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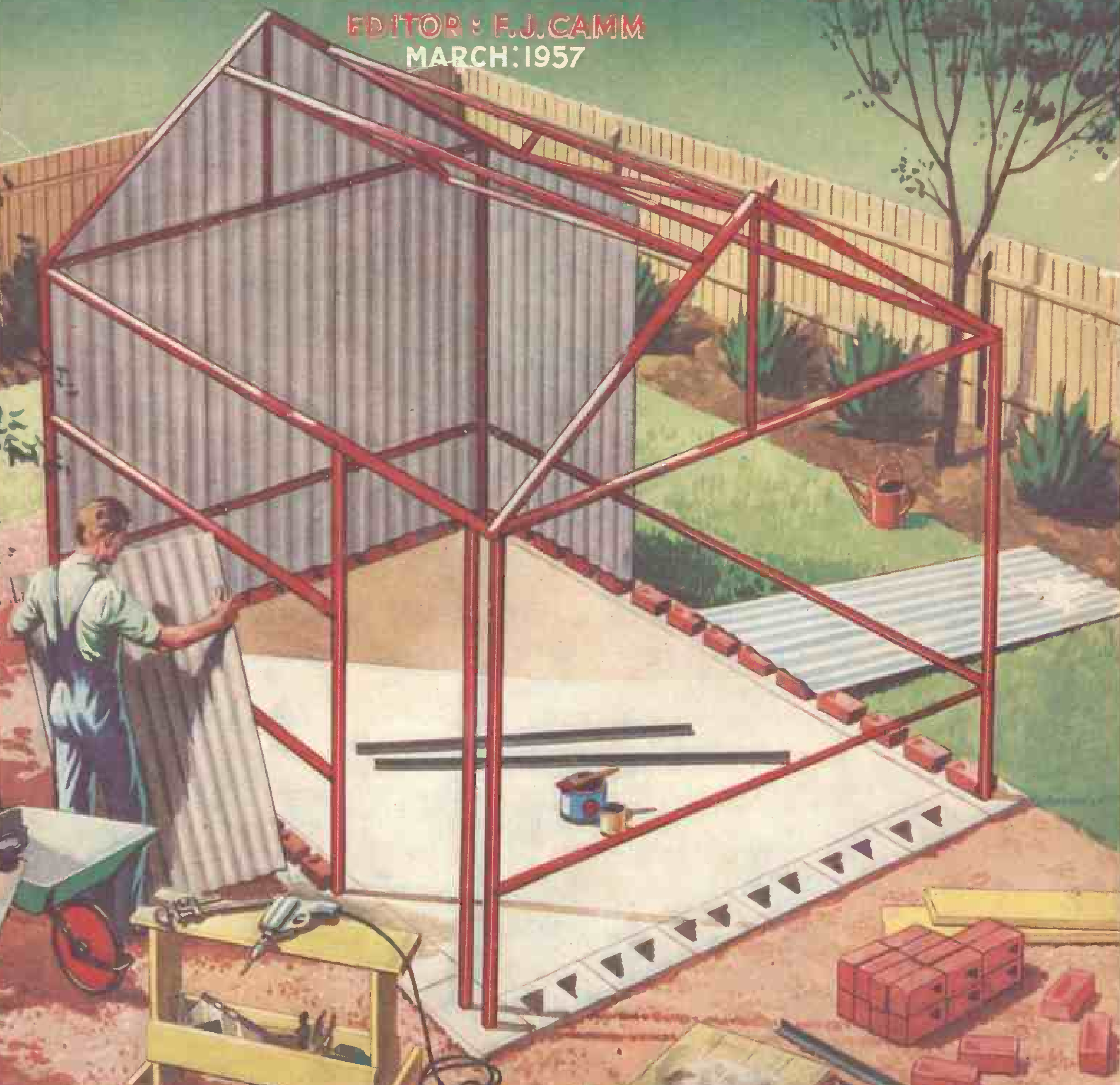
EDITOR: F. J. CAMM

MARCH: 1957



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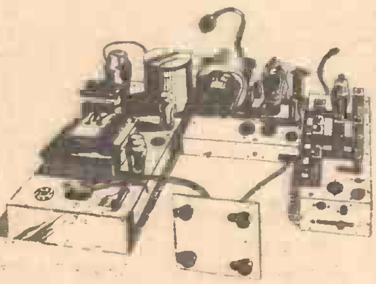

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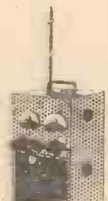

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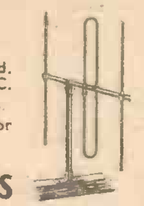

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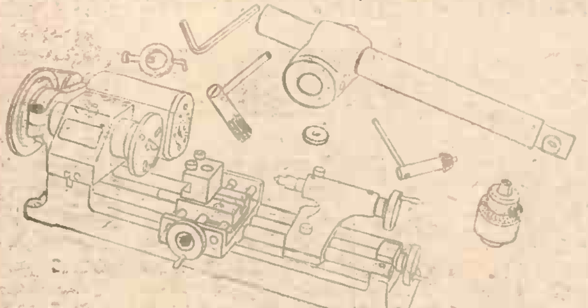

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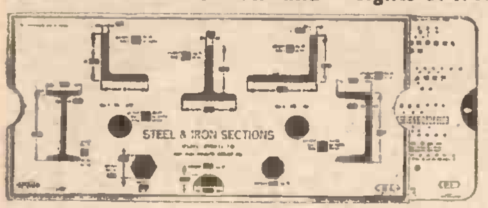

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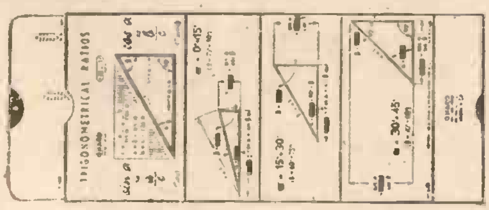

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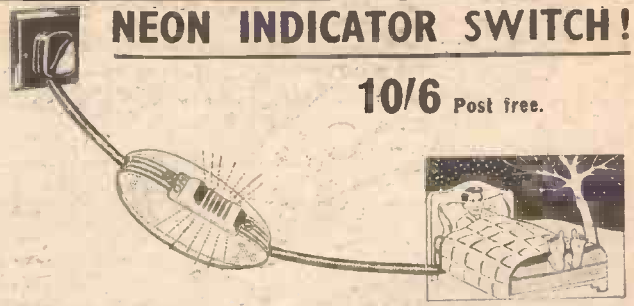

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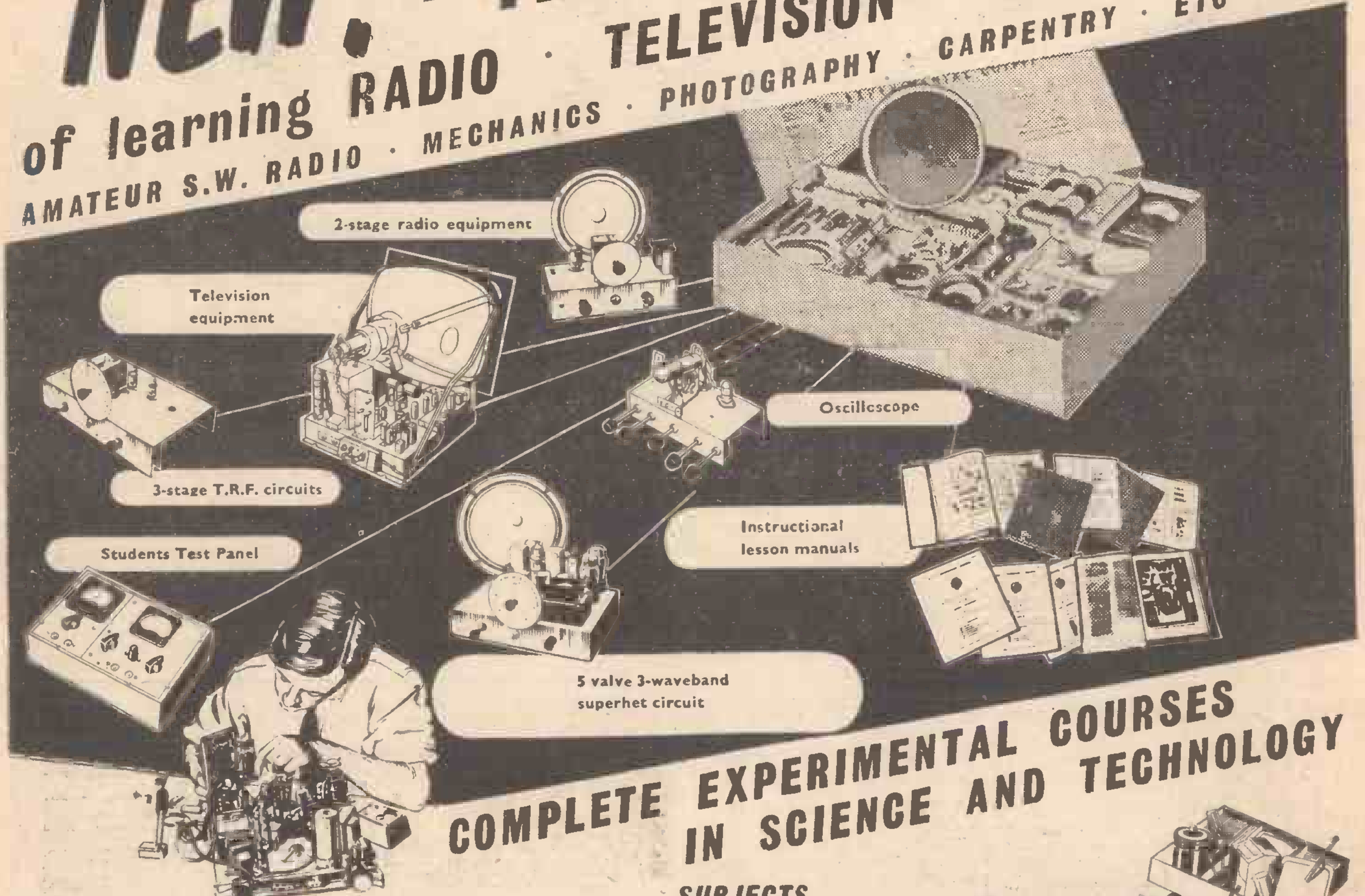

