter of wonderment, and there was ample scope for admiration of mechanical ingenuity in the automatic lathes, millers and grinders which were to be seen in operation on several stands. In particular we would mention the wonderful 6-spindle Conomatic machine displayed on Stand No. 113, and shown in the illustration (Fig. 3).

Among the heavy machine tools—several of them weighing many tons—were the huge vertical boring and turning mills by George Richards, Webster and Bennet, etc. (Fig. 4), planers by H. W. Kearns and others; drilling machines by Asquith, Archdale, and so on.

The well-displayed exhibit of the National Physical Laboratory showed that progress in machine tool design is accompanied by operative research into not only turning, drilling and other operations, but also in such matters as material handling, swarf disposal, production control, rate fixing and planning. The Production Engineering Research Association of Great Britain co-operated with the N.P.L. in the staging of a most interesting and instructive series of exhibits.

In short, this exhibition was an education, not only to production engineers and machinists, but also to mechanics and engineers interested in any phase of engineering and mechanical construction.

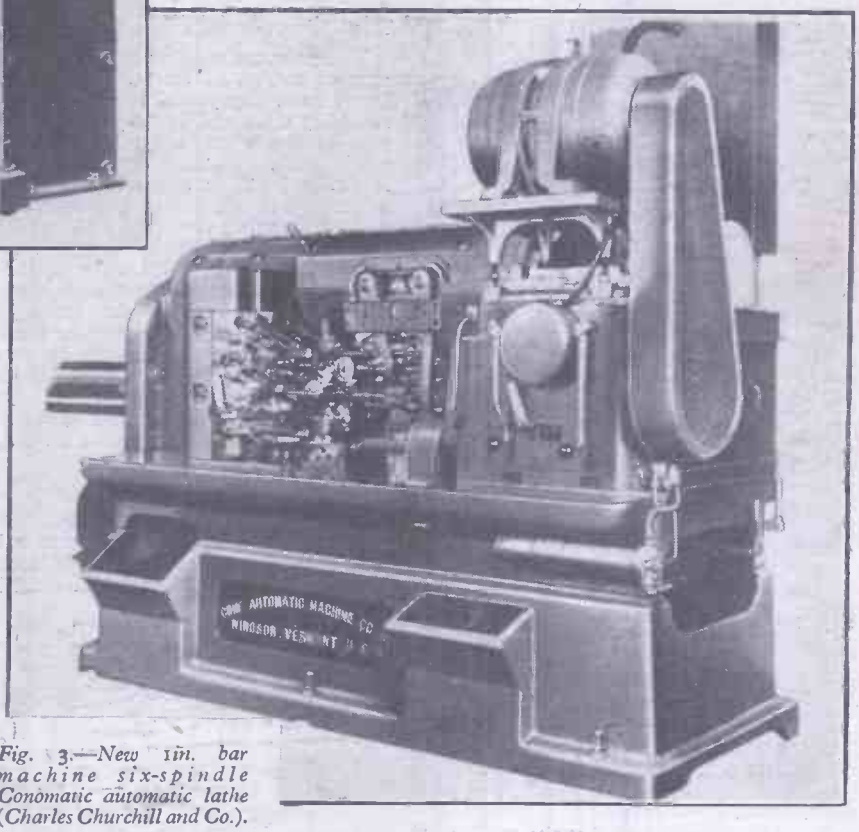
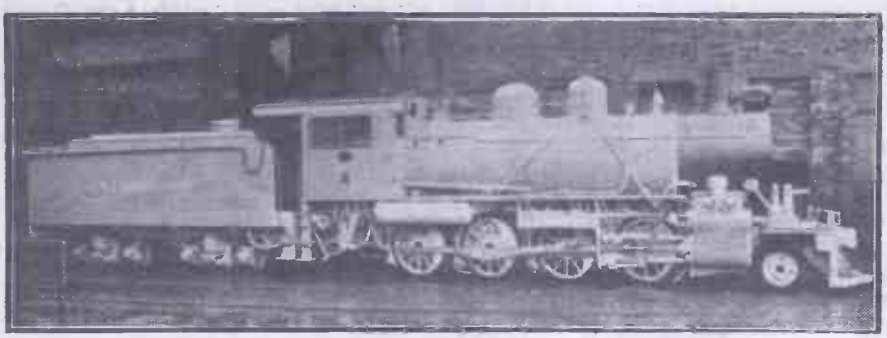


Fig. 3.—New 1in. bar machine six-spindle Conomatic automatic lathe (Charles Churchill and Co.).

Special Locomotive for the Andes

THE Hunslet Engine Co. Ltd., of Leeds, has just shipped to the Guaqui-La Paz Railway, Bolivia, a special 2-8-0 steam locomotive intended to work the whole of its time at an altitude of 12,000 to 14,000 ft. above sea level. Special attention therefore had to be given to the draught arrangements, air-space through the firebars, Westinghouse brake compressor design and proportions, and so forth. Moreover, the design had to be within the limits of a 10½-ton axle load. Within an engine weight of 50 tons enough tractive capacity has been obtained to start and haul a trailing load of 1,000 tons. The 16in. by 24in. cylinders which are supplied with steam at 200lb. pressure, drive 46in. coupled wheels. The engine is an oil-burner, and another feature is that the Walschaerts valve gear has been so well proportioned that the maximum slip of a die-block in the link is only 5/16in.



The new locomotive and tender for Bolivia.

The Elements of Mechanics and Mechanisms—13

Compound Machines—Pressure of Liquids

By F. J. CAMM

The Screw Propeller

THE screw propeller used on steamships is a further example of the use of the screw. It actually is a section of a helix. A two-bladed marine screw is really a section cut from a two-start screw thread and a triple-bladed marine screw is a section cut from a three-start screw thread. The main use of screw threads is for fastening pieces together. There are many screw-thread

Fig. 1.—Screwdriver, showing application of leverage.

standards such as Whitworth, British Association, British Standard Fine, Acme and so on, and these are all fully dealt with in the "Screw Thread Manual" published by the proprietors of this journal.

Compound Machines

We have already seen that the mechanical powers are seven in number, but a further examination will show that in *principle* there are really only three, namely, the lever, the pulley and the inclined plane. For example, the toothed wheel or gear and the wheel and axle are really only levers, while the wedge and the screw are adaptations of the inclined plane; thus we can classify the mechanical powers as follows:

1. The Lever	The Lever Proper The Toothed Wheel The Wheel and Axle
2. The Pulley	
3. The Inclined Plane	The Inclined Plane The Wedge The Screw

All machines consist of combinations of these powers, and no matter how complicated the machine analysis will show it to employ one or more of these seven powers.

The crane, for example, which is used for lifting heavy weights, is a combination of the wheel and axle, the toothed wheel and the pulley. The screw press is a combination of the screw and the lever. A screwdriver is a device which enables us to hold the screw and to drive it home by applying a torsional force to the handle. For example, in Fig. 1 the dotted lines, A, B and C represent those parts of the handle which act as levers, and the force is applied along the centre line.

The Governor

The governor used on steam engines consists of two metal balls connected by two levers to a ring placed near the top of the revolving shaft, and by two other levers with a loose ring which can slide up and down on the shaft. To this loose ring a bent lever is attached and is connected to the steam valve. When the engine works the shaft is rotated, carrying the balls with it. Centrifugal force causes the balls to fly outwards, and as they rise they lift the ring up the shaft causing the lever to partly close the steam valve and thus reduce the speed of the engine. If the engine encounters extra load the speed, of course, tends to be reduced and the balls tend to fall, so opening the steam valve and increasing the power applied. Gramophone motors of the clockwork type have governors which perform a similar function.

The Compound Lever

When it is necessary to balance a larger weight by means of a smaller it is more convenient to use a combination of short levers

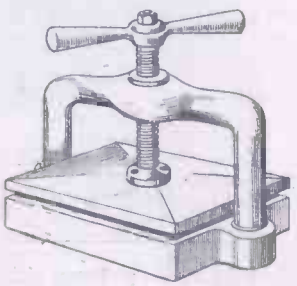


Fig. 4.—Simple screw press.

rather than to use a single long one. Such an arrangement is shown in Fig. 2, where the power is applied to the long arm of the first lever. The short arm of this acts upon the long arm of the second lever, and the short arm of the second lever operates on the long arm of the third lever. In this case there is a multiplying leverage. If, for example, the lever ratio is in each case 10:1, the mechanical advantage of the combination is 10 x 1 x 10 x 1 x 10 x 1=1,000. A weight, therefore, of two pounds would support a weight of 2,000lbs., or *counter-balance* it. The weighing machine, as we have already seen, is a compound lever constructed on this principle.

Pressure of Liquids

Under the heading of fluids are included gases as well as liquids. Air, for example, is

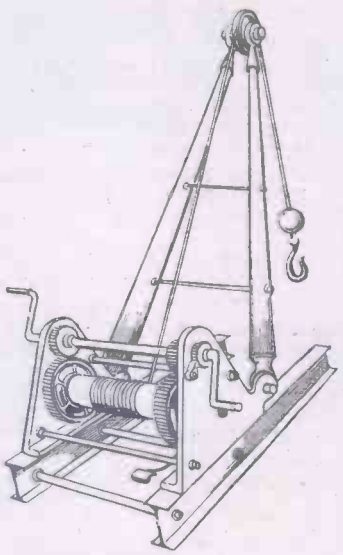


Fig. 3.—Crane, example of a compound machine.

a fluid, and so is hydrogen. The word merely means something that will *flow*, and as both liquids and gases are capable of this, they are known by the generic term "fluids." The difference between a solid and a liquid is due to the varying amount of the force of cohesion which holds the molecules together. It is less with fluids than with solids. As a result, solids keep their shape and press downwards only; liquids and gases, on the other hand, have so slight a cohesion of the molecules that they are continually changing their places and their shape.

But although liquids and gases are considered as fluids, these two states of matter are not similar in all their properties. The molecules of liquids have greater cohesion than those of gases. The resistance of water is greater than that of air. In some liquids the cohesion is greater than others. Oil,

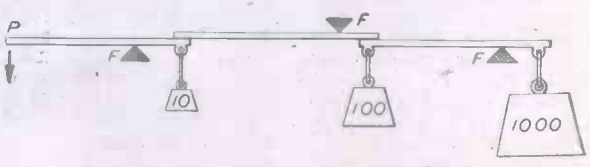


Fig. 2.—Multiplying leverage, showing combination of short levers.

for example, has greater cohesion than water and so has treacle. The result of the cohesion of liquids is that they have a definite surface.

In gases, the force of cohesion is absent, and the molecules, instead of attracting, repel one another. As a result, gases have no surface of their own. When some gas is put into a container, no matter how small the quantity may be, it will completely fill the container.

The Repulsive Force of Heat

Heat may be used to change the state of any body, and by the addition of heat solids may be converted into liquids and liquids into gases. Similarly, by taking heat away, gases may be changed into liquids and liquids into solids. Thus we see that cohesion and heat are really opposing forces.

Incompressibility of Liquids

A piece of cork or a sponge may be easily compressed to a much smaller volume. This is because they are porous and the pressure used to compress them brings their solid parts nearer together by reducing the size of the pores. It is almost impossible to compress liquids. It is true that they may be compressed, but it is only to an infinitesimal extent. Air pressure amounts to about 15lb. per square inch approximately. If we partly fill a bottle with water and place it under the receiver of an air pump, the water will rise in the neck when the air no longer presses upon it. A pressure of 15lb. per square inch is termed *1 atmosphere*, because it is that naturally exerted by the air at sea-level. A pressure of 75lb. per square inch represents a pressure of 5 atmospheres, and so on. Now it has been found that 22,001 gallons of water are compressed into 22,000 gallons by a pressure of 1 atmosphere, and this demonstrates that for all practical purposes liquids are incompressible.

Pressure on Liquids

When pressure is exerted on a solid body all the pressure is transmitted in one direction only. If we push on one end of a bench the pressure is transmitted to the opposite end. Liquids, however, act in a very different manner. *Liquids transmit pressure equally in all directions.*

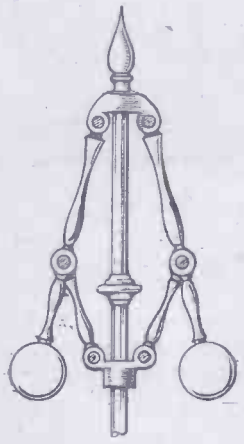


Fig. 5.—A governor.

Liquids press laterally, that is, upon the sides of the containers which contain them as well as on the bottom. A simple experiment to prove this may be made by piercing some holes in the side of a tin, disposing the holes one above the other and plugging them with corks. Now fill the tin with water and remove the corks. It will be found that water spouts out of every hole, demonstrating that the liquid is pressing upon the side of the tin. It will also be observed that the jet from the lowest hole reaches a greater distance than that from the hole above it, until we come to the top hole, which will have the smallest jet of all. This proves that pressure increases with depth. It is a fact that the pressure at a depth of 40in. is just twice as great as that of 20in. At 60in. depth the pressure is three times as great, and so on. Summarised as a rule, *pressure increases proportionately with the depth.* Thus, in designing vessels the lower parts must be made thicker and stronger than the upper parts.

Vertical Pressure of Liquids

The pressure exerted on the base of its container by a liquid varies proportionately to the vertical depth of the liquid. If the depth of any liquid and its specific gravity be known, it is a simple matter to calculate the pressure it will exert on the base of the vessel which contains it. For example, the specific gravity of mercury is 13.5, so whatever the pressure of water this will be increased by 13.5 times for mercury.