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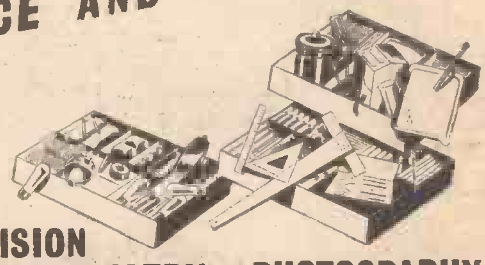

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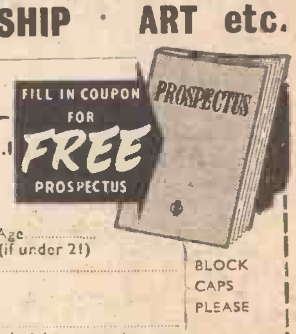

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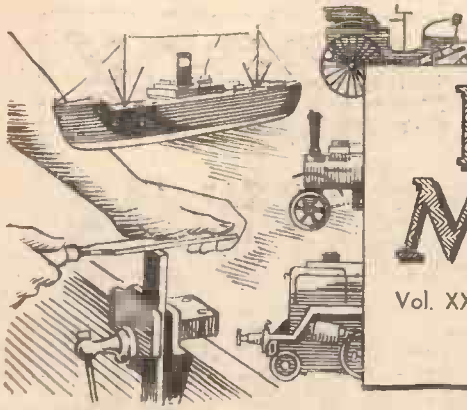

Practical Mechanics

Vol. XXIV. No. 277 MARCH, 1957

"The Cyclist" and "Home Movies" are temporarily incorporated

FAIR COMMENT
by the Editor

The Geo-physical Year

SOME time after July 1st scientific history will be made and the first practical steps taken towards the achievement of space travel by the launching of the 20in., 21½lb. magnesium sphere by the United States to celebrate the international geo-physical year. As this artificial satellite circles the earth, at a speed of about 18,000 miles an hour, its flight will be electronically "watched" by a chain of stations, extending from the outskirts of Washington to Santiago in Chile. Observation stations in many other countries will also make recordings and optical and radio signal data will be collected as the satellite passes. They will be transmitted within 20 minutes of the passage of the satellite to a centre in Washington which will, of course, be the central point for what is now known as Project Vanguard. From there the information will be transmitted by telephone and teletyped to a computer centre close by. These electronic brains will perform the calculations producing mathematical equations showing the path or trajectory described by the satellite. These machines will forecast the time at which the satellite may be visible in any part of the globe, and the information will be broadcast to other nations in time for them to be on the lookout.

Radio equipment will, of course, be used for most of the tracking. The satellite will carry a miniature radio transmitter radiating a weak but continuous signal to the earth, thus making its position known at any time. Visual tracking will be taken care of by 12 special cameras which will be set up on American soil and at strategic points around the earth.

Apart from the importance which attaches to the result of this fascinating experiment, the information gained may be of great use to TV and it may make possible world-wide television broadcasting, for the satellites could serve as relay stations to bridge the great distances across which television signals cannot be projected at present. It will be remembered that some time ago an aeroplane was used as a relay station which carried a television programme from Cuba to receiving sets all over the United States. The greater altitude of a satellite would, of course, vastly extend the range because, using a number of satellites, programmes could be relayed from one to another.

We shall await with fascinated interest the results of this project which paves the way for interplanetary travel. We have made all arrangements to keep our readers informed as the projects develop.

Those Alternative Fuels

PETROL rationing has caused motorists to consider the possibility of using alternative fuels, as they did during the early days of the war The conditions, however, governing war-time rationing and the present system are not parallel. During the war rationing was introduced because of the very heavy requirements of the services, the need to restrict shipping to a minimum, and the desire to cut down private motoring so that labour and materials could be diverted to war work. The Suez was not closed to us.

Every motorist, therefore, is keen to keep his vehicle running on the meagre ration and they are considering alternative fuels, such as propane and butane. Unfortunately, the Ministry of Fuel and Power has written to the distributors of these substances asking them to discourage their use, as the supply is conditioned by the same factors that apply to petrol and oil and an increase in demand would cause a shortage, resulting in hardship to homes where these gases are essential for cooking, heating and other domestic purposes. It is not, of course, illegal to use them but the supply position is such that it may be difficult to obtain them, and distributors are asked not to deliver them for use as motor fuel.

It is illegal, of course, to use paraffin as a motor fuel, either in its neat form or diluted with petrol, unless a licence is taken out with Customs and Excise. Only petrol is authorised for road transport use. All of the alternative liquid fuels are sold at a price which does not include the 3s. 6d. tax. This applies to white spirit, methylated spirit, premium kerosene or tractor vaporising oil.

"More Miles Per Gallon"

MOTORISTS and motor cyclists will, therefore, turn to methods of obtaining more miles per coupon, in other words higher m.p.g. and for their convenience we have produced a limited edition of "More Miles Per Gallon" (3s. 6d., or by post 4s.), from the Book Department, George Newnes Ltd., Tower House, Southampton Street, Strand, W.C.2.

This 96-page illustrated handbook deals with the causes of heavy petrol consumption, restoring lost performance, carburetter adjustments, petrol economisers, alternative fuels and petrol dopes, and the information applies to motor cars, motor cycles, mopeds and scooters.

Delay in Delivery of Goods

ONE effect of the petrol shortage has been to cause a delay in the delivery of goods. When ordering goods from our advertisers readers should make due allowance for this, as deliveries which were formerly made daily may now be made only once a week.—F. J. C.

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A PORTABLE POTTERS' WHEEL

A Light Motor-driven Wheel and Reduction Gear Unit

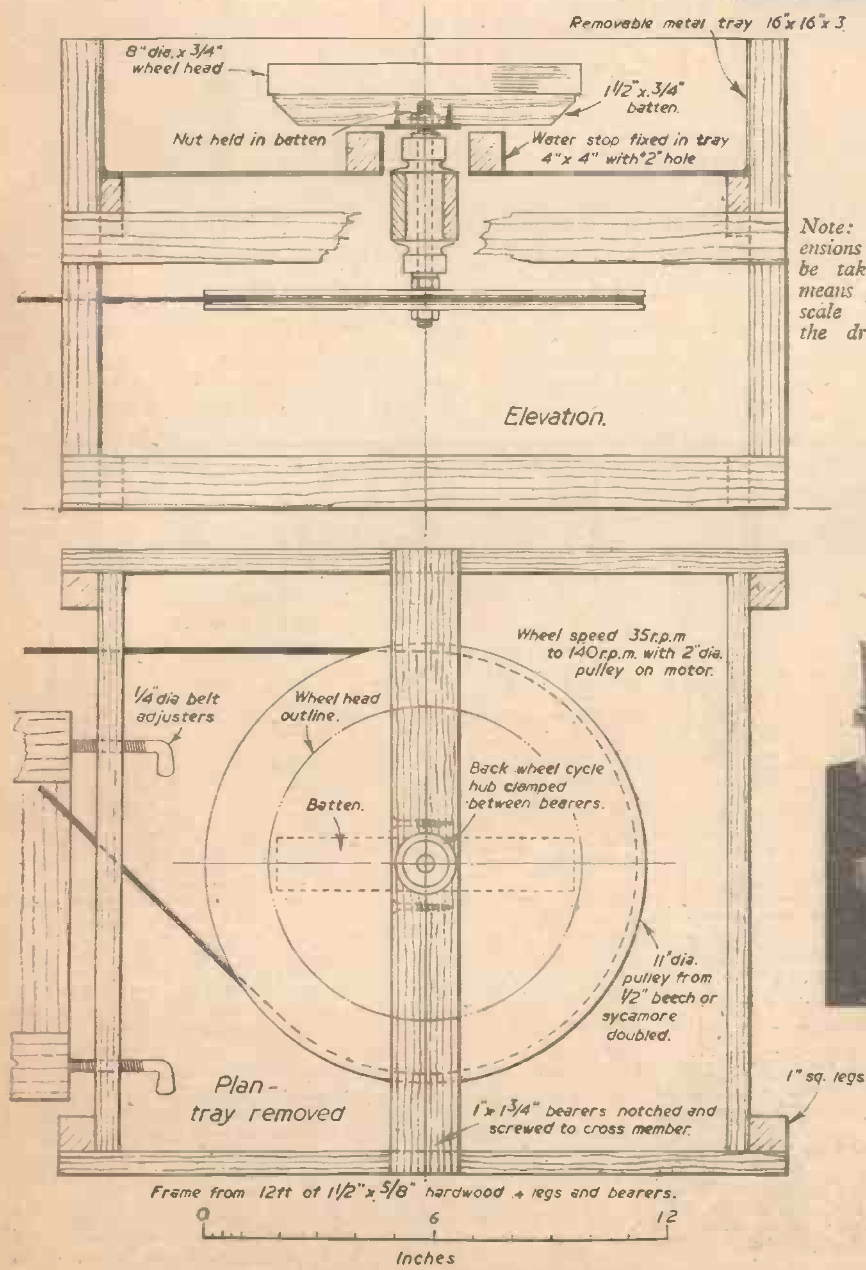
By S. B. WILMOT

THE conventional potters' wheel is too large and cumbersome to find a place in the average workshop, which is used for other purposes, and for this reason and its simplicity of construction the wheel shown in Fig. 1 was made, and has been found very satisfactory in use for throwing up to four or five pounds of clay. It is in two separate units, which are quite light and when the motor is lifted off for other use these can literally be hung on the wall or put under a bench.

Construction

Taking first the wheel unit, a photograph of which is shown in Fig. 2, the first requirement is a bicycle back wheel hub; an old one with good bearings can, of course, be used. This is clamped between two main bearers about 1in. × 1¾in. × 16in., a hole the size of the central portion of the hub first being bored centrally between the two pieces (see Fig. 3). The frame is then built up to the dimensions in the scale drawing, Fig. 3, from 1½in. × ⅝in. strips of hardwood such as sycamore, on four 1in. square legs. No specially formed joints were made in the prototype and this was found to be quite satisfactory with all parts fixed together with 1¼in. No. 8 woodscrews. The only cutting required, other than to length is the ends of the main bearers clamping the cycle hub. These are recessed on to the frame to give rigidity and to bring the top level with the side members which carry the tray.

Fig. 1.—(Right) The wheel in use.



Note: Dimensions should be taken by means of the scale below the drawing.

Fig. 3.—Elevation and plan of the wheel unit.

The Wheelhead

If a suitable lathe is not available both this and the pulley can be made without. The wheelhead is of 8in. × ¾in. timber battened across the grain; it was given two or three coats of paint at finish to prevent soakage and warping. It can be cut quite sufficiently accurately to a scribed line either with a circular saw or by hand and finished with a paring chisel.

A hole is bored in the batten to fit tightly on the hub spindle and a hub nut can then be carefully marked out and let into the timber. This is fixed in with a small metal plate, drilled and fixed with woodscrews, so that the head can be easily removed for cleaning. If, when this is done, the top does not run true the easiest way is to mark it when spinning and plane a little off, since turning in a lathe on the spindle would be inclined to loosen the mounting. All these details can be seen in Fig. 3.

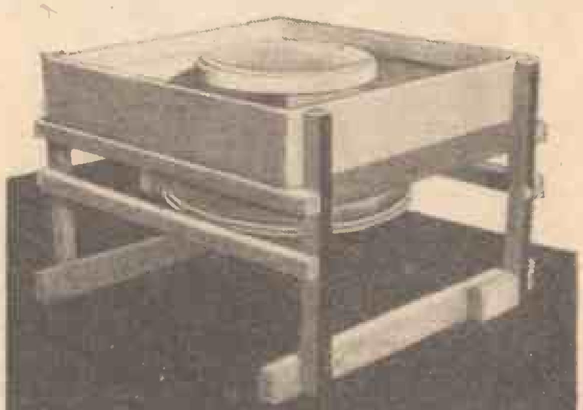


Fig. 2.—A photograph of the wheel unit.

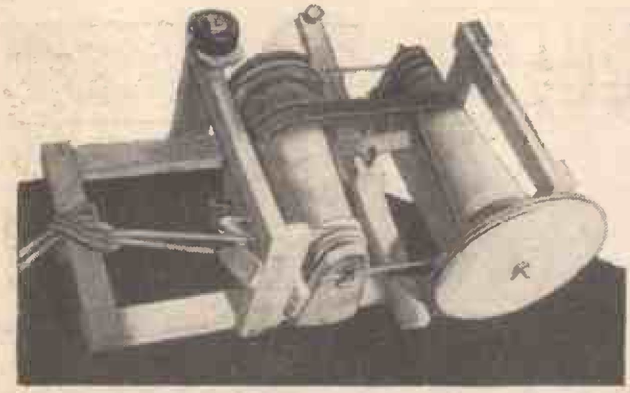


Fig. 4.—The reduction gear unit.

The Driving Pulley

This is rather large, being 11in. diameter, but it is necessary to have it this size to simplify the gearing. It is made from two pieces about ½in. thick with the grain laid crosswise, but if 11in. width is not available there is no reason why each part should not be made in two, though a glued joint would simplify the cutting if done by hand. In this case the inner edge of the bevel is scribed out and the bevel made with a plane before glueing or screwing the two halves together. This pulley is clamped between two nuts, as shown in Fig. 3.

The tray is made of sheet zinc, though aluminium might be preferable. A construction of hardboard with cloth and paint joints could be used. In any case a water stop consisting of a small square of timber with a hole in it corresponding to the hole in the tray should be firmly fixed to the bottom with woodscrews to prevent water running down.

The Reduction Gear Unit

This is much simpler than might appear from a glance at Fig. 4 though some care is necessary to get correct alignment of bearings.

The most used "fractional horsepower" motor—in this case ⅓, though ¼ will just do for short-period work—runs at 1,425 r.p.m. The average speed of a foot-operated potters' wheel is some 70 or 80 r.p.m., though this may sometimes be greatly speeded up with advantage, but must be very much slowed down for turning or finishing thin work. It is, therefore, necessary to have a reduction gear which averages 1,425 to 70 or, say, 20 to 1, with a wide range on either side, which can be varied while working. This is accomplished in the present design by belt and pulley in two stages with an intermediate pair of conical pulleys on which a belt can be moved to give up to half or double the average speed.

By a quick change of belt to a larger or smaller pulley on the motor a complete range of higher or lower speeds can be had if required.

Reduction Gear Construction

Two standard 13in. lengths of 5/16in. bright steel are first obtained, each threaded for 1½in. at one end, with two nuts, and four 1in. lengths of brass tube of suitable inside diameter cut and worked on these to form easy bearings. Two hardwood cones are then turned 9in. long × 4in. to 2in. diameter or slightly less (as in Fig. 5) provided they are identical. These should be roughly shaped and bored through to a tight fit on the shaft on which they can then be truly turned.