Upward Pressure of Liquids

A liquid presses not only downwards and sideways but upwards also, and it is this upward pressure which supports boats. If a cork is placed at the bottom of a tin of water the upward pressure causes it to rise to the surface because it is lighter than water, bulk for bulk. Solids do not rise

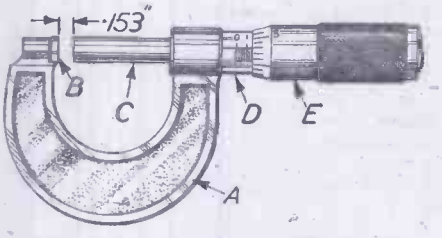


Fig. 6.—In Fig. 8 on page 18 of last month's issue, our draughtsman had erroneously shown only four divisions on the thimble instead of five. The corrected diagram is here shown, the reading being .153in.

in this way because, bulk for bulk, they are heavier than water. The effect of the upward pressure of the water on these solids, however, is to make them lose part of their weight. A diver can easily lift weights lying at the bottom of a river or the sea which he would be quite unable to move on dry land. If the arm is thrust deeply into water the upward pressure can actually be felt.

Application of Liquid Pressure to Machines

By employing a liquid enclosed in a rigid container it is possible to transmit force from one place to another. By this means we can not only alter the point of application of a force but we can also alter its magnitude and direction.

(To be continued)

A Fifty-years-old Dynamo Still in Service

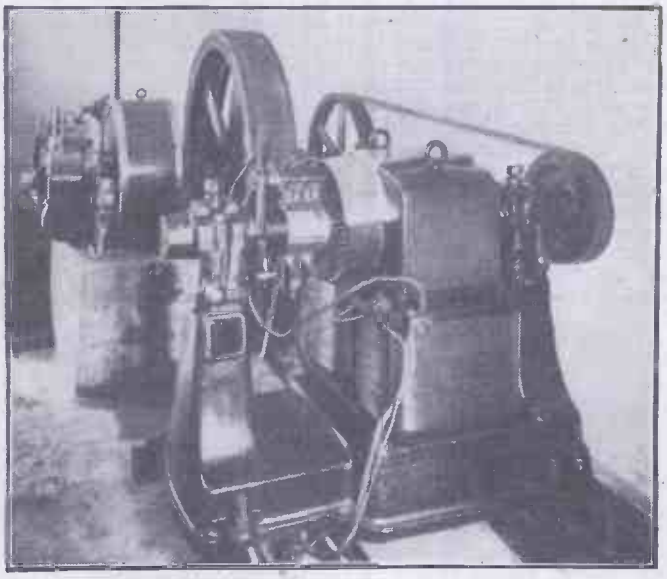
OVER fifty years ago, when The General Electric Company had a small engineering works in Manchester, the company supplied one of their "Byng-Hawkins" dynamos for service at a private house in Wimbledon Park. This machine had an output of 50 amps. at 140 volts when running at 1,140 r.p.m., and was used for house lighting, and to supply power to the motors of an electric organ.

Twenty-seven years later it was bought by James Webb and Sons, the well-known firm of toolmakers, and installed in their works at Bloxwich, near Birmingham. After running in these works continuously for several years, it then served as a standby plant and was eventually put into store.

There it remained until the serious fuel position in the country gave rise to the introduction of "the powerless day," when the machine was brought into service once more to supplement the power produced by a modern G.E.C. generator, which forms part of the works' 110-kW. D.C. and A.C. generating plant. The "Byng-Hawkins" dynamo is still in regular use and supplies office and individual toolroom lighting, as well as power for magnetic chucks and several small motors which drive grinders and drilling machines. A Tudor storage battery is used in conjunction with the dynamos, thus making a very reliable plant.

Throughout its long life the only maintenance to be carried out on this machine consisted of reinsulating the end of the commutator, which was skimmed, and replacing the original copper brushes with carbon brushes. The original bearings are still sound and show no signs of wear.

The efficiency of this dynamo very nearly equals that of the more modern generators, while its commutation is as near perfect as possible. Even on 50 per cent. continuous overload, no sign of sparking occurs.

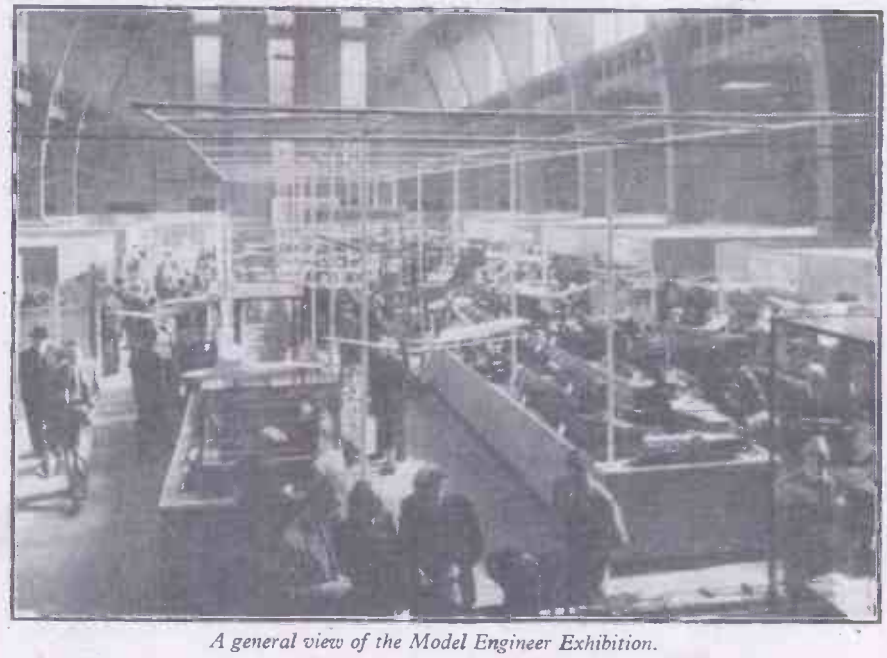


The G.E.C. "Byng-Hawkins" dynamo in general use after half a century's service.

THE WORLD OF MODELS

The Model Engineer Exhibition

By "MOTILUS"



A general view of the Model Engineer Exhibition.

THE centenary of George Stephenson's death on August 12th, 1848, fell close to the opening of the 23rd Annual Model Engineer Exhibition in London this year. I could not help thinking, as I entered the Royal Horticultural Hall on the opening day of the Exhibition and saw the array of competitive exhibits, how stirred Stephenson would have been if, like a Rip Van Winkle, he could have come back and seen this remarkable display. How thrilled and amazed he would have been at the exhibition of amateur model locomotives in the locomotive section, all developed from his own first locomotive in 1814!

With the competition displays, the working model demonstrations, the stand exhibits of well known clubs and societies and those of trade firms, this annual exhibition is a fine rendezvous for both amateur and professional model-makers. My memory reaches back to the first Model Engineer Exhibition and its successive improvements from year to year. This year gave us the most attractive and, I believe, the best attended exhibition ever yet held. The trade stands were, as last year, uniform in their exterior design, colouring and fascias, but the style was much improved. The competition work, always of first importance, was outstanding in good detail and finish and showed an immense variety in choice of subjects.

The Exhibition opening brought together a crowd of well-known personalities among amateur and professional model-makers, and also the technical and popular press. There was one figure, however, missed by everyone: that of the late Mr. Percival Marshall. Those who had been present the previous year were inevitably reminded of the grand welcoming address "P.M." gave at his last opening of a Model Engineer Exhibition. Mr. Marshall was a personality who will be missed not only at these annual gatherings, but throughout the model fraternity.

The official opening this year was in the able hands of Mr. K. E. Garcke. Mr. Garcke, referring to the sad loss of Mr. Marshall, said he hoped the good traditions and comradeship inspired by the founder of this exhibition would continue to be the mainspring of the model world. Following a supporting speech from Mr. Arvid Ohlin, of Stockholm, who welcomed the innovation of an International Section of the Exhibition, the audience took light refreshments while engaging in lively discussion of model news and experiences since last year. I was happy to find myself close to our friend and editor, Mr. F. J. Camm, who is always ready with alert and stimulating discussion on any mechanical problem under the sun.

International Section

The International Section is a new idea for this model event, and we all hope it will become a regular annual feature. There were contributions from Sweden, France, Holland, Austria, Norway, Switzerland, Denmark, Spain and Canada, and there were some fine models among them.

The working models arena once more occupied a central position at the far end of the hall, and was encircled by an admiring crowd for every demonstration. The restoration of an old favourite—two passenger-carrying railway tracks—was welcomed by huge crowds of young and old, with frequent queueing for rides. The position of the tracks, down one side of the large hall, is an admirable idea, as they do not interfere with access to the general competition section and the trade stands. On the whole it was a good move to reinstate this popular item, and its unobtrusive position removes any objections that might otherwise be legitimately raised by serious visitors and students.

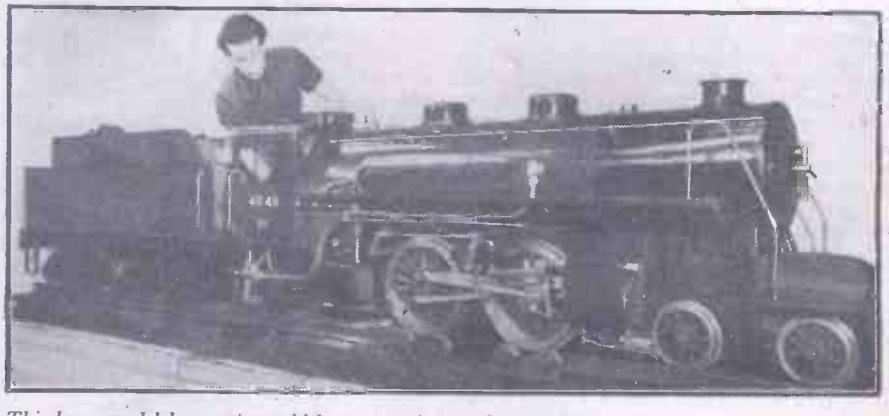
As always, a comprehensive exhibition such as this leaves the reviewer at a loss to know which of the many models of high standard he will select for comment. Choose he must, however, so I will follow with my own remarks on some of the models I particularly noted, although these are only a few of the great number that attracted attention or displayed unusual features in design or execution.

Model Locomotive Display

Commencing, as I often do, in the locomotive section, there is no doubt that the most outstanding model was the Championship Cup winner, No. 15, which stood at the foot of the staircase near the entrance. This was the 1½in. scale, L.M.S. 4-6-2 "Duchess of Buccleugh," the work of Mr. H. C. Powell, foreman coppersmith at Crewe L.M.S. Railway works. Many locomotives have been built for private garden railways and also for public outdoor model railways, but never has such a beautifully finished and detailed locomotive of this size been seen before: practically every scale detail has been included. I feel, however, that it would have been better to have raised this model from the ground on a higher stand than that provided, in order that some of the admirable detail work could be more carefully examined. It deserved pride of place and it would have been much more imposing as a special exhibit and Championship Cup winner.

Another locomotive model which attracted much attention, especially from G.W.R. fans, was the ¾in. scale, 3½in. gauge, G.W.R. King Class locomotive, which won a silver medal and also the Curwen Prize. The builder, Mr. F. Cotton, of Greenfield, who is a railway restaurant car attendant, has included all scale details in his model and well deserves his reward. A bronze medal was given to Mr. J. M. Crowther, of Huddersfield, for his 7¼in. gauge "Midge" locomotive: this was modified from a G.W.R. design and had a G.W.R. 1103 class cab. Another bronze medal winner was Mr. W. D Hollings, of Bradford, who contributed a well-finished model 7¼in gauge, 1½in. scale 0-6-0 dock-shunter.

The well-known model-maker, Mr. W. H.



This large model locomotive, which was on view at the Exhibition, is to be exported to Durban, South Africa, where it will be used on a miniature railway. Weighing 25 cwts. loaded, the locomotive and tender is 13ft. 6in. long overall.

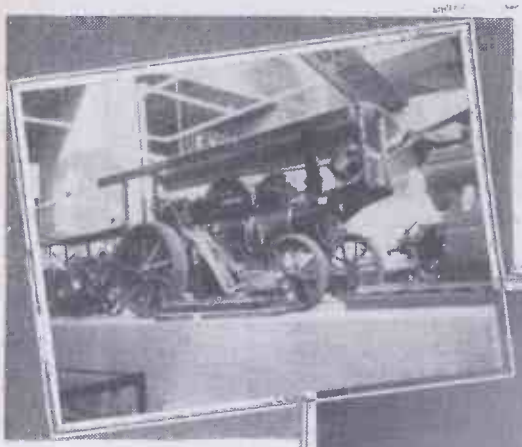
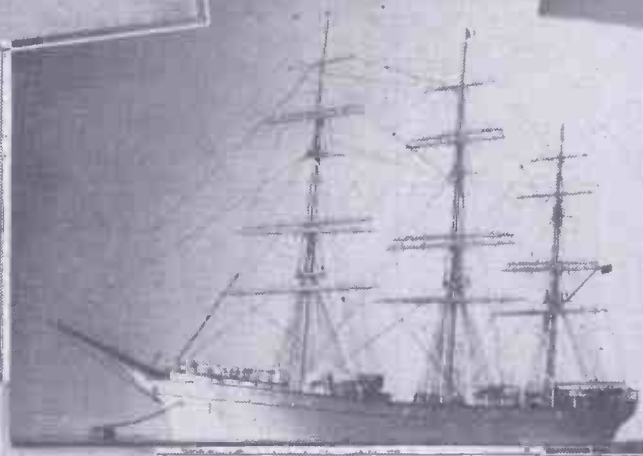


Fig. 1 (above).—A 2in. scale free-lance showman's type traction engine. Weight 200 lbs. Pressure 90 lbs. per square inch. By H. Awde (Woodford Green).

Fig. 3 (below).—Model of the "Brynhilda." Scale ½in. to 1ft. By Dr. S. Rowland, of Northampton. Awarded a silver medal.

Fig. 4 (above).—Model river pilot boat, powered by a twin-cylinder I.C. engine. By T. Fletcher, of Colne. Awarded the championship cup.