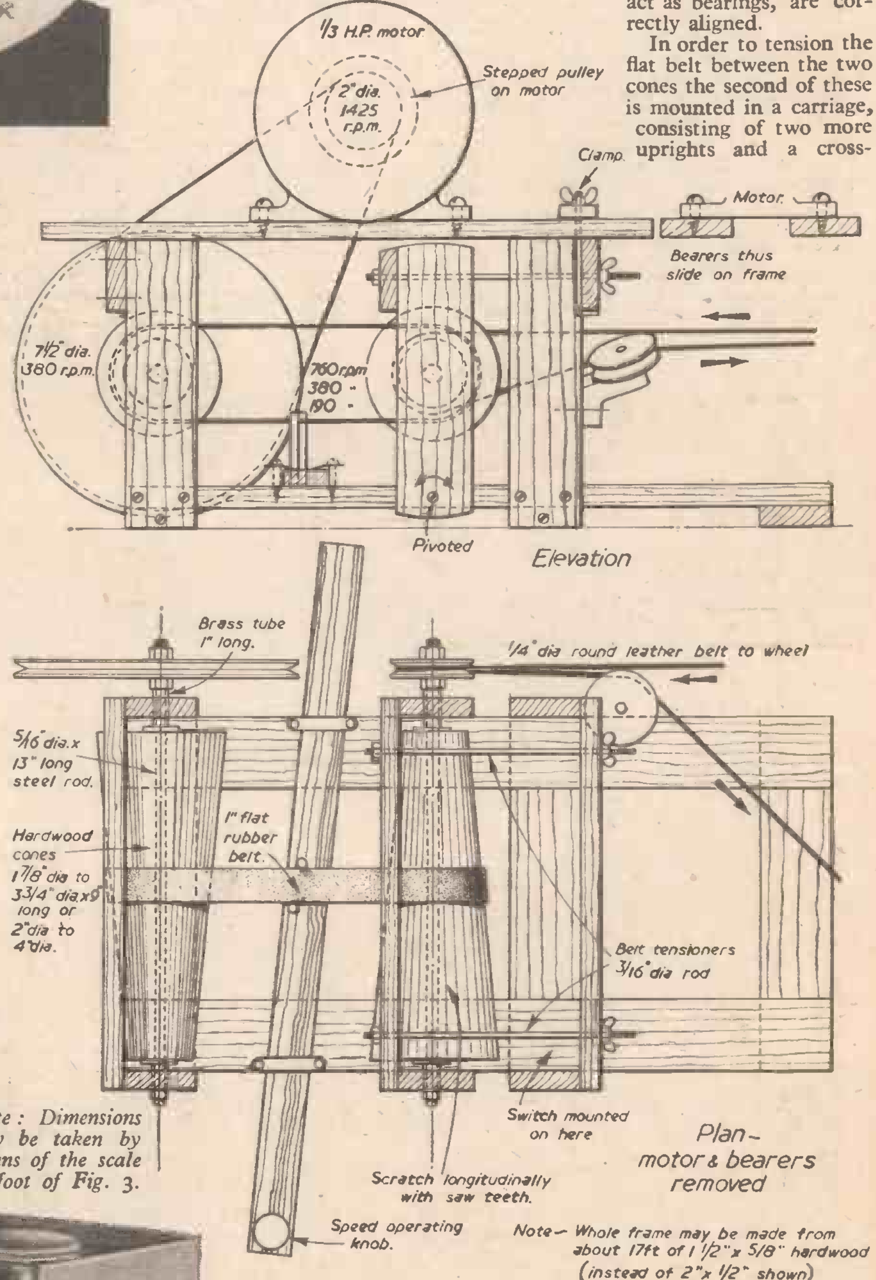
The 8in. and 2½in. O.D. pulleys can then be turned from one piece or the larger one built up as before from two discs. Both pulleys are ultimately clamped to their respective shafts between two nuts.

The Frame

The simple framework with two pairs of uprights and two crossheads is next built up. Here it is necessary very carefully to square up the left-hand pair so that the holes, into which the small brass tubes are pressed to act as bearings, are correctly aligned.

In order to tension the flat belt between the two cones the second of these is mounted in a carriage, consisting of two more uprights and a crosshead. This is pivoted on two large woodscrews at the bottom, the tension being provided by two small rods with wing nuts or, alternatively, fairly strong springs.

The belt is moved by a sliding bar running parallel to the sides of the cones and held in position by two spring clips fixed to the bottom frame. In this are set two vertical pins on either side of the belt.



Note: Dimensions may be taken by means of the scale at foot of Fig. 3.

Fig. 5.—Elevation and plan of the reduction gear unit.

The Jockey Pulley

To convert the drive between the two units from horizontal to vertical shaft a small jockey pulley is used, mounted on one of the

(Concluded on page 300)

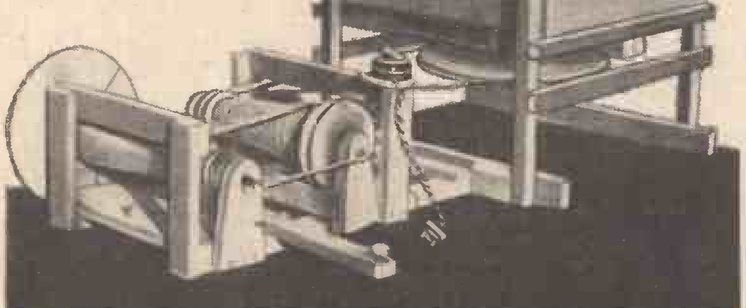


Fig. 6.—A further view of the completed potter's wheel.

A MIDGET PORTABLE RECEIVER

Making an All-dry Camera Type 4-valve Superhet

By "RADIO MECHANIC"

As can be seen from Fig. 4 and the list of components the set uses four valves of the B7G class and although the circuit is quite conventional the results are surprisingly good.

The overall size of the set, which is shown completed in Fig. 1, is $8\frac{1}{4}$in. x $3\frac{1}{2}$in. x $2\frac{1}{4}$in., this size being chosen as being handier to carry around than something more cubic in shape; in fact it has been found that it fits comfortably in a normal raincoat pocket.

The H.T. battery is a 30-volt deaf aid Drydex type DH505, the size of which is $\frac{7}{8}$in. x $1\frac{1}{4}$in. x $2\frac{5}{8}$in. long, and although of such small physical size this has lasted over 20 hours and is still going, the total consumption being $4\frac{1}{2}$ mA. The L.T. is provided by an Ever Ready U2 $1\frac{1}{2}$-volt cell, the filament consumption being $\frac{1}{4}$ amp.

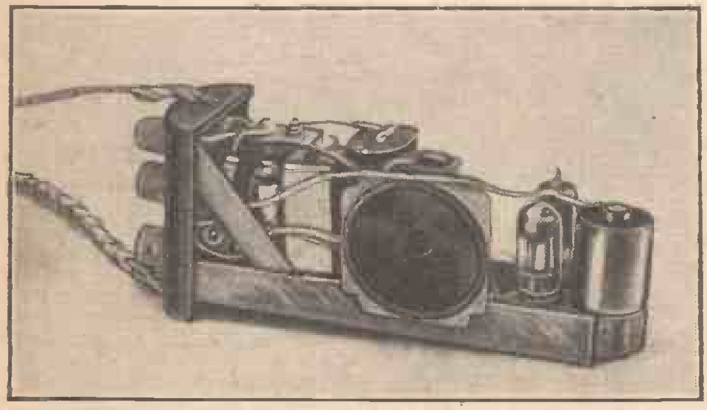


Fig. 2.—An underside view of the receiver.

Components

All parts are standard except for the two switches and the speaker transformer. The switches (2-pole 2-way rotary) were purchased ex W.D., but these can be replaced by miniature Oak switches.

It was decided when making this set to have switched tuning for the Home and Light stations; this, of course, means that no tuning condenser is required, and keeps the overall size down, and also does away with another rather difficult job, namely, that of getting the oscillator tracking correctly—a difficult job at the best of times, but even more difficult with a midget set.

The coils were made from modified Aladdin formers as shown in Fig. 3. The oscillator anode coil, as will be noticed, has tight coupling and considerably more turns on than is usual: this is to ensure that the frequency changer will oscillate with a low H.T. voltage. With this coil oscillation will take place at as low as 20 volts, the grid current being in the nature of 20 mA.