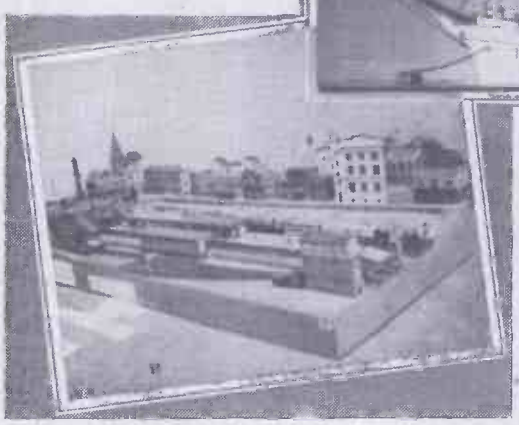


Fig. 2 (left).—Model of a typical L.N.W.R. station in industrial setting. By J. K. Nelson and K. Tyler of Ilford. Awarded a silver medal.

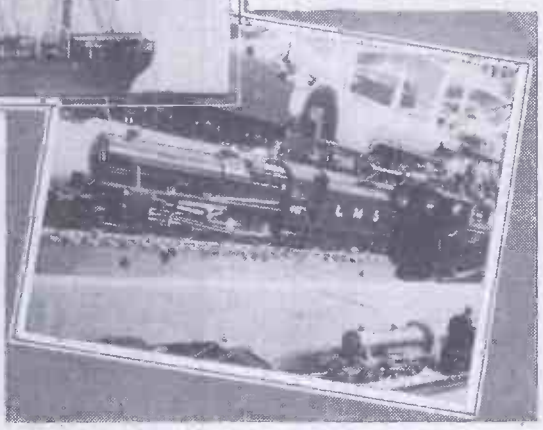


Fig. 5 (right).—Model L.M.S. Clan class locomotive and tender. Length overall, 4ft. 2¾in. Weight 100 lbs. By J. Knighton (Ilkeston).

Dearden, A.M.I.Mech.E., who has now reached the advanced age of 74, contributed to the exhibition a 1in. scale Caledonian locomotive, number 142, which he completed as recently as March this year. Mr. Dearden has done a great deal of model-making in his time and his experience endows him with fine skill and accuracy in all his work. His Diploma Award was well-earned.

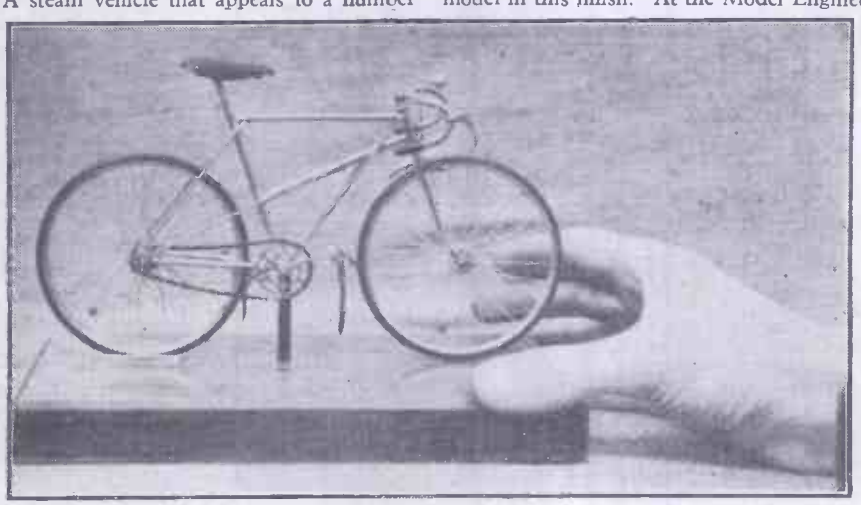
"00" Gauge Layouts

In smaller gauges, there were some excellent 00 gauge layouts. One, by Mr. P. B. Denny, of London, was on display in the upstairs rest room; an 18 mm. gauge model of "Tingewick" Station, a halt on the Buckingham (Great Central) branch line. The model has a 2-rail system throughout and shows the station, with scenic details, as on the Great Central Railway in 1912, with goods yards, level crossing, animal pens and station buildings. In the station stands a model 4-4-0 Pollitt locomotive and Great Central coaches: quite a unique layout. Also in the rest room was the comprehensive 00 gauge, electrically controlled layout of the Ilford and West Essex Model Railway Club.

Another 00 gauge layout I specially noticed was a model of an L.N.W.R. station in an industrial architectural setting. In fact, it seemed almost more an architectural than a railway model, the combination making a most realistic piece of work in a small scale. Built mainly from thin cardboard and carefully hand painted, the model was based on drawings made and measurements taken on an ex-L.N.W.R. station, the layout and track being similar to that at Weedon, Northants. The detail in all the railway accessories and in the main buildings was very well executed. I was glad to see that a silver medal was awarded to Messrs. J. K. Nelson and K. Tyler, of Ilford, for something quite out of the ordinary run in model railways.

Model Road Tractors

A steam vehicle that appeals to a number of model-makers is some form of traction engine or steam-driven road vehicle. I remember some years ago Mr. F. J. Camm making a working model road tractor, to a scale of ¾in. to 1ft. The model was featured in PRACTICAL MECHANICS, and drawings, castings and parts are still available from Messrs. Bassett-Lowke, Ltd. The one built by Mr. Camm was silver-plated for exhibition purposes and made an exceedingly smart model in this finish. At the Model Engineer



A remarkable piece of precision modelling. This ⅛in. scale model bicycle, weighing ½lb., was made by F. Harden, of Surbiton.

Exhibition a more elaborately developed road tractor was shown by Mr. H. Awde, of Woodford Green. This was a large, well-finished, 2in. scale showman's type traction engine, weighing over 200 lb. and having a working boiler pressure of 90lb. per square inch. It was complete with a dynamo on the usual bracket attached to the smoke-box.

Sailing-ship Section

The ship sections certainly had a greater variety of models, both ancient and modern, than I can remember having seen before in the Exhibition. There was, of course, the usual collection of rather tawdry, showy galleon models, where little use has been made of the available information to obtain as accurate a representation as possible. Among the galleons, however, there were also some finely-made models; outstanding among them was a detailed model of an Elizabethan galleon of c. 1600, made by Mr. W. R. Willison, of Sandy Lodge, nr. Northwood. This model was to a scale of 1:64, with overall dimensions of 2ft. 7in. by 13in. wide. The fine details shown in rigging, deck fittings, carved hull and even the ship's crew showed the results of much patience and neat workmanship—a praiseworthy quality in these ancient ship models.

Turning to more modern ships, the model 10-rater racing yacht by Mr. W. C. Morrison, of Southall, showed beautiful lines in hull and sail. With smart chromium fittings, this made a splendid Silver Medal winner. Another trim sailing ship model was that of a Yorkshire Whitby coble, a type of ship now fast dying out. To a scale of 1:12 the model was timbered and planked and was a clean-cut ship which should give a good performance on the water. The Championship Cup in the sailing-ship section was awarded to Mr. W. H. Honey, of Tulse Hill, for his excellent model of a Norwegian Jagt, the *Gjoa*.

Before leaving sailing ships, special reference must be made to the beautiful model of the *Brynhilda*, for which Dr. S. Rowland, of Northampton, won a Silver Medal. The prototype of this model was a full-rigged iron sailing ship built in 1885 by Messrs. Alexander Stephen and Sons, Glasgow, for Messrs. J. and W. Carmichael, of Glasgow, Nova Scotia. Dr. Rowland knew the ship well and was able to borrow the original ship's drawings for building his model to a scale of ⅛in. to 1ft. It is interesting to note that the masts and spars of the *Brynhilda* model are of brass, and that Dr. Rowland says, despite its disadvantages, he prefers to use metal for this purpose in all his ship models. He also prefers the use of correct colour finishes to gold and silver plating, but does not use paint to colour his small iron-work; instead, he uses a chemical process and then a thin, clear lacquer, or transparent green lacquer if green colour is required.

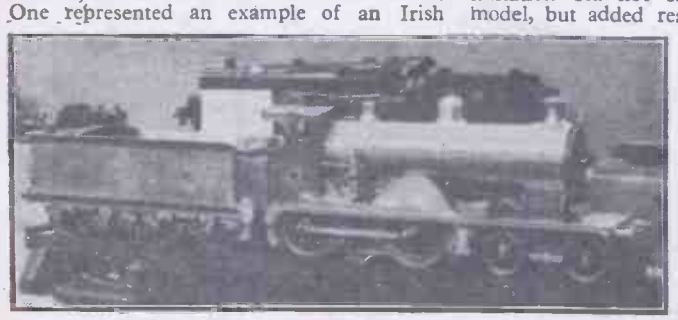
Three unique model boats were contributed to the Exhibition by Lt.-Cdr. J. H. Craine. They represented three small, light river boats, one from Wales and two from Ireland, and all were to a scale of 2in. to 1ft. One represented an example of an Irish hide-covered coracle still found on the River Boyne, Co. Meath, where such boats have sailed since the days of Henry VIII—the only hide-covered vessels left in Europe. Another was of a Welsh coracle from the River Teivi, Cardiganshire. This type of vessel, which is still employed for salmon fishing, has a history that goes back to the Stone Age. Yet another historic type of boat which has survived, and is in common use in Galway Bay, was depicted in the model of the three-man Galway curragh, built of canvas, stretched on an ash-lath framework and tarred.

Power-driven Boats

In the power-driven boat section the Championship Cup for working model steamers were given to Mr. T. Fletcher, of Colne, for his model of a river pilot boat propelled by a twin cylinder internal-combustion engine. This was a well-finished, well-designed and well-equipped model which, I should think, will show a good turn of speed when given the opportunity.

Model of Whitby (Yorkshire) coble, a type fast dying out. Scale 1 : 12, timber planked. Length 43in., height 30in., beam 8in. By D. C. Wray, of Edgware.

The largest ship in the world, the Cunard White Star *Queen Elizabeth*, is one of the most popular subjects with model steamship builders. Commercially, also, huge models of this ship are being made for publicity purposes; the largest model built of this or any other ship is now on the stocks at Northampton, in the works of Messrs. Bassett-Lowke, Ltd. When finished, it will be about 22ft. in overall length. It is interesting to note that a Silver Medal and also the "Hampshire" prize were awarded to Mr. D. McNarry, of Barton-on-Sea, for his small waterline model of the *Queen Elizabeth* (scale 1in. to 50ft.), shown at the Exhibition. Apart from very fine detail work on the ship's decks, the inclusion of a small yacht on the imitation sea not only gave scale to the model, but added realism to this fine piece of miniature ship modelling.



A 1in. scale model Caledonian locomotive 142. Made by W. H. Dearden, of Ashtead.

Model Aircraft

The aircraft models and their performance displays proved a great attraction to those drawn to the Grand Circular Track. These competition models were realistically suspended in the centre of the hall, which gave ample opportunity for detailed examination by the bystanders below. The Championship Cup in this section went to Mr. S. A. Miller, of Luton, for a fine semi-scale, power-driven 1 c.c. C.I. model. The "Bristol" Challenge Cup, offered for the best aircraft model of a Bristol machine entered in the competition, was awarded to Mr. G. A. Hobbs (nr. Chippenham), for a Bristol Type 123 model.

In the first floor rest room the Light Railway Transport League were showing a working 7 mm. scale modernised tramway system, and also had on view a series of models to illustrate the development of electric trams from the very early Metropolitan Electric Tramways to the latest modern trams of the Glasgow Corporation. Another deservedly popular showpiece in this room was undoubtedly the marionette theatre of Mr. S. Kemp, of London. On my expressing interest in the almost lifelike 9in. puppets, Mr. Kemp took me "back-stage" and showed me how he operated his varied and colourful collection of marionettes: clowns, pierrots, a Chinaman, a buxom opera singer and many more. Mr. Kemp, who was awarded a Diploma for this model, told me he used his theatre during the last war to give performances in aid of war charities.

Before closing this brief review of a very fine exhibition, I would like to congratulate Mr. E. D. Stogdon, the Exhibition manager, and his staff, on the further improvements that were effected in the layout and general arrangements of the Exhibition this year. I believe Mr. Stogdon is now faced with another problem: that is, how to accommodate in reasonable comfort the thousands of people who now visit these Exhibitions. One suggestion that has been made is that both Horticultural Halls should be engaged, but I do not think this a satisfactory solution, as it would be difficult to divide the Exhibition into two separate parts and still maintain its integrity. A second suggestion is, "Why not go to Olympia?" but I feel that would be neither so convenient nor so intimate as the Royal Horticultural Hall. The best suggestion I have heard so far is that the Exhibition be extended to 15 or 16 days so as to include three Saturdays; this should spread the crowds over a longer period. However, whatever decision Mr. Stogdon and his fellow organisers reach, I am sure next year's Exhibition will be as popular as ever.

Letters from Readers

Space Flight

SIR,—I should like to draw attention to a point raised by Mr. R. F. Wiseman in his letter referring to space flight. Unfortunately, I was unable to read Prof. A. M. Low's article, but the inference I draw from this letter is that the professor has in mind a spaceship fired from a gun, i.e., one incapable of moving under its own power. This, of course, would need to attain the high speed necessary to leave the earth's gravitational attraction, and can at once be ruled out as impracticable for any passenger-carrying purposes for obvious reasons.

No, the type of spaceship needed is one capable of creating its own motive power, and this, even with a rate of climb of only one mile an hour, must eventually leave the earth's sphere of attraction. A number of people imagine the second type must also attain the "escape velocity." I wonder if they imagine a solid ring round the earth preventing anything from leaving once it reaches a certain height? In actual fact the earth's pull decreases with height and could not prevent a spaceship, that supplied its own power and could use it to move away from earth, from leaving at any speed.—RICHARD WARDELL (Sheringham).

SIR,—I think that both Professor Low and your correspondent, R. F. Wiseman, are labouring under a delusion regarding space flight. The velocity of escape of the earth, which is 11.2 kilometres per second, is the *initial* velocity which must be imparted to a body in order that it may completely escape the earth's gravitational pull, without being given any further impetus.