The aerial has been made with a dual purpose in mind, and acts as a frame aerial and as a strap for carrying the set. It is made by cutting eight lengths of 7/36 P.V.C. covered wire 4ft. 3in. long: by keeping together two sets of three wires, and one set of two wires, the three sets may be plaited together. All-white covered wire was used for this purpose but it might be rather effective to try plaiting two different colours.

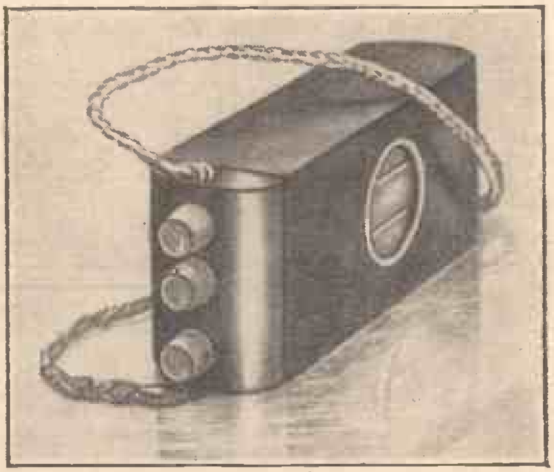


Fig. 1.—The midget portable in its carrying case.

Since the frame aerial is connected in series with the aerial coil, this does, to a certain extent, obviate one of the inherent difficulties associated with frame aerials as applied to portable radios, as the directional properties of the aerial are, to a certain extent, nullified and the angle of acceptance is approximately 120 deg. out of 180 deg. before there is any appreciable change in the signal strength. Therefore the set can be used comfortably while walking.

The two ends of the aerial are placed through holes in the top and bottom sections of a front false member, and joined together inside so as to form a continual length of wire as shown in Fig. 8.

The Chassis

The chassis is made of a piece of 20G copper plate, together with an end plate, supports and L.T. battery fixing attachments (Figs. 6 and 7). After making the chassis, solder the end plate in position and L.T. battery fixing attachments, but leave the fixing of the supports until the wiring is completed. The components may now be mounted, but before assembly of coils solder wires to the station selector switch, mounted on the end plate under the chassis, and pass these wires through holes to the top of the chassis ready for fixing to the two postage stamp trimmers. The coils may now be mounted. The valve holders (B7G ceramic with metal top plates) may be soldered direct to the chassis. Another point regarding these valve holders is that they must be earthed efficiently to the chassis by the metal ring in the centre of the holder,

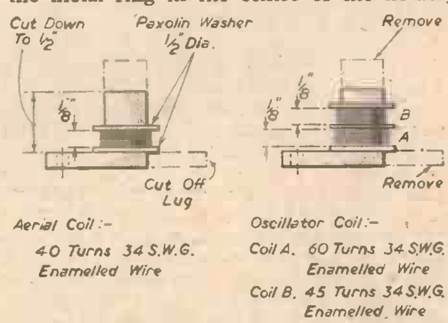


Fig. 3.—Details of the coils.

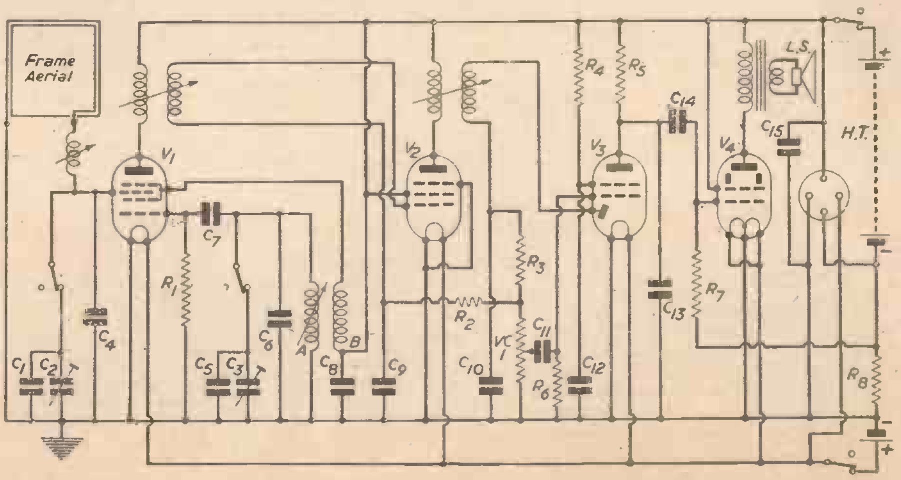


Fig. 4.—Theoretical circuit of the receiver.

as there is a metal plate pressed into the glass base of these valves which locates centrally over this ring and acts as an internal screen in the valve.

Wiring

Having completed the assembling of components, wiring can now be commenced, the same type of wire being used as was specified for the frame aerial.

When fitting L.T. cell, remove cardboard tube before assembling.

If another 465 kc/s superhet receiver is available the I.F. transformers in the midget set can be easily aligned by wrapping a covered wire around the I.F. valve grid or anode, on the second receiver, when this is tuned to a station, and connecting the other end of this wire through a .01 μF condenser in turn to the grid and anode ends of the second and first midget I.F.Ts. These may then easily be tuned by screwing in or out the dust cores for maximum signal. While making these adjustments the frequency changer from the midget set should be removed.

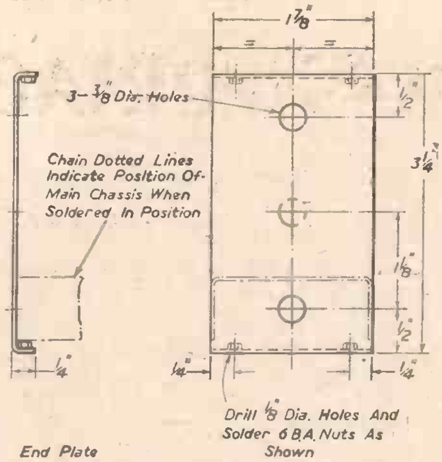


Fig. 7.—Further chassis details.

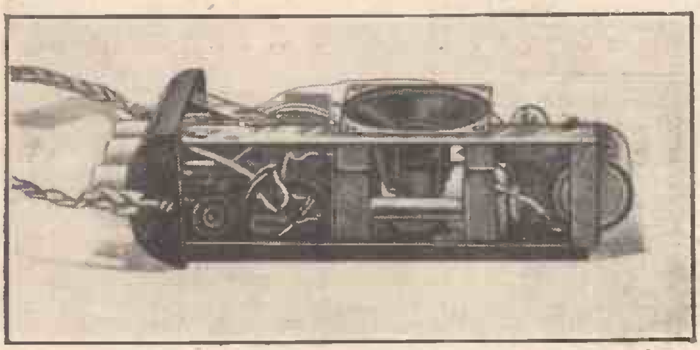
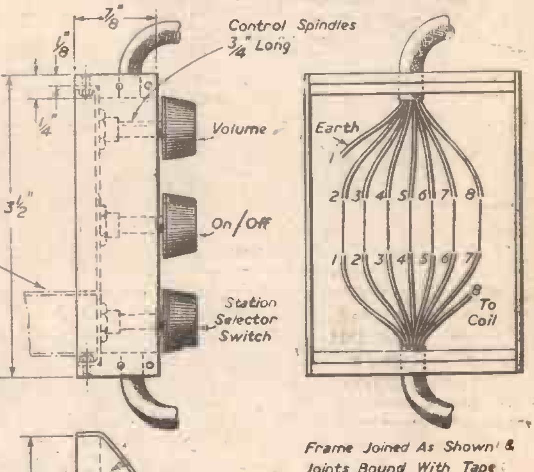


Fig. 5.—The chassis removed from the cabinet.

The dust-iron cores in the tuning coils may be adjusted, with the additional condenser switched out of circuit, until the Light programme is heard. If, by virtue of the 20 per cent. tolerance on the fixed tune condensers, the dust-iron cores protrude beyond the end of the coil formers when the station is peaked, remove core from former and cut down the lengths a little at a time until the coil can be peaked with the core either parallel or below the top of the coil former. This is necessary since if the core protruded above the former it would foul the case. Having tuned in the Light programme, switch the additional condenser into circuit and adjust postage stamp trimmers for the Home programme.

The on off switch is a two-pole type since it is essential to switch both the H.T. and L.T. supply.