However, for self-propellent bodies such as rockets, this velocity does not apply. Provided a sufficient fuel supply could be carried, a rocket could ascend at walking pace until completely clear of the earth's gravitational field.—E. A. WHITAKER (Plumstead).

Dissolving Scrap Celluloid

SIR,—I notice that it is mentioned in the "Queries" column that scrap celluloid can be dissolved in a 50-50 acetone-acetate mixture. I have done quite a fair amount of this and find that the above mixture is not a very good general dissolvent. Most makers have their own formula for celluloid and sometimes the mixture won't touch it. And ageing also makes a difference. I find the safest thing is to dissolve with acetone. Then, when the celluloid is very thick (treacle-ish), thin down with acetate. This will very often, when dry, have a smoky appearance on the surface, and also be a poor adhesive. A little castor oil will help to take away this effect. Ten per cent. is about the amount, but it can be varied a little either way. Of course, it slows the drying.—H. D. SMITH (Wembley).

Metallic Paint

SIR,—In the August issue your correspondent I. Bristow (Edmonton) asks for information regarding mixing gold or bronze powder.

I find that white or bleached shellac mixes readily and dries quickly.—C. BURNETT (Redcar).

Westminster Chimes

SIR,—With reference to the reply given on the above subject in "Queries and Enquiries" in a recent issue, the following may be of some assistance to your correspondent.

I find that for brass tubes the frequency of the ringing tone varies inversely as the square of the length, so that the relative lengths for an octave are as follow:

Note	*Length*
C	1.000
C′	.974
D	.945
D′	.919
E	.892
F	.866
F′	.843
G	.817
G′	.795
A	.773
A′	.750
B	.729
C	.707

I have made a successful set of Westminster chimes from 1in. o/d brass tube 30/1,000in. thick with the following lengths:

G 14⅜in.; C 12 13/16in.; D 12⅛in.; and E 11 15/32in.

The suspension is best made at the nodes, which are at 0.2242 of the length from each end.—G. M. BOYD (Bromley).

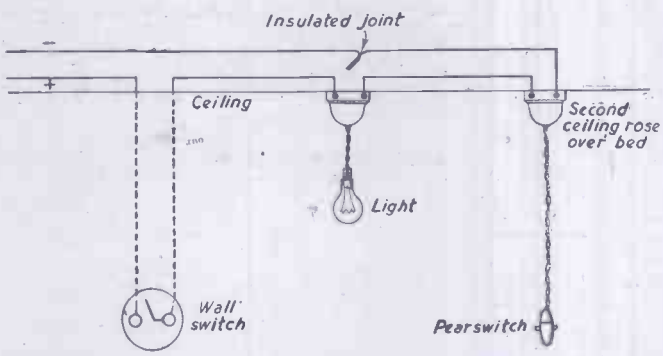
Controlling Electric Light from Bed

SIR,—In the June issue of PRACTICAL MECHANICS I noted the letter from B. T. Miller (Chesterfield) re the operating of the bedroom light from a pear-switch via the wall switch.

It will be appreciated that in a lot of cases the picture rail does not exist and what is more unsightly than electric wires trailing round a room? In this respect I wish to submit a more "professional" touch to the one from B. T. M. Obtain a second ceiling rose and mark the position over the bed where it is required. Switch off the "mains" and loosen the screw of one of the terminals in the "light" ceiling rose (either will do). Next, take a suitable length of twin w (lead covered if possible) and go into the loft after marking the position of the bed switch by boring a hole big enough to pass through the wire. Trim the ends of the wires of the insulation and push one end through the hole over the bed.

At the other end pull the existing wire through from the (light) ceiling rose (the terminal screw which was previously loosened) and in its place push one wire of the extension cable. The other end is then joined securely to the wire which was pulled out and well wrapped with insulating tape. On returning to the bedroom, fit the ceiling rose over the bed to the two wires protruding, fix to ceiling, connect suitable length of flex, complete with pear switch, and screw the cap on. At the other end remove the ceiling rose in order to wire in the one wire which will be protruding, and screw back into position.

This, of course, does not mean it is a "two-way" switching. This would be more expensive to install.—H. J. ANDREW (Staveley).



Wiring diagram for controlling an electric light from a bed (H. J. Andrew).

Hot-air Engines

SIR,—In your article by "Handyman" (PRACTICAL MECHANICS, August, 1948, issue), I was surprised to read that the power-weight ratio of the hot-air engine is over 15 cwt. per horsepower. I had thought it was common knowledge that the hot-air engine is now being developed for driving motor-cars and other machinery. Indeed, one well-known motor manufacturer was reported in the daily press recently to have a car running on road test already.

The current type of hot-air engine is an efficient high-speed job weighing very little more than an equivalent 4-stroke petrol engine. Its efficiency in terms of horsepower per gallon per hour is superior to the internal combustion engine, and since it has neither valves nor exhaust it is reliable and silent.

So far as I know, this engine has not yet been built in miniature.—C. H. BUCK (Birmingham).

[*In the article mentioned we were dealing with the piston-type of hot-air engine.*—ED.]

Club Notes

Southport Model and Engineering Club

THIS club held its first exhibition in the Cambridge Hall, Southport, from Saturday, October 2nd, to Saturday, October 9th, inclusive.

As far as is known, this was the first exhibition to be held in Southport to include all fields of model making, and was on a far larger scale than any previous exhibition devoted to a single branch of model work.

Over 250 exhibits made by club members and other enthusiasts were displayed, including aircraft, ships and boats, locomotives, racing cars, architectural models, engines, machine tools, etc. In addition to this display, which included many working models, some of which were shown working, there were stands and displays provided by the trade, who showed models in motion under their own power, and some very fine professionally-built models.

Of particular interest was a beautifully-made 5ft. model of a lifeboat, constructed by a club member who started this model in 1895. It was made entirely without machinery and includes working bilge pumps. All metal parts were made by hand. The anchor, for instance, having been made from solid brass.

There was a model church over 2ft. in length, built from matchsticks, entered by one of our younger members, and a model ship made by a German seaman and taken when his ship was captured in the recent war.

The working models included motor launches in a special tank of water, and an electrically-driven flying model aeroplane. A compressor was in operation to drive some of the numerous models of locomotives and steam and compressed air engines.

Trade Notes

Industrial Water Heaters

THE Food and Drugs Act stresses the importance of hygiene and cleanliness wherever food and drink are handled, as distinct from the wide demand for a hot water service essential for washing-up purposes, the toilet, general cleaning, first aid and cooking.

Ascot Boiling Water Heater

Two distinctive Ascot Instantaneous Water Heaters specially designed for installation in industrial premises are being marketed by Ascot Water Heaters, Ltd., 43, Park Street, London, W.1. These heaters are not suitable for domestic use but, as industrial heaters, are not subject to Purchase Tax.

Priced at £7 net, the Sink Water Heater provides an ample hot water service instantaneously for all washing and cleaning purposes. The Boiling Water Heater (illustrated) at £10 15s. 0d., offers the additional facilities of warm, hot or boiling water at the turn of a tap and both appliances are continuous in action, fully automatic and economical in use since gas is only burnt when hot water is drawn off. The Industrial finish is in silver grey aluminium with lacquered brass fittings and immediate delivery is available for installation in factories, shops of all kinds, stores, hospitals, schools, public houses, dairies, restaurants, milk bars, canteens, ice creameries and kindred establishments, excluding professional and commercial offices.

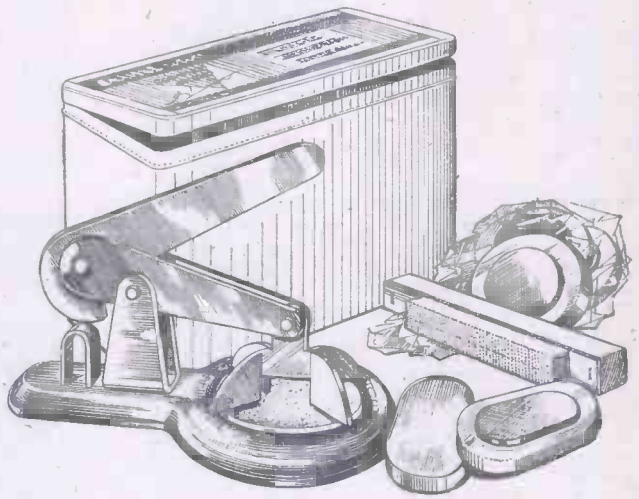
Full particulars and technical information may be obtained from all gas showrooms or direct from Ascot Water Heaters, Ltd., at the address given above.

Autotherm Vulcanizer

THE Autotherm General Purpose Vulcanizer is a handy little machine specially designed for repairing pneumatic tubes of all sizes, including tractor, lorry, motor-car, motor cycle, down to the smallest bicycle tube. Many other rubber articles, such as hot-water bottles, football bladders and rubber gloves, etc., can also be repaired.

Complete Outfit

The Autotherm is sold as a complete outfit with a supply of heat units sufficient for a number of repairs. Additional heat units are obtainable as required. To use the vulcanizer, roughen the area around the injury. Remove the linen from the heat unit, and place the unit centrally over the injured part of the tube, and clamp firmly in the vulcanizer. Ignite the fuel, by means of a match, and in about five minutes a perfect repair will result. Further particulars can be obtained from the manufacturers, William Frost Products, Ltd., Fernhead Works, Fernhead Road, London, W.9.



The Autotherm General Purpose Vulcanizer

Books Received

Science at War. By J. G. Crowther and R. Whiddington, C.B.E., F.R.S. Published by H.M. Stationery Office. 184 pages. Price 2s. 6d. net.

THIS book is a popular account showing how science helped the Armed Forces to win the war.

It was clearly not possible to cover the whole field of the scientific war effort, which touched practically every aspect of national life. The account is therefore not comprehensive, but illustrative of the methods used. Four aspects of research are covered: Radar, Operational Research, the Atomic Bomb, and Science and the Sea. Although all four subjects are of the widest interest, operational research is perhaps the most vital at the present time, for the methods used in wartime are now being employed in industry.

The presentation of scientific facts in a manner comprehensible to the lay mind is not easy, yet in "Science in War" the authors have made the subjects clear to the reader with little technical knowledge.

The book is profusely illustrated with excellent half-tones and line drawings.

The Science of Clocks and Watches. By A. L. Rawlings, Ph.D., B.Sc. (London). Published by Sir Isaac Pitman and Sons, Ltd. 302 pages. Price 20s. net.

THIS is an authoritative and interesting American book on the scientific principles of horology, and deals in a practical manner with the selection and maintenance of various types of clocks. It has been revised and brought thoroughly up to date. Chapters dealing with striking clocks and with perpetual calendars have been introduced, and a section on automatic winding mechanisms has also been added. The book, which is well illustrated, should prove invaluable to all engaged in the horological trade and others interested in the subject.

How to Build a Good "00" Loco. By "Pro." Published by Messrs. Hamblings. 70 pages. Price 5s. 6d.

THE newcomer to model railways will find much to interest him in this useful book. Written by an expert from a practical angle, the book deals mainly with loco construction, and covers all types of footplate, cabs, boilers, fire-boxes, etc., and is not confined to the construction of one particular locomotive. There is also a chapter on painting and lining locos, and charts are given for colours of each railway group. The book is well illustrated.

Furniture Repair and Renovation. Home Mechanic Series. Published by C. Arthur Pearson, Ltd. 166 pages. Price 5s. net.

THE purpose of this book is to enable the home handyman to carry out his own repairs, which will considerably extend the life of his furniture. A chapter is devoted to loose covers, and instructions are also given for the modernising of old furniture, and for the conversion of heavy Victorian pieces into smaller articles of furniture more adaptable to present-day conditions. For handymen who have made various pieces of furniture themselves, and wish to provide a professional touch by the use of french polish, details of practical polishing methods are given. There is also a chapter on enamelling and staining and some useful information on the treatment of worm-infested woodwork. The book is well illustrated with line drawings and half-tones.

Horology. By J. Eric Haswell, F.B.H.I. Published by Chapman and Hall, Ltd. 288 pages. Price 16s. net.

THIS is an excellent text-book for everyone interested in clocks and watches. The principles of operation and the constructional details of clocks, watches and chronometers are explained in such a manner as to assist the student and provide a work of reference for the more experienced reader. Appropriate historical facts have been embodied wherever desirable, but the primary object of the book is to furnish technical data and information, supplemented by clear and accurate diagrams, which are a noteworthy feature of the book.

Toys You Can Make of Wood. By Lawry Turpin. Published by Sir Isaac Pitman and Sons, Ltd. 152 pages. Price 7s. 6d. net.

A USEFUL book containing numerous easy-to-follow designs for making a variety of simple toys, including doll's house furniture, tanks, trains, jointed animals and many other novel playthings for youngsters. All the toys can be made from odd scraps of wood and with a minimum of tools. Every toy described has been constructed by the author, and the photographic illustrations show some of the pleasing results.

QUERIES and ENQUIRIES

A stamped addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 16 (THE CYCLIST), must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Detecting Traces of Lead in Tap-water

COULD you please furnish me with a method for determining traces of lead (Pb) in tap-water as I fear these minute quantities are interfering with some experiments I am making. I would like the method to be fairly accurate, because when I know the quantity of lead present I can quite easily allow for it.—H. Bratherton (Middlewich).

TO detect traces of lead in tap-water, place about 100 c.cs. of the water in a long cylinder (a Nessler cylinder is best) and add a few drops of dilute acetic acid solution and of potassium chromate solution. Allow to stand for a few minutes and examine in a good light against a dark background. The presence of lead is revealed by a yellowish turbidity. This may take some time to appear if the quantity of lead present is only very small. Compare the test sample with a sample of distilled water similarly treated.

Repeat the experiment, using a sample of the water which has been evaporated to a small bulk.

To estimate the quantity of lead present, place 100 c.cs. of the test water in a Nessler cylinder. Add 5 c.cs. of ½ per cent. hydrochloric acid and 5 c.cs. of a saturated solution of hydrogen sulphide gas. Stir the contents. A yellow-brown colouration will result. Match this colouration in the following way :—

Make up a standard solution of lead acetate or nitrate, 1 c.c. of this containing 0.0001 gram of lead. Take several Nessler cylinders similar to that containing the sample. Into each of these place small but different amounts of the standard lead solution, introduced accurately from a burette, say, 0.5, 1, 1.5 and 2 c.cs. of the lead solution. In each case make the total amount of liquid up to 100 c.cs. with distilled water. To each of these then add the same amounts of hydrochloric acid and hydrogen sulphide solution as was used with the original test sample. Compare the colorations with that of the water under test, if necessary making fresh standards until the coloration is exactly matched. Calculation of results is as follows :—

100 c.cs. of water required 1.5 c.c. of standard lead solution to match the colouration with hydrogen sulphide. Hence—

$$\text{Lead} = 1.5 \times 0.0001 \times \frac{100{,}000}{100} = 0.15 \text{ part per } 100{,}000.$$

Lagging a tank : Thermostat Adjustments

I HAVE fitted an immersion-heater into the top of a cylindrical tank which is approximately 18in. diameter and has a height of 2ft. 9in. (copper tank).

Will you please explain the best method of making an insulating jacket to retain the heat in the cylinder, and where to obtain the necessary materials.

The immersion-heater is fitted with a thermostat control—Warm, Hot, Very Hot—and it works all right on the setting "Very Hot," but when it is turned to "Warm," nothing happens ; and I should be glad if you can tell me how to test this instrument and set it correctly. The whole of the mechanism is covered by a round tin, and without removing this it is possible only to move the pointer to the heat required.—P. Emmott (Upminster).

THERE are various methods of lagging. The cylinder may be fitted with a specially made jacket or wrapped with corrugated cardboard and covered with sailcloth or canvas. Another way is to make a wooden casing to cover the cylinder, granulated cork being poured into the spacing between the cylinder and the casing and well rammed down. About 2in. to 3in. thickness of cork is advisable round the cylinder, with a minimum of 3in. on the top. To enable access to the element to be obtained an insulated collar may be fitted round the element housing, with a cover which registers flush with the wooden casing. You could probably obtain insulating materials from Messrs. William Kenyon and Sons, Ltd., of Dunkirkfield, Cheshire.

When the thermostat is set in the "warm" position the temperature of the water will rise only to a limited degree, of course. We regret that, without having details of the construction of the thermostat mechanism, it is not practicable to give you any useful information regarding its adjustment. The thermostat presumably contains contacts which are operated either by unequal expansion of two metal rods or tubes, or by means of a bi-metallic strip. To obtain a higher temperature the contacts should be adjusted to bring them into contact earlier ; if a snap action is fitted, this will no doubt necessitate adjustment of the operating mechanism. In any case it is likely that such adjustment will result in a higher temperature being obtained on all positions of the thermostat, with corresponding increase of current consumption.

Repolishing Plate Glass

I HAVE a plate-glass shop counter, the top of which is badly scratched. Can you tell me of any method of polishing or improving the surface of the glass ? Also, can you please suggest any books dealing with Sifbronze welding as applied to cycle frames ?—O. R. Burt, (Brockley).

SINCE your glass counter is badly scratched we fear that there is no really satisfactory method of restoring it to a new condition other than by a process of mechanical polishing. The polishing could not be done satisfactorily by hand owing to the relatively large area of the glass.

Actually, the polishing method is simple enough. The glass is matted equally all over to the depth of the deepest scratch, this being done by abrasion with a cutting powder, such as aloxite. The glass surface is then brought up to a fine polish by the use of successively finer and softer polishing agents, such as rottenstone, whiting and rouge. But the job would have to be mechanically done to get an even result, and the cost would be greater than that of a new counter.

You could do something to improve matters by scrubbing the glass surface over with a solution of caustic soda (1 part in 6 of water) in order to get rid of the ingrained dirt. The glass is then washed well and dried. It is then polished with a dry cloth and given a coating of clear cellulose lacquer, obtained from a paint shop. When this is dry, the glass is turned round in its frame, so that the top side of the glass becomes the underside. By this means, the lacquered surface will be protected from further abrasion and as it will fill up the scratches to a certain extent, the roughness of the glass will not be so noticeable.

Readers are asked to note that we have discontinued our electrical query service. Replies that appear in these pages from time to time are old ones, and are published as being of general interest. Will readers requiring information on other subjects please be as brief as possible with their enquiries.

There are no books specially written on the welding of cycle frames, but you will be able to obtain general information from the following volumes :

P. Bardtke : "Technique of Modern Welding."
G. F. P. Fox and F. Bloor : "Welding Technology and Design."
L. A. Groth : "The Welding and Cutting of Metals."
C. Hale : "Welded Steel Construction."
Owens : "Fundamentals of Welding."
"Welding Engineers' Pocket Book."

You will probably be able to get secondhand copies of some of the above works from either Messrs. W. & G. Foyle, Ltd., Charing Cross Road, W.C.2, or Messrs. H. K. Lewis & Co., Ltd., 136, Gower Street, W.C.1.

Painting Designs on Cloth

I WOULD be grateful for the following information : I wish to paint or colour designs on damask linen tablecloths, viz., roses, tulips, etc., and would require a paint or colouring matter that would stand up to a lot of washing. Can you gave me a formula for mixing the required colouring, or would it be more economical to buy ? If so, could you supply me with the address of a firm that would supply it ? Do I require to use a fixitive, and how do I prevent running beyond the design ?—James Law (Ballymena).

THERE is no paint which would fulfil the conditions which you desire in regard to the painting of designs on cloth. Even though the designs were actually printed on the cloth by a process of up-to-date fabric printing, they would not stand up against repeated washings.

Using ordinary dyes, the material would have to be printed from engraved copper plates, rollers or wooden blocks. This would necessitate equipment which would possibly be beyond your resources.

For hand painting, the only two alternatives are (a) a cellulose paint, (b) a wax paint. These would stiffen the cloth and would not stand washing well. You can make a cellulose paint by adding water colour pigment to cellulose lacquer, which can be obtained from most paint shops nowadays. A wax paint can be made by dissolving wax of any kind in petrol or white spirit, and by colouring the solution with a wax-soluble dye. In either case the products would have to be made fairly thick in order to obviate the "running" of the design.

It is just possible that you may now be able to obtain some form of wax paint from a good firm of handicrafts dealers, such as Dryad Handicrafts, Ltd., St. Nicholas Street, Leicester, or Messrs. G. W. Russell & Co., Ltd., Hitchin, Herts, but we are afraid that you will hardly be satisfied with the ultimate results of your trials.

Silica Moulding Material

I WISH to mould hard, fireproof cylindrical components (½in. by 5/16in.). A sort of tough, fine stoneware would suit the purpose.

I think it might be useful to start with a preparation containing silica in flour form, which could be baked dead hard.

Can you please give me some idea of a suitable composition, and where to obtain the materials ? Is there any similar preparation on the market ?

Also, can you tell me where I can get small supplies of tellurium, selenium and possibly columbium or polonium ?—W. H. Lansdowne (Sutton).

TO make a silica-containing material such as you describe, the most satisfactory way would be to use a hydrolysed ethyl silicate and to use a mixture of silica flour and fine asbestos as a filling agent. This is a rather expensive process, and it would take too long to describe it within the bounds of a short reply, but you can obtain full particulars in a pamphlet published by Messrs. Albright & Wilson, Ltd., 49, Park Lane, London, W.1., the booklet being entitled "Ethyl Silicate."

The following method is quite good and is much less expensive than the foregoing one :—

Mix together 1 part fine silica or silica sand, 1 part asbestos flour and 2-2½ parts calcined magnesite. Then slake the mixture to mortar consistency with a fluid made by dissolving 40 parts of magnesium chloride in 60 parts of water. Pack the white mortar into greased moulds. It will set therein within about 30 hours, and, because it expands very slightly on setting, it will give very sharp mouldings.

Note that both of these processes require a cold setting on the medium, no baking being required.

Asbestos and silica flour can be obtained in small amounts from any London chemical merchants, as, for example, Messrs. W. & J. George & Becker, Ltd. 17-29, Hatton Wall, London, E.C.1, or Messrs. A. Gallenkamp & Co., Ltd., Sun Street, Finsbury Square, London, E.C.2. Alternatively, you could obtain these from Mr. A. M. MacCarthy, 37, Sandford Road, Moseley, Birmingham, 13.

Tellurium and selenium may be obtained from either of the above London chemical firms. Columbium is not obtainable in this country. Polonium is a radio-active element, and its sale is restricted by the recent Radioactive Substances Act. However, if you can put up a good reason for acquiring it, you should apply to Thorium, Ltd., Amersham, Bucks, or to Messrs. Johnson, Matthay & Co., Ltd., Hatton Garden, London, E.C.1.

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Editor: F. J. CAMM

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Phone: Temple Bar 4363
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Comments of the Month

By F. J. C.

Sixty Years of Road Records

THE Diamond Jubilee of the foundation of the Road Records Association by A. J. Wilson was celebrated recently in London, when many of the famous old record breakers, as well as some of the newer ones, sat down to dinner under the chairmanship of the President. The R.R.A. was formed at a meeting held on April 11th, 1888, at the Freemasons Tavern, Great Queen Street, London, when a committee was elected and Sydney A. Chalk was appointed honorary secretary and treasurer. At that meeting, according to the R.R.A. Handbook, it was decided to adopt the road records already passed by the Records Committee of the National Cyclists Union, and twenty-five were placed on the books.

At this period 50 miles, 100 miles, 24-hours and Land's End to John o' Groats were the only records listed. The 12-hours was not added until the inaugural meeting, when Alfred Nixon was appointed honorary secretary and treasurer on November 12th, 1888, when thirteen claims to records were passed.

In 1889 it was decided to recognise place-to-place records over the following routes: London to Bath and back, London to York, London to Edinburgh and London to Liverpool. In that year seventeen claims to records were passed.

A. J. Wilson was elected first president of the association in 1890, when it was decided to award certificates for record performances, and London to Brighton and back was added to record routes, the coach route from Piccadilly to Old Ship Hotel, Brighton, being the only course allowed. On July 25th, 1890, it was decided to appoint official timekeepers and Liverpool to Edinburgh was added to the routes. Thirty-seven claims to records were passed.

What a pity it was that the effort made by the R.R.A. in 1891 to control road racing did not meet with a more ready response. In that year H. D. Arnott became honorary secretary and treasurer, and twenty-nine claims to records were passed in 1892.

A. J. Begbie was honorary secretary and treasurer in 1893 and the restrictions on the Brighton and back course were removed and any route allowed between Hyde Park Corner and the Aquarium, Brighton. In that year record challenge shields were instituted and twenty-one claims to records were passed. In 1894 thirty-five claims to records were passed.

Record breaking was at its lowest ebb in 1896, for only seven attended the annual general meeting, when four claims to records were passed. The attitude of the police towards cyclists and cycling in those days was comparable to their attitude to motorists to-day, and that undoubtedly accounted for the dropping off in interest.

In 1897, A. F. Ilsley became honorary secretary and treasurer, the 1,000 miles and Edinburgh to York records were added to the list and the recognition of unpaced records as a separate class was decided upon. Seventeen claims to records were passed.

The attitude of the police had not lessened in 1898, when only four clubs were represented at the annual general meeting, and the first unpaced record was placed on the books—A. A. Chase, 50 miles in 2 hours, 7 minutes, 8 seconds—and twelve claims to records were passed.

In 1899 London to Portsmouth and back and Land's End to London were added to the record routes and eight claims to records were passed.

In 1900 the position had not greatly improved for many clubs had left the road for the track, and the number remaining affiliated to the association was reduced to five. The first of a series of triennial dinners was held on February 1st of that year, and motor pacing was no longer permitted in paced events. Eleven claims to records were passed, and seven in 1901. The years 1902 to 1907 did not evince any great interest in record making or breaking, but in 1908 the coming of age dinner was held on November 27th, and seven claims to records were passed. Nothing much of importance took place until S. M. Vanheems took over the secretaryship from F. H. Wingrave. Up to that time a body which had existed to homologate records had not excelled in the organisation of its own office, and as Vanheems has so often stated, the filing, correspondence and office documents were in a chaotic mess. Vanheems, however, set about the task of putting things in order, and so successful was he that within a year everything was in shipshape order, a card index system had been introduced, the history of the association written up, and the affairs of the R.R.A. put into good working order. It is only right that it should be set on record that one man, and one man only, was responsible for the rejuvenation of the R.R.A. and that was without doubt S. M. Vanheems. It seems a great pity that so many years should have been allowed to elapse without someone associated with the Road Records Association making the attempt to clear up the mess.

There was considerable revival in road record breaking in later years, and especially under the secretaryship of Leonard Ellis, who retired somewhat under a grievance. He was a live wire and loyally carried on the work which was really commenced by Vanheems. It seems a pity that his work did not receive greater recognition.

The foundation year 1888, must certainly have been the vintage year of cycling, for those present at the Diamond Jubilee Dinner testify by their very appearance and fitness to the fact that strenuous cycling is of benefit to the health.

By the very nature of things many of them must pass on in the course of the next ten years or so and there is no sign up to now that we shall have amongst the modern generation of record breakers anyone comparable to the giants of the past, with the possible exception of Frank Southall. We think, however, that the time has come when the R.R.A. should have a proper office where the records of a records association can be kept. As it is they are passed on from secretary to secretary whose addresses are constantly changing. It may be that in order to do this an increase in subscription will be necessary. The present arrangements are unsatisfactory from all points of view. The secretary is unpaid and, therefore, has to do the work in his spare time. He can only be contacted by post and not often on the telephone. Any urgent information, therefore, which is required cannot be obtained. The methods at present adopted are more appropriate to a local club than to a national body.