The speaker transformer, which is shown on the photograph (Fig. 5) as fixed above the loudspeaker magnet, is an extremely small item salvaged and rewound from ex-W.D. equipment. There are, however, several midget ones on the market, and if one cannot be obtained as small as the one shown there is space between the speaker and the output



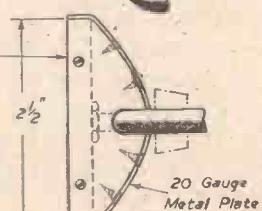
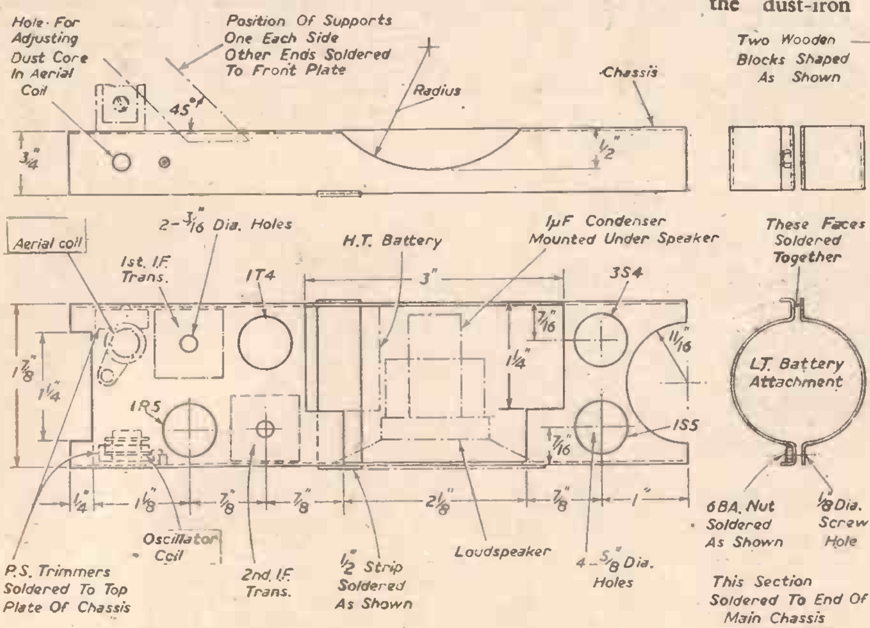
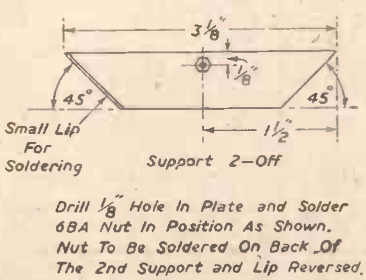


Fig. 8.—Controls, aerial connections and "false" ends.

stage where a larger one could be fitted, the ratio required being 35 : 1. This space was originally left for an additional H.T. battery to be run in series with the remaining one. However, having tried the two batteries and found no improvement in the volume, although the H.T. current rose to 11 mA., it has been left out. The assembled set with the case removed is shown in Fig. 2.





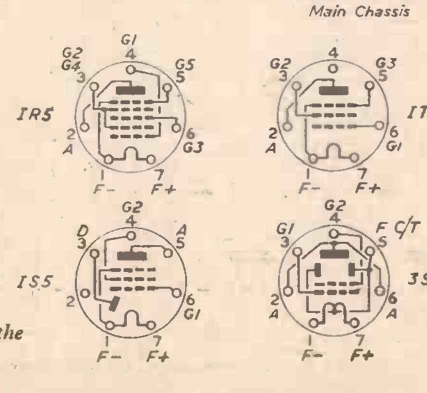


Fig. 6.—Cutting and drilling details of the chassis.

LIST OF COMPONENTS

Condensers

C1, 75pF ceramic tube.
C2 and 3, 50pF postage stamp trimmers.
C4 and 6, 200pF midgets.
C5, 50pF ceramic tube.
C7, 10 and 13, 100pF midgets.
C11 and 14, .001μF midgets.
C8, 9 and 12, .1μF midgets 150 v.w.
C15, 1μF midget 150 v.w. Hunt's type W49.

Resistors (¼-watt midget)

R1, 100KΩ.
R2, 4 and 7, 3.3MΩ
R3, 47KΩ.
R5, 1MΩ.
R6, 10MΩ.
R8, 620Ω.
Valves: V1, 1R5; V2, 1T4; V3, 1S5; V4, 3S4.
Two I.F. transformers, Wearite type M400B.
2½in. dia. P.M. loudspeaker.
Midget volume control, VC1, 1MΩ ¾in. dia.
Two miniature 2-way 2-pole switches.
Four B7G ceramic valve bases.
Two Aladdin formers with dust cores.
H.T. and L.T. batteries (see text).
Connecting wire, 7/36 P.V.C.
Plug and socket optional (see text).
Three knobs, ¾in. dia.

The Case

The case is made of ⅛in. thick plywood, one end of which is rounded to the same profile as that of the plate around the false member in front of the receiver, and a plate of similar dimensions is then fixed around the end. The other end of the case butts up against the front false member, top and bottom, while the two sides fit inside the front flanges. Two countersunk screws are then put through two small holes in the case to engage with the nuts soldered on the back of the supports. To give a professional finish the case may be covered with rexine or similar fabric.

If the 1S5 diode pentode valve is purchased ex W.D. be very careful to check that the filament is not touching the diode at the top of the valve. This appears to be a rather weak point with these valves since the filament goes through the diode and is very close to it. A socket has been added at the back of the speaker magnet so that with the internal batteries switched off external batteries may be connected. This was done in the writer's case so that it could be run, with a suitable vibrator and L.T. dropping resistance, off a motor cycle accumulator.

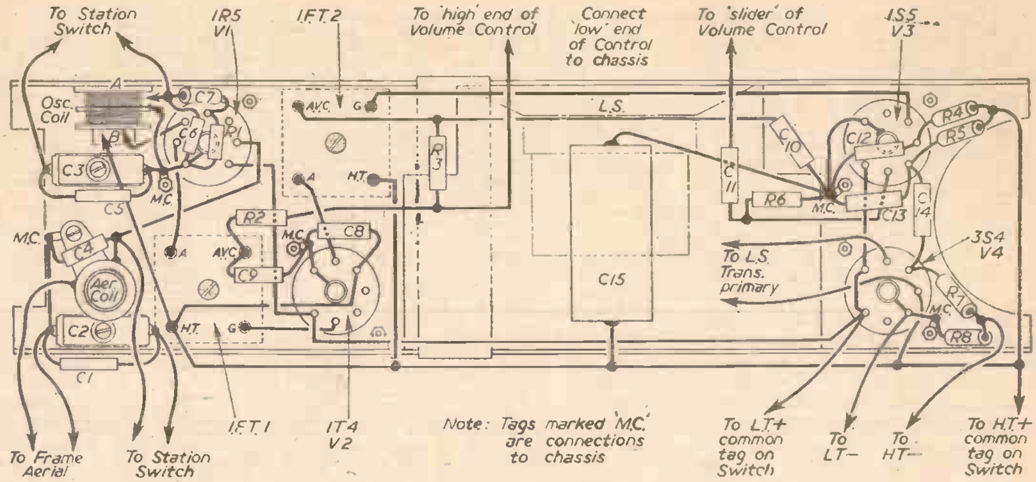


Fig. 9.—The wiring diagram.

SIMPLE ELECTROTYPING

How to Make Copies of Medallions, Coins, etc.

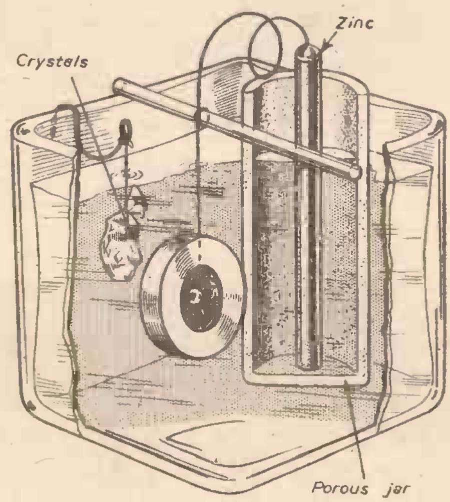
ELECTROTYPING can be briefly defined as a method of coating impressions of objects in wax, gutta-percha, etc., with electroplating copper, thus forming a thin "shell" the exact duplicate of the mould, which can be strengthened by being filled with molten solder. In copying foreign coins, the obverse and reverse "shells" are usually mounted side by side.