The Longer Evenings

NOW that lighting up time is from half an hour after sunset to half an hour before sunrise, it behoves cyclists to see that their lighting equipment is in good order. Night riding has a fascination all its own, but it can only be enjoyed when there is adequate illumination to pierce the darkness. There is a charm about night riding in winter. The cheery lights from an old country inn glow out a warm welcome to the traveller. The study of the history of old inns is fascinating. We have just been delving into the history of that famous old inn "The Ostrich," at Colnbrook, which in its day was a famous port of call for cyclists. It was built in the year 1106 by Milo Crispin as a hospice and the name became corrupted to "Ostrich." Cecil Roberts in his interesting book, "And So to Bath," says that this could not be because the ostrich was not known until very much later. In this he was wrong, for we have checked up with the Zoological Society, who inform us that the name "ostrich" was known as far back as the Roman times, when ostriches were used in their circuses. The Oxford English Dictionary gives the word as first being used in the English language about 1200, and as a word would certainly be in use for many years before it found its way into a dictionary, there is every possibility that the inn at Colnbrook was named after the bird. Thomas Deloney, the first English novelist and contemporary of Shakespeare, wrote a novel called "Thomas of Reading" dealing with one of the murders at the Ostrich, and Charles James, in 1895, wrote a book entitled "At the Sign of the Ostrich," also dealing with one of the murders at the inn. If readers have any other facts to contribute, we should be glad to have them.

Paragrams.

New Cycle at 82

MR. R. BURCHNELL, of Princes Road, Old Fletton, Peterborough, has for many years been a keen cyclist and even now, in his 83rd year, he says he would far sooner cycle 30 miles than walk three miles. In fact he celebrated his 82nd birthday by having a new bicycle as a birthday present, and he doesn't think he could have chosen a better or more useful present. May he continue to ride it until it is worn out!

British Cycles Best

MR. AND MRS. F. G. WEST, of Anne Street, Leicester, are back home again after spending a year in America under the scheme for the exchange of school teachers between the two countries. They taught in separate schools in Nashville, Tennessee, and while out there they made the most of their opportunity of learning as well as teaching. Mr. West was surprised at the heaviness of the bicycles produced in America and says that few riders know what a three-speed is. He says there will always be a market for a good British cycle and he mentions that at one garage he saw an English three-speed bicycle which so thrilled the garage attendants that they were taking it in turns to ride it.

Not Safety-minded?

THE tendency of present-day children towards wilful destructiveness was referred to at a meeting of Daventry and District Road Safety Committee when it was decided not to erect any more boards bearing road safety notices because the children pull them down. The boards have been re-erected several times but each time they are pulled down. In future the notices are to be stuck on walls wherever possible, and the Committee is now waiting for the little dears to start attacking the walls with pick-axes.

Going Where?

WITH our increased wish to attract more and more dollar-spending visitors to this country, it is surely time to have our signposts altered so that they really mean something. Local Councils throughout the country seem to think the traveller only wants to find his way to the next insignificant little village along the road. This is particularly noticeable on main roads, where a traveller is apparently expected to use his map continuously and hop from village to village, simply because of the parochial outlook of the local authorities responsible for the signposting. Signs which are the responsibility of the Ministry of Transport on trunk roads are often just as useless.

Cycle for York Museum?

THE 1852 Quadrant cycle owned by Mr. Jack Hobson, of Finkle Street, Thorne, Yorks, is likely to find its final resting place in York Museum. Mr. Hobson has had many inquiries from museums and from private collectors about this unique forerunner of the modern bicycle, and various offers to buy it, but he feels he would prefer York Museum to have it. His latest acquisition in the way of early transport is a 1913 4½ h.p. Triumph motor-cycle of the type used during the 1914-18 war.

New Yorks Cycle Track?

THE Miners' Welfare Activities Committee in the mining district of Bentley, Yorks, has plans for the construction of a cycle track at Bentley, of which the town has long been in need. Many Doncaster cyclists who have to go a fair distance to find a track upon which they can train would find a track at Bentley of very great use to them for their training in track events.

Vice Versa!

A 14-YEAR-OLD Cleethorpes Scout, who has just returned from a scouting trip to Austria, appears to have been very taken up with the fashions in cycling which he saw over there. He says the men in Austria all seem to ride ladies' bicycles while the women ride bicycles with cross-bars.

Traitors!

DURING the recent short-lived heat wave, a party of cyclists riding south down the Great North Road felt that, after all, there was something to be said for the internal combustion engine. So they hailed a passing lorry, placed their machines and themselves carefully on it and rode gaily past those other perspiring cyclists who were sticking to two-leg power instead of horse-power.

Fate Gives a Push

CHIEF Steward Christopher Evans, of Cranford, Middlesex, is the first British Overseas Airways steward to complete 100 Atlantic crossings. He never had a mishap or ran into trouble on any of his crossings, but shortly after completing his century he fell off his bicycle near his home, sustaining injuries that are expected to keep him in hospital for about a month.

Watch the Girls!

MR. JOHN PROFUMO, prospective Conservative candidate for the Kettering division of Northamptonshire, has suggested an idea to the County Road Safety Committee which he thinks may protect schoolchildren from road accidents. His idea is to have a number of full-size plywood cut-outs of schoolgirls, one of which would be placed in the middle of the road outside each school as the children were leaving. This, he thinks, would cause road-users to slow down. A Kettering commercial artist has made one cut-out but before more are made the legal aspects of the scheme are being considered by the County Council.

That Dangerous Jimp!

MEMBERS of Cleethorpes Road Safety Committee suggested at a recent meeting that the "Traffic Jimp" in the Ministry of Transport road safety notices does more harm than good so far as children are concerned. The child cyclists, it was stated, take the statements made by the "Jimp" at their face value and do not appreciate the sarcasm behind them, so they tend to do exactly what they should not do. The committee decided to pass its objections regarding the "Jimp" to the North Midland Accident Prevention Federation for consideration at the federation's next meeting.

Nose to the Ground

THE road accident bulletin issued by the Warwickshire Constabulary and covering August claims that one of the primary causes of accidents involving cyclists is the habit of riding with the head down. Of the total casualties during the month, 25 per cent. were cyclists. Carelessness on the part of the drivers is blamed for 43 per cent. of all accidents, while dogs running wild on the road, so beloved by cyclists, caused 16.5 per cent. of the accidents.

One Shilling a Yard

ALTHOUGH he said he rode only 20 yards without his lights on, a Kettering cyclist was fined 20s. by the local magistrates. The police inspector told the magistrates that a ride of 20 yards was as bad as a ride of a mile without lights.

Not so Safe

BRIGG (Lincs) Road Safety Committee is concerned at the ack of road-sense shown in the town, in spite of all their efforts. One member suggested that motorists take the recently erected road safety signs to mean: "This is a safe town. Drive like the devil" while the police complained that "scores" of children cycle without holding the handlebars. Members also complained about the lack of enthusiasm shown by Lindsey Education Committee and its failure to support a proposed Safe Cycling League for schoolchildren and one member said he hoped the cycles provided by the education committee for schoolchildren were issued in a serviceable condition.

Police Inventor

HAVING noticed how difficult it is for the police to control traffic passing along roads that are partially blocked, a Bedford policeman has invented a miniature set of traffic lights. The lights—red and green, without the yellow—have a flex and plug so that they can be fitted into any car lighting system, and they are controlled from a small portable switchboard inside the car. It is claimed that they are much more efficient and less dangerous to the operator than the usual clumsy hand-lamp control method.

Old Rutland Cyclist

MR. J. T. STRICKLAND, an Oakham (Rutland) butcher, who has just retired at the age of 73 after 53 years in business at Oakham, was well known in Leicestershire and Rutland as a cyclist in his younger days. He was a prominent member of the Melton Cycling Club and in 1894 he won a cup, given by Lord Lonsdale, for winning a 32-mile road race. He started from scratch and won by a very close margin in 1 hr. 33 mins. He is still very proud of the medal which he received with the cup.

Speedy Veteran

IN a 12-hour time trial, arranged by the Northampton and District Cycling Association, a veteran cyclist from Rushden, Northants, 61-year-old Mr. Frederick Denton, put up an average speed of 16.6 miles an hour over a total distance of 200 miles. Mr. Denton has for years had an ambition to beat the record of 193½ miles in 12 hours, set up 17 years ago by another veteran rider, Mr. E. H. Strevens, of Bishops Stortford, of the Upper Holloway Club. The average age of the 23 other riders who took part in the trial was 26 years. Mr. Denton covered 150 miles before he made his first stop and his speed during the last hour of the trial was, he claims, higher than during the first hour. He has always been keen on racing and feels that his speed increases with his age. In 1922, at the age of 35, he did 186½ miles in a 12-hour trial; while at 54 he reached 192½ miles. He has been riding for 43 years, and for many years has averaged some 10,000 miles a year.

Four-year-old John Boyd Dunlop the Fourth goes out on his tricycle to celebrate the Diamond Jubilee of the patenting of the pneumatic tyre by his great-grandfather on July 23rd, 1888. Riding a more primitive tricycle, his grandfather, John Boyd Dunlop the Second, then a boy of ten, tested the first pneumatic tyres sixty years ago.

Around the Wheelworld

By ICARUS

R.R.A. Diamond Jubilee Dinner

THE R.R.A. Diamond Jubilee Dinner, which took place at the Abercorn Rooms on September 17th, provided a gathering of celebrities which has not been seen for many a year. Record breakers old and new sat down to dinner under the chairmanship of the President. Frank J. Urry, my colleague and member of the Roadfarers' Club, made the speech of the evening, tracing the history of the club in graceful phraseology and paying tribute to all those who have contributed to the sixty years unbroken record of the R.R.A. During all that time there has only been one accident in R.R.A. record attempts, and that was to Monty Holbein. Sydney M. Vanheems, former secretary of the R.R.A., was present and many tributes were paid to him; for it was Vanheems who put the R.R.A. on a sound footing and organised a card index system out of the chaos which was handed over to him. For make no mistake about it, up to the time of Vanheems the affairs of the R.R.A. were by no means in order. I understand that there was a heterogeny of letters and papers, and it was practically impossible to trace the history of a record. Those who have taken over the job since have found it easy enough, as a result of Vanheems' work, to carry on. The record breakers, past and present, were toasted by A. T. Moss, with a response by C. F. Davey. I had to leave just after this.

Polhill R.C. and the B.L.R.C.

W. C. CROSK, hon. gen. sec. of the Polhill R.C., writes: "In reply to your letter (relating to plebiscite), the matters referred to therein were placed before a meeting of the club and I have to inform you that the unanimous decision was that a change of officials is both desirable and necessary. They desire me also to stress that there has been no change of policy and that massed start racing will be organised as the most important part of our programmes. Great surprise was expressed at the statement attributed to a League official and I am directed to inform you that Mr. H. R. Lintern of the Ministry of Transport was in error in making such a statement as no League official would express an opinion so entirely opposed to the open and stated policy of the League."

Unfortunately for Mr. Crosk, I believe Mr. H. R. Lintern and his assistant, who were present. I believe that Mr. Durman made the statements attributed to him. I have been in touch with Mr. Lintern who reaffirms and emphasises that Mr. Durman made those remarks. Mr. Durman has not replied to my letter on the subject. Why? I should have thought that he would have been most anxious to have refuted the statement at the earliest possible moment.

Cycle Accessories

MR. R. H. ACHERSYCH, of Coventry, writes: "I have read with great interest your remarks in *The Cyclist* of September, 1948, *re* the poor quality of cycle accessories, especially regarding rear lamps, etc. I, too, have been disgusted at the quality of rear lamps offered, and decided to do something about it.

"After experimenting with various types of material, I designed a lamp that is rust proof, acid proof, shock proof and practically indestructible, with all metal parts totally enclosed in a semi-plastic material. Also the fixing clip is stainless steel, so that it will last indefinitely.

"Thinking that I had something good, I cheerfully patented same and obtained costs of manufacture from various firms for the component parts. This at present-day prices would be about 7s. 6d. retail. I then offered patent rights and licence to manufacture to several big firms, who inspected the prototype with interest but would not manufacture for varied reasons, one being 'The public would not buy at the price in sufficient quantities to make the production worth while.'

"Slightly too cheerful, I offered to sell to a large retail concern with hundreds of shops all over England, and at an interview with the chief buyer was told, 'The public would not buy at the price.'

"Now, the point of all this is that, although a first-class product fit to buy could be produced, no one will take the slightest interest in same, so once more a good and tested idea is shelved, as is often the case, just because retail establishments would rather sell new lamps every season at about 4s. instead of one lasting years at 7s. 6d."

"Clubmen"

APROPOS my comments last month under the above heading, Mr. G. H. Davies, of Huddersfield, writes:

"I would like to write a few words on your column headed 'Clubmen' in September *Cyclist*.

"Although I agree wholeheartedly with your remarks on the inferior quality of the average present-day cyclist, I strongly disagree that these remarks apply to the real clubman who uses a machine and equipment to suit his own needs and not to suit some one else's opinion.

"The unkempt appearance, the stripped machines, and ill-mannered behaviour both on the road and in tea-houses, that you mention in your article, belong for the most part to members outside clubdom.

"I also maintain that 90 per cent. of this type of individual can neither ride a bicycle nor wishes to learn. I know from experience that a clubman detests most of them, whose Sunday 'run' usually entails tearing up and down a few miles of 'tarmac' in the false impression that they are fast men. Most of them cannot ride on the saddle, having to 'stand on 'em' at every little hump in the road, whilst a bit of rough stuff which the normal club run usually includes, would probably break both their hearts and their machines.

"I personally belong to the 'old-fashioned' brigade who, after nearly twenty years of club riding, still swear by a fixed wheel, and have no use for either clips or straps, and maintain that no one else who knows how to pedal correctly needs these encumbrances either, and certainly not with any form of freewheel.

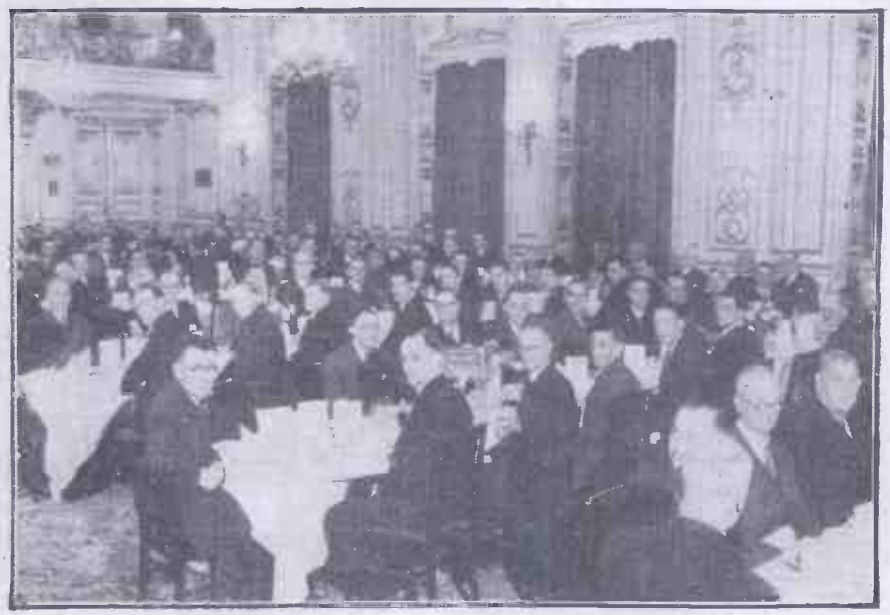
"The real clubman still abounds, and only silly young kids and other types are usually guilty of both bad manners and poor riding, whilst the better qualities are still to be found in a real club.

"Incidentally, the correct form of riding with the former type appears to be as follows: On sighting other cyclists in front, to tear off and pass them at all costs, then these in turn should object to being passed and promptly endeavour to regain their position in front. And so it goes on, and we have scores of lunatics tearing round the country every Sunday to the disgust both of the public and the real cyclist.

"Yes, it's certainly enough to make Bidlake or any other cyclist worthy of the name turn over in his grave, Icarus, but you won't find such happenings in a real club."

The Cycle Show

THERE can be no doubt that the Cycle Show will break all records. Over thirteen thousand buyers from more than 100 countries have been invited to attend it, and they will come from countries so far away as China, Fiji, Ethiopia and Iceland.



Members and guests at the R.R.A. Diamond Jubilee Dinner at the Abercorn Rooms.

Wayside Thoughts

By F. J. URRY

Kenilworth Castle. The great Norman keep eighty feet high and fourteen feet thick. The big mullions show where Robert Dudley cut Tudor windows in dating from 1170, the massive walls.

The Ideals

THE quality of bicycles—like mercy—should be unstrained, but such desire is not always to be found in their make-up. I have my mind on chain wheels and sprockets at the moment—those components which in my youth were carefully machined to fit the pitch of the chain, and there was no question of "wearing the chain in," which in any case is rather a misnomer, for actually it is wearing the chain out and the sprockets and chain ring in. I wonder if completely machined cogs can be part of the excellence of good-class bicycles? It isn't always the case now, and some of us are aware of the fault because chains do not carry silent service for so lengthy a period, and sprockets "hook" more rapidly. Now, I do not pretend to say I can tell the difference in running between the fully machined chain wheel and sprocket and those commonly fitted, because the leg is not a delicate instrument of exact power measurement, but I do know by experience that chains of similar make last at least twice as long when running over correctly shaped cogs than is the case with blanked wheels. No doubt many people will say this is a fiddling argument, and quote the fact that the cheaper process does the job admirably; but then so does the roadster tyre in its department, so why give the expert the choice of the open-sided cover? To me, cycling is a game, and I want to play it as easily and as comfortably as I can, which means seeking and, if possible, pursuing perfection. If chains wear twice as long on cut wheels—and they do—then I am losing rather less energy per mile of travel, and also have the mental satisfaction of knowing such is the best practice. And if I conserve chains, chain wheels and energy, it is a certainty I am also practising cash economy, so the satisfaction is complete.

Choice in Bicycles

SOMETIMES one drops across an illuminating sentence almost by accident. A week or so ago a man of whom I had never heard wrote me a charming letter of congratulation on my return to cycling, and in describing part of his own experiences he used the expression: "It was then I found the difference between a bicycle and a real bicycle." If only one could publicise such experiences for the greater erudition of the cycling public, this pastime would have no limit; of that I am certain. The bicycle is common, but it is not cheap, and it never will be. You might and probably do pay less cash for this than that, but it proves nothing except the fact that in doing so you rate your powers cheaply. The bicycle is not to blame. It is an old business, this making and selling of bicycles, but the buying of the product needs, it seems to me, a new approach. I have heard people say, "but I only want a bicycle to knock about on; anything will do to help me over the few miles I want to go." That mental attitude is wrong; it is thinking of the bicycle in terms of cash and entirely forgetting the human element. The same individual would not dream of walking into a shoe-shop and speaking similarly of footwear. No, the wrong shoe would hurt; so does the wrong bicycle. For, if you used a machine merely for utility riding, what sense is there in buying discomfort and trouble when, for a little extra in cash and care of selection, you can make your travel, if not a thing of joy (and that will grow on you), at least a comfortable convenience 'twixt here and there. Then, too, you will discover the difference between a bicycle and a real bicycle, and the chances are, having made the one discovery, you will slip into the knowledge that cycling is the best game of all.

A Line on Club Life

SPEAKING to various people in numerous parts of the land, I find my recent concern for the better preservation of club life among older adherents of the pastime is very largely shared. In these post-war years the emphasis on the racing side of the game has become so pronounced that club cycling in the social sense is in some danger of disappearing. This tendency was noticeable before the war, and now it has become predominant. I am interested in racing, and shall continue to be, because it was part of my introduction to this variable game, but if it became the be-all and end-all of my cycling I should conclude that my mental processes had developed a one-way track. Variety is the spice of life, and variety is the spice of cycling, and that will always be the case if an individual is to get the best out of the game. Part of that best is undoubtedly concerned with club life in its wider sense of riding in companionship and feasting amid a circle of friends. This desire is not progressing, rather retarding in many clubs, and some of the older members are losing interest for they are conscious of neglect. The racing fixture is just a race, a mouthful of talk with old and new friends, a quick cup of tea and a bun, and then everyone is off home. No doubt it suits the racing boys, but as I understand the term it is not club life. It is useless blaming this or that reason for the changed conditions (we interested oldsters each have our own pet theories); the thing to do is to rescue club life from being drowned amid the strenuous incidence of the racing world, and I think the method is to institute a real old-fashioned club run once a month during the racing season, and get the backing of the older members' support as a nucleus, with an open invitation to all the younger element to join in, and by so doing build up the real club spirit as an institution that will stand up to the gales of winter, and make cycling what it should be—a game of congregation and a happy social intercourse.

These Things Hurt

THE heavy road casualties are a distress. I am far too fond of the road to view them with that spirit of detachment that seems to be common practice among so many people, as if the death and maiming were a necessary part of modern progress. At the risk of being written down as partisan, it seems to me that the present emphasis on the cure of the disease has shifted more than ever towards the victim, and in particular to the young people. I am all in favour of training the youngster—and, indeed, all other folk—to the continual exercise of care on the road, but the other folk surely include the motorist, and it appears to me that he escapes most of the censure the daily press prints. I believe that the exercise of care in all circumstances by the motorist is far more important than is generally believed, and I say that from my daily experience as a utility rider. There are so many people driving cars now who lack the very elements of road sense, and while they are often expert handlers of a car, possess not the slightest knowledge of any other form of travel. Many years ago the late S. F. Edge said that no individual should be given a driving-licence without first serving a 3,000 miles' apprenticeship as a cyclist. That may sound drastic, but had such advice or something on similar lines been adopted I am certain road accidents would never have touched the numbers now recorded. It is road-sense we all need, and the non-cycling motorist specially. I am prepared to aver that the old cyclist turned motorist is among the safest of drivers, because he possesses sympathy for other road-users and that predication for the possible error in judgment of his fellow-travellers, however they journey. We are all in need of road education, to travel always with those two spiritual companions—care and consideration—and none of us more urgently than the motorist who is the main cause of most of the troubles, though they are not always his fault.

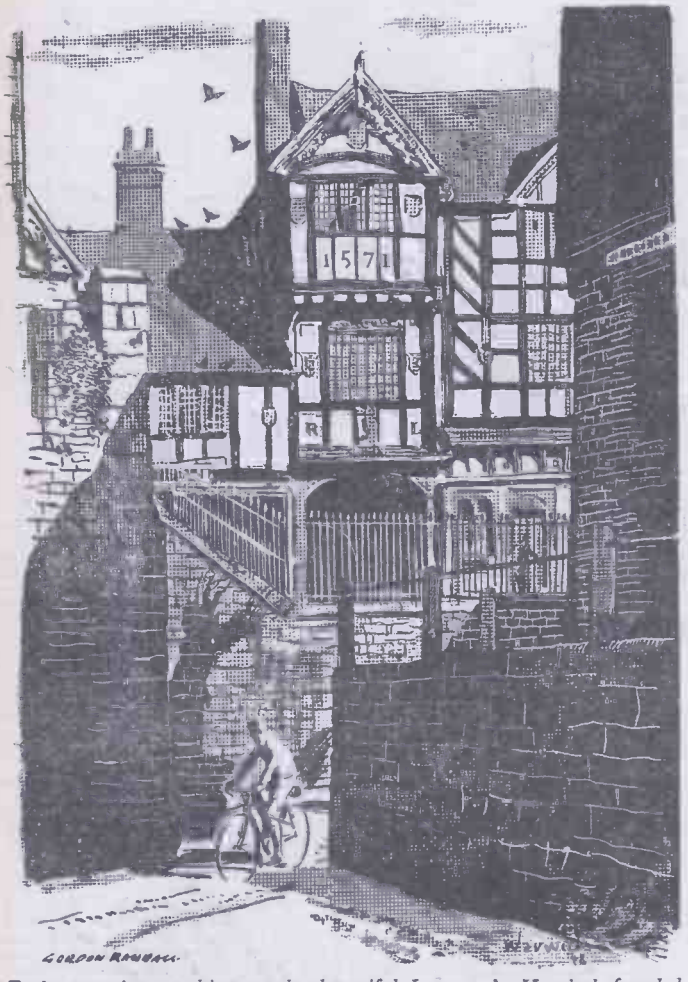
The Joyous Return

IT is only a few weeks since I have returned to the saddle of a bicycle after a lapse of nearly three months, by far the longest period since 1889 I have been divorced from the pastime. Actually, I should be in danger of over-emphasising my love of the game if I endeavoured to describe my delight when I found it possible to ride twenty or thirty miles without distress. Since that experience the distances have trebled, and the stretching of them, not for the miles but for the infinite joy of being fit, has been a pleasure almost equal to the imaginative one of first discovering the pastime. During the late days of July I drifted around the lanes solo, seeing and loving many of the old spots that charmed me as a boy and, incidentally, discovering that all the delectable places do not necessarily mean a long journey for acquisition. I found again, too, that hill-climbing and the negotiation of long, upward slopes were as much a trick of proper ankling as of brute force, and the value of the changing gears multiplied when the muscles were seeking fitness, and of course when the count of the years is well beyond the sixty mark. Except for past experience I was, in very fact, a rather ancient man learning to ride again for the sheer pleasure of the journeying; now I think I can understand better than ever why the middle-aged individual thinks cycling hard work. Some of that error derives from the use of the wrong type of bicycle, but apart from that the unfitted muscles are often driven too hard and not allowed that gentleness of time for comfortable development, which is not only desirable but necessary. These things and a thousand others I proved to myself in this mid-summer season and during the welcome return to which I was treating myself after the alterations and repairs. But I shall never be able to tell anyone of the joy of that return.

"By me you know how fast to go." The legend of the famous Abinger Hammer clock. The pretty village lies in the lovely Tillingbourne valley, and takes its name from its old-time iron industry.

CYCLORAMA

By H. W. ELEY



Early morning sunshine on the beautiful Leycester's Hospital founded in 1571 by Robert Dudley the Great Earl of Leicester. These almshouses adjoin the fine West Gate of the old town, and are well known to all Midland cyclists.

Suffolk Lure

BROWSING among old maps and books recently, I came across some jottings I made of a cycle tour in "Silly Suffolk"—a county for which I have an abiding love, for to me it has all the charm and essential characteristics of the true English scene . . . and, incidentally, the county has been written about in a wonderfully understanding way by Julian Tennyson, and I commend his book "Suffolk Scene," to all who love East Anglia, and the quiet and peaceful places where Constable painted. And, as I turned over the pages of my old notebooks I almost made up my mind to go for an autumn ride in Suffolk: there is no better time of the year for a little cycling tour than October . . . when the trees are changing to russet and gold, and the woods are gay with autumnal tints.

The Essential Bike

BUSINESS took me recently to a large factory in the Midlands, and I happened to be there at the moment when thousands of workers were leaving the plant . . . and tremendous numbers of them were on bikes. I watched men and women taking their machines from those cleverly-constructed racks, which by their design take so many machines in the very minimum of space, and I could not help thinking what a vital and essential thing a bike is! And how, in such busy industrial areas, the cycle relieves congestion on trams and 'buses! As those streams of riders left the factory gates, I thought how convenient the bike is . . . no waiting for transport, no trouble, just a pleasant and speedy ride home. Just one thought: as a man interested in tyres, I was a little saddened to see so many of the tyres woefully under-inflated! Some cyclists miss a lot of riding comfort!

A Great Cycle Show

FROM all one hears, this year's Cycle Show is going to be a huge success, and I predict that it will compare in glory with all the shows of former years. Looking back over many years, I think the fact that strikes one most of all in connection with those arrays of machines, is the big advance there has been in making cycles more pleasing to the eye. Colour has been the "magic wand" which has performed such miracles, and—by contrast — the machines of forty years ago were quite funereal when compared with the gleaming, colourful bikes of to-day. And . . . thinking of colour, I hear that we may see some most attractive coloured saddles at the Show. . . .