Apparatus Required

The single-cell arrangement, which is very convenient for operations on a small circle, is shown in the sketch. It consists of a glass jar holding anything up to three pints of liquid; a wide-mouthed jam-jar would answer the purpose, although a rectangular glass (or celluloid) accumulator cell is much more suitable. Inside this "vat" stands a round, narrow cell of porous earthenware which can be obtained quite cheaply, or a substitute may be made by winding several layers of stout brown paper round a rod and securing the end very carefully all the way along with sealing-wax. A disc of cardboard must also be fixed into one end of the tube in the same way to form a bottom. The bottom part of the paper cell should then be soaked to a depth of about ¼in. in melted paraffin wax or "candle grease." A strip of zinc with a piece of copper wire soldered to one end, or better, a Leclanché battery zinc rod, is now required; this will need to be amalgamated, which is done by dipping it in weak acid to clean it, and then rubbing a little mercury all over with a pad of flannel until the surface shines like silver.

Making the Mould

Suppose it is desired to make a copy of a medal or coin. First obtain a cardboard pill box lid, considerably larger than the coin make it hot on the stove and fill it with melted sealing-wax; when this is almost set, gently press the coin into it and leave to set hard. On carefully removing the coin a perfectly-detailed imprint should be revealed; this must now be "metallised" or coated with graphite or blacklead, so that it will conduct electricity, which is a very important operation. Moisten the impression with a drop of methylated spirit then, with a camel-hair brush, proceed to cover it thoroughly with a smooth, shiny film of graphite. Be careful to polish every crevice and also to leave no superfluous material in the mould after it is finished, otherwise the resulting "shell" will be full of imperfections and pin-holes.



Apparatus for electrotyping.

Setting up the Cell

Fill the glass vat with a saturated solution of copper sulphate (acidulated with one or two drops of sulphuric acid), and suspend some crystals tied up in a piece of linen across the vat, to keep the solution up to strength. Now charge the porous pot with one part of commercial sulphuric acid and nine of water, and stand it in the other solution as shown. Put in the amalgamated zinc and take care to see that the liquid inside the porous pot is level with that outside. Having done this clean up the wire from the zinc, heat it slightly in a flame and embed it in the mould so that the clean point touches the "metallised" surface of the impression. Brush some more graphite round the point to insure a connection and immerse in the solution. If, after an hour or so, the deposit in the mould is covered with dark brown smears or appears rough the current is too strong, and this can be adjusted by partly lifting the zinc out of the porous cell. After about 12 hours the "shell" will be thick enough to be carefully detached from the mould.

A Cutter for Sheet Asbestos

By D. L. DRANE

THE tool is made of ⅜in. square tool steel which is bent, whilst red-hot, to the shape shown in Fig. 1. The cutting edge can be filed or ground to the approximate angles shown in Fig. 2. The completed tool is then hardened and tempered to a dark straw colour and fixed in a handle.

Use the tool like a glass cutter, laying the sheet to be cut on a flat surface. Use a straight edge or a batten and score the sheet deeply with the cutter. Support the sheet on a batten immediately below the cut as shown in Fig. 3. Hold down by another board or batten and press down steadily on the unsupported piece, resulting in a clean break. Whole 8ft. by 4ft. sheet can be cut easily in this manner singlehanded.

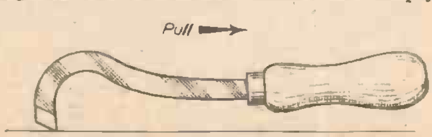


Fig. 1.—The basic shape.

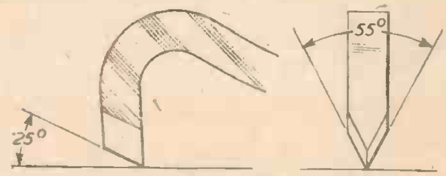


Fig. 2.—Angle of cutting edge.

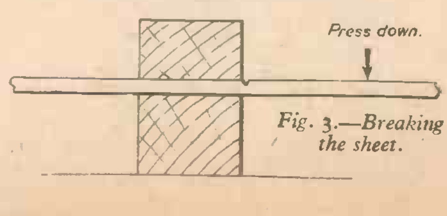
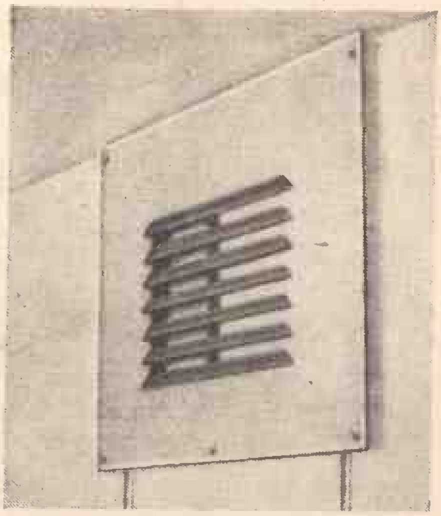


Fig. 3.—Breaking the sheet.



A HOME-MADE EXTRACTOR FAN

Increase the Ventilation Efficiency of Your Kitchen

By L. SEWELL

MOST kitchens are ventilated by a primitive method, that of omitting a few bricks from the wall structure at (or near) the ceiling level. This cavity is usually disguised by a device similar to that shown inset in Fig. 1. The air inlet takes the form of an airbrick on the outside wall. Although this method certainly allows fresh air to enter the kitchen it does not eliminate steam and cooking smells, as does an extractor fan.

Fig. 1 shows a very efficient home-made extractor fan unit. By pulling down the right-hand cord (Fig. 1) an air vent behind the facia is opened and the fan is switched on. Conversely, by pulling down the left-hand cord the air vent is closed (fully or partly as desired) and the fan switched off. The above unit is made for a cavity wall but could be adapted for others.

Figs. 2 and 3 show the fan which is operated by a clockwise turning tape recorder motor (Collaro) which needs no suppressing, does not interfere with radio or T.V. and is remarkably strong and fast. Operated on 240 volts, this motor consumes only 140 mA., 34 watts approximately.

Because it is mounted horizontally the motor draws little or no steam, etc., through its windings.

The little cooling fan which was on the motor when it was bought, was retained. The 4in. x ½in. x 1/16in. fan arms are of brass, bolted to a bushed wheel from a popular construction outfit. The hole through the bush had to be reamed slightly larger to take the motor spindle. (See Fig. 4.)

The fan blades (Fig. 5) are cut from thin aluminium to the dimension and outline shown at A, bent to the outline and dimensions shown at B, and then riveted to the arms. To reduce weight the arms do not extend to the full length of the fan, but are just long enough to take the outside rivets.

The Fan Box

This is made from ¾in. plywood. Fig. 3 shows a plan view with the top removed. Top and bottom are identical, both measuring 8⅛in. x 8in. The front panel measures 5½in. x 3⅞in. and the back 5½in. x 4½in.

To ensure a strong jet of expelled air the air intake vent (Figs. 3 and 6) is slightly larger than the outlet vent. A semi-circular sheet of tinplate is screwed into the blind side of the box, reaching from the top to within 1in. of the bottom. This measured 11½in. x 4½in. before bending. The resulting space between tin and bottom of box enables wiring to the motor to be carried out easily. The tin acts as an air baffle.

The overlapping front edges of both top and bottom of the box are grooved to take a sliding panel of Formica or brass, etc. (See Figs. 3 and 7.)

The front panel (right-hand side) carries a brass strip which is bent outwards from panel to form a spring lever. This measured 5in. x ½in. before bending. Half an inch lever movement is needed. This lever actuates the motor switch. The sliding panel occupies about half the width of the front of box and more than covers the air inlet vent. To this panel is screwed a wooden block which is grooved to take standard curtain cord. The block should be screwed on from behind the panel, care being taken to ensure that the screws miss the groove. A thin top cover for the block to retain the cord should be made. (See Fig. 7.)

(The block holding the cord is necessary to bring the cords in line with the pulleys.)

The Switch Unit

Two bakelite lampholders are required. Dismantle both and with a hacksaw cut off and discard one side of the contact holders. Drill the resulting brackets so that each take two wood screws for fixing. Reassemble both contacts and fix to box end (Fig. 8). A switch bar is now required. This can be made from Paxolin or any hardwood. Two plates of copper or brass are now recessed into the switch bar and held with copper or brass rivets. Apart from holding brass on to bar these rivets also carry current to the motor. File down the recessed plates flush with switch bar. A metal switch bar guide should now be made (Fig. 8). This must be a loose fit to allow bar to slide in and out easily. The switch bar is now loosely coupled to the actuating lever. The hole in the end of the lever is elongated so that when the lever is screwed to switch bar and depressed there is no strain on either lever or switch bar. The contacts should be allowed to press on the switch bar gently but firmly. A slight smear of petroleum jelly ensures smooth movement of the bar through the contacts. Wire the switch to the motor and male part of the connector (Figs. 9 and 10). Wiring to the motor is passed through a hole drilled below switch unit close to the bottom of the box so that the wire passes comfortably below the tinplate lining inside the box.