The English County Town

MOST of our county towns have charm and historic interest; I think of ancient Warwick, of Chester with its famous "rows," of Shrewsbury with its lovely old timbered houses . . . and somehow I rather think I love Shrewsbury best of all. I like its quaint street names, I muse upon the old days when the stage-coach rattled up Wyle Cop . . . and I fall to thinking upon the good cycling country there is in Salop . . . the happy rides I have had around Wenlock Edge, through stately Ludlow, and through that good part of Salop which Mary Webb made her own in such wistful, delightful books as "Precious Bane" and "Gone to Earth." Yes, a goodly land is this Salop . . . and Shrewsbury is one of its chief glories.

This is "Tree Time"

EVEN as I write this article, and it is but late September, the trees are beginning to change colour, and the foliage is tinged with brown, and orange, and tawny yellow. Soon, and the woods will be at their glorious autumnal best . . . and invite you to wander through glades where the sun kisses the leaves and turns every tree into a riot of gold. Sometimes, I am struck by the general ignorance about English trees: whilst everyone recognises the sturdy oak, I find that quite large numbers of folk cannot name the alder, or the hornbeam, or the wych elm. Now it does seem a little strange that in this well-treed land, where we have such lovely varieties, there should be such unfortunate ignorance in identifying the different species. And how it adds to the joy of a country ramble or ride if one can recognise each tree, and give some study to its habits, form and growth. There are several simple and excellent little books published on this subject of trees, and I would particularly recommend "The Observer's Book of British Trees," published by Frederick Warne and Company. "Tree study" goes well with cycling, and I commend the subject to all who love the forest glade, the thickets and copses where the hawthorns and the hazels grow.

Look to Your Saddle

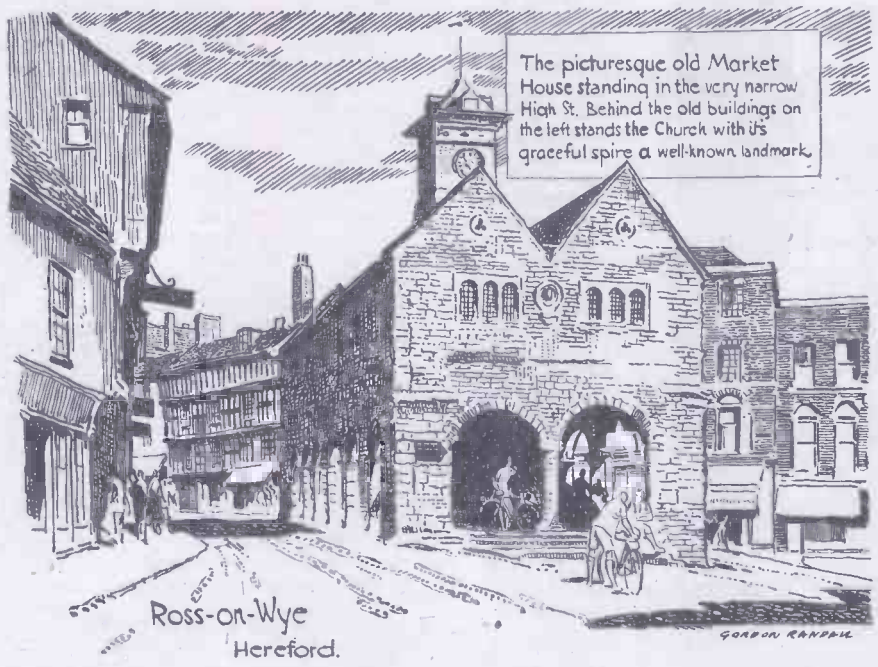
IN a recent article in this series, I mentioned the question of saddle comfort, and commented on the strange lack of attention which the average saddle gets. Often, I see a saddle with the springs gone, and the thought always comes to me that the rider of such a contraption is losing a lot of the comfort and pleasure of cycling. Saddles are certainly not over-high in price, and a replacement, when the old saddle has "had its day" is such a good investment. If you are contemplating autumn touring, then I suggest that it is good policy to look to your saddle, renew it if its condition is really bad . . . and you will add to the joys of your trip!

"The Roadfarer"

I HAVE received number two of "The Roadfarer," the official organ of the Roadfarers' Club. It contains some most interesting articles, is nicely printed and well illustrated. It is, of course, available only to members.

My Point of View

By "WAYFARER"



Security First

AT one of the places where I stayed when in Mid-Wales recently my bicycle was put in a roomy farm-building, and it was promised—rather unnecessarily, as I thought, because the farm was very remote, being at the end of a track leading off a dead-end road—that the door would be made secure. On the following morning I found, with considerable amusement, that drastic measures had been taken to foil house-breakers, burglars, and common or garden thieves and pilferers. A piece of string and a section of hospital bandage, knotted together, had been tied round the central posts of the double gates, a neat bow completing the operation. Had I known of these security measures I am sure that my slumbers would have been even more placid than they were. The next morning revealed a new precaution. The combined string and bandage were dispensed with, and a piece of wood was laid along the ground, in close contact with the double-gates, which thus could not be opened—unless you moved the wood!

This experience reminds me of one I had at the Stage House Inn, Glenfinnan (near the head of Loch Shiel), some years ago. My friend and I were directed to put our bicycles in a stable about 100 yards from the pub. and to lock the door—leaving the key in the lock! Nothing untoward happened, of course, and our bicycles spent the night safely behind that locked door—with the key in the lock!

The Bridge

ALWAYS at the end of a cycling holiday (and it is long years since I had any other sort of holiday) I look with special affection at "the bridge which carries me"—in other words, at my bicycle. It's a bit mucky. It is 10½ years old, and it has never been cleaned—except when Jupiter Pluvius has done the job, as very frequently happens. The bicycle is not neglected: on the other hand, it is not fussed over. When the time comes for me to set off for my annual holiday, it is taken from its resting-place, the tyres are pumped, perhaps the chain is oiled, the bag is packed—and then a start is made. The bicycle does what is asked of it, without complaint or trouble. On my latest jaunt I did (without trying) just over 60 miles a day. It was not necessary for me to give the machine a single thought, except that, after a drenching, I found the brake was working stiffly, and I "borrowed" two or three (literally) spots of oil from a garage, and put the matter right. I have always looked upon the quality bicycle as a thing of magic, and year by year my belief in that respect is intensified. And thus I have a very considerable regard and affection for my bicycle, which does so much for me at so little expense, and in return for a minimum amount of attention. Thus I salute "the bridge which carries me," and does so with such complete reliability.

Rewarding

THE rain which started soon after lunch on an August Thursday continued throughout the night. I was in it—getting very wet—during the daylight hours, and at night-time the clamour of it wakened me up. Listening intently, I picked up the ever-increasing roar of the tiny and insignificant stream which flows down the valley where I was staying, and I realised that this unexpected (and, as I thought, quite unwelcome) spate was going to be rewarding. My first act in the morning was to cross the farmyard in order to reach the frail home-made bridge which spans the stream. The trickle of yesterday was now a roaring torrent, the river proclaiming to all and sundry that its importance was equalled only by that of the Amazon. After breakfast, as a prelude to my day's journey, I made my way up the valley to where an old stone bridge carries the lane across the would-be Amazon. Here, again, the waters were in angry mood, and the view up-stream reminded me of the Pass of Aberglaslyn, on a very small scale.

All that day I had my reward for the persistent rain, in the form of swollen streams and enlarged water-falls. It may savour of the process of "making a virtue of necessity," but there is something to be said in favour of an occasional wet day in a mountainous country like Wales.

More Kindness

HARDLY had my recent note about the kindness of people appeared in these columns than I had a fresh experience in this direction. The final day of my August tour was a soaker. I rode 40 miles in rain, and then, in the evening, I observed that fireworks were threatening. It went very black, and "Heaven's artillery" was busy in the distance. I hoped that the thunderstorm would be travelling away from me, but that was not to be my luck, and in a few minutes I found that I was at the very centre of the disturbance. Flash and bang went the elements, and, almost before you could say "Knife" the roads were running streams. It is a long time since I have cycled in such heavy rain. Deciding that there was nothing to be gained by pressing forward, I took refuge in a small shop, leaving my bicycle under the verandah. The woman of the shop welcomed me. She provided a chair and, almost before I could sit down, a cup of tea was thrust into one hand and the evening newspaper into the other hand. It was all very pleasant. This sort of thing helps to revive one's faith in human nature. People can be very kind, as my experience has proved on many occasions.

Adjustment

THERE is nothing inconsistent in my attitude with regard to gearing. For the last quarter-of-a century I have been an enthusiastic exponent of the single gear, fixed. Not denying the delights attaching to the free wheel, I nevertheless prefer the fixed gear, and at the moment there is no sign of a change in my attitude in this respect. If there was, and I changed over to the free wheel, I fancy that I would revert to the fixed gear for cold-weather cycling, especially seeing that I wear "shorts" for most of the year.

It is, however, in regard to the other aspect of the matter that I am beginning to adjust my ideas and to trim my sails. It was borne in upon me more than a year ago that certain advantages would accrue to me were I to "turn from the error of my ways," changing my policy and going in for a moderate dose of variable gearing. That opinion was confirmed during a recent tour of 600-odd miles in hilly country. I have never made a fetish of riding up hills, being always ready to "get out" when the gradient hurt, but I now walk far too many and far too much of them, and I cannot help feeling that, with increasing years, and (possibly—I don't admit much in this respect!) declining powers, I would do better if there were available for my use something smaller than my usual 63-gear. And so, when the manufacturers are able to "do their stuff" and put on the market a two- (or three-) speed gear, fixed, I shall join the great majority of cyclists the users of variable gears, in one form or another. "Progress ever: stand still never" is quite a good motto. Admittedly, I have stood still (in a way) for 25 years. I am now going to try a spot of progress. (The latest news at the moment of writing is that in about a month's time I shall be walking up fewer hills—and thus wearing out less shoe-leather!)

Not Reduced

SOME 18 months ago I called on a squire in the Welsh Marches. It was a business visit, and I travelled by motor-car. During my August tour I paid his eminence a second visit. My "shorts" and my near-white ice-cream jacket made no difference to his attitude, nor to the kindly reception he gave me, but when he saw my bicycle leaning against a wall near his front door, he said (not too seriously): "So you're reduced to *this*, are you?" That remark gave me an opening through which I did not fail to pass, and I told the squire that it was not a case of reduction but promotion, or enhancement: that I was now travelling first-class, and that anybody could have motoring journeys so far as I was concerned. When he volunteered the opinion that he "couldn't do it," I thought fit to tell him why! Quite a lot of the people in the couldn't-do-it category *could* ride bicycles, and ride them well, if only they would try—really try—to do so.

Road Impressions

WHAT are my impressions after 600 miles of road travel, a certain proportion of which, it must be admitted, was duplicated? Outside Birmingham, where the roads are notoriously vile, I found, on the whole, excellent surfaces. The roads have stood the racket of the war years, and the neglect of the post-war years remarkably well. The only complaint I have to make is in regard to the extremely unpleasant practice of repainting a road with tar, followed by a dose of chippings and a visit from the steam-roller. The result is a surface of coarse texture which slows one up and is tiring to traverse. I suppose that, in present circumstances, one must not make a song-and-dance about this method of maintaining roads, but I hope that the day is not far distant when the practice will cease.

Cleanliness—Now

THE mentality of Government departments is often beyond the understanding of the mere man-in-the-street, and it seems to me that such is the position in relation to the tin plaques which, when tin is said to be in short supply, have been issued by the thousand to caterers all over the country. These plaques which, it must be admitted, are most attractive in appearance, bearing the surprising slogan: "Now—wash your hands." They are intended to encourage cleanliness in caterers (and possibly to impress foreign visitors), but their exhibition in all sorts of places suggests to me the process of "passing the buck" to customers!

Overheard

ONE does not always realise how voices carry. The other day, when far from home, I encountered a pair of young cyclists. After they had gone by with the usual "Cheerio," I heard the boy say to his girl-friend: "That's old . . ." naming me. If the girl had replied: "Oh! 'im!" I might have been annoyed, but her answer, which I just caught, showed that the important news imparted to her by the boy was already in her possession. I only hope that the "old" was almost a term of endearment, rather than a criticism of me for being born so long ago!

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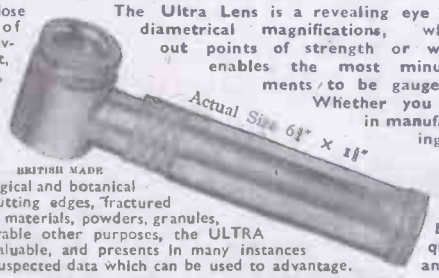

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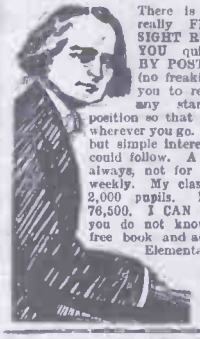

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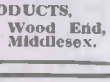

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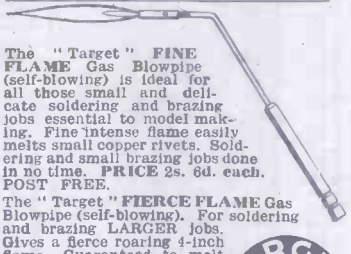

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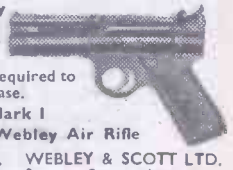

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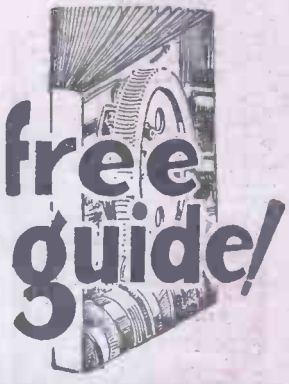

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