A dust-cover of wood should be made to cover switch (Figs. 9 and 11). This is held in position by two screws placed well away from the wires and switch movement. It should not be wider than ¾in., then total front is under one brick length.

The Frame

This should now be made as shown in Figs. 9 and 12, holes for cords and wall fixing drilled, and a recess made for the mains cable. A pair of pulley brackets are required (Fig. 9),

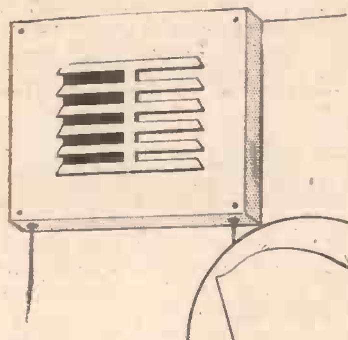


Fig. 1. — The completed extractor fan unit and (inset) the usual kitchen ventilator.

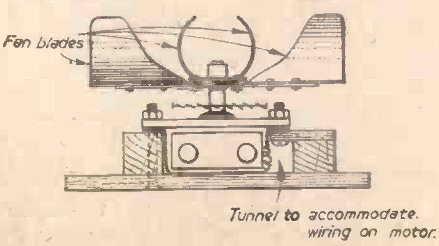


Fig. 2.—Side elevation of the fan.

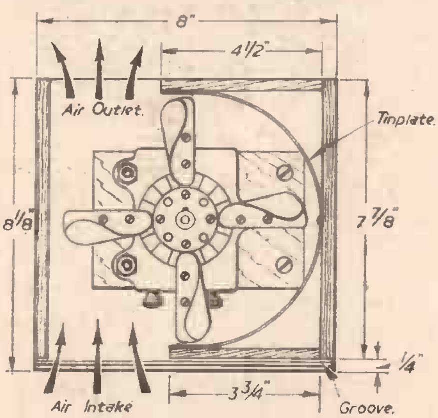


Fig. 3.—Plan view of the fan.

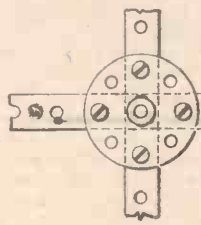


Fig. 4. (Left).—The fan arms and bushed wheel.

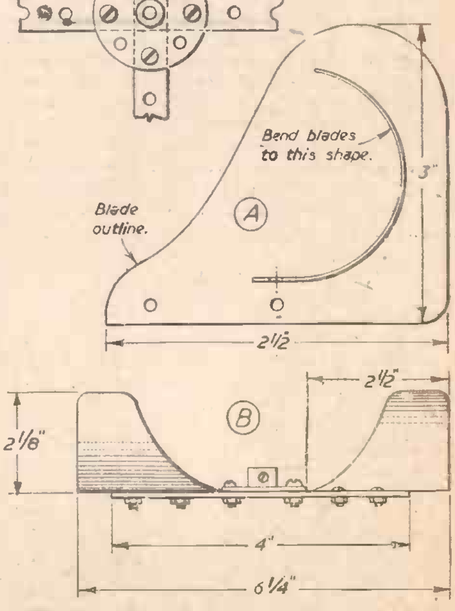


Fig. 5.—Details of the fan blades.

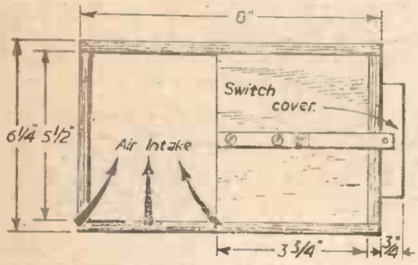


Fig. 6.—Front view giving dimensions.

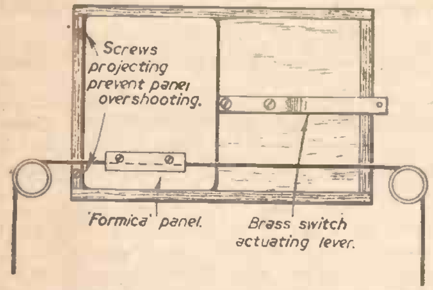


Fig. 7.—The sliding panel and pulley details.

one left-hand and one right-hand. Pulley wheels should be ¾in. to 1in. in diameter. The pulley brackets are "let in," flush with the back of the frame. Brass 1/16in. thick is suitable for the pulley brackets.

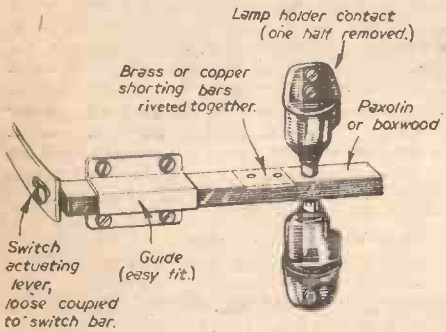


Fig. 8.—The switch unit.

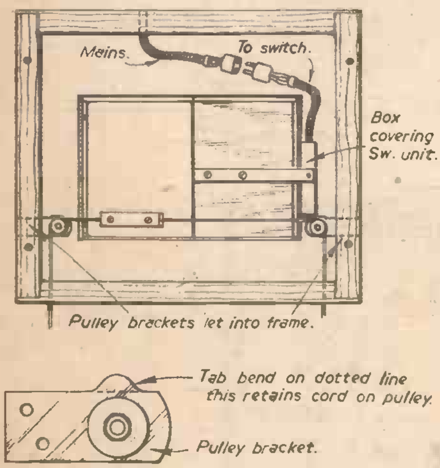


Fig. 9.—Details of the frame and the pulley bracket.

The Facia

This is in two-colour Formica (beige and cherry-red). The air vent through it occupies the left-hand side of frets only (see Fig. 13). The frets were cut as in Fig. 13 and glued into position flat. The effect is deceptive, the frets appearing to stand out like a venetian blind.

The facia is held in position by four small brass screws, the heads of which are painted to match the frets.

In the event of adjustment being necessary for the fan, all that has to be done is to remove the facia, take off the cord retaining cover on the sliding vent cover, remove the cord from the groove, disconnect the plug from the mains lead and withdraw the box from the cavity in the wall. This is less than a five-minute operation.

Points to Note

To secure trouble-free working the following items are important:

1. The switch movement must be robust and work easily without strain.
2. The wiring must be neat and efficient and only new wire should be used.
3. Grooves for the sliding panel should be ⅛in. deep minimum and lubricated with petroleum jelly.

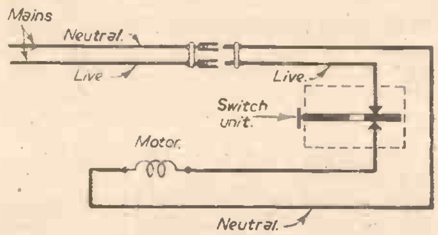


Fig. 10.—The circuit.

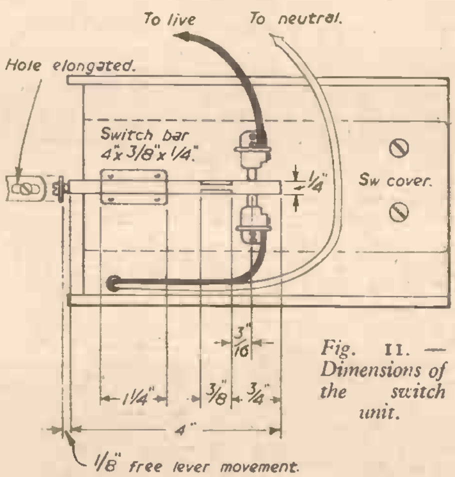


Fig. 11. — Dimensions of the switch unit.

4. Cords and pulleys must be in exact alignment and pulley wheels must rotate easily.
5. The box should be painted inside and out.
6. Fan blades and arms, etc., must be lacquered or shellaced, especially the grub screws on the bushed wheel, which must remain firmly fixed.

The frame dimensions will depend upon the space available and upon the position of the cavity in the wall. However, the dimensions of the author's frame are: height, 12⅞in.; width, 14in.; 1¼in. x ⅜in. wood was used.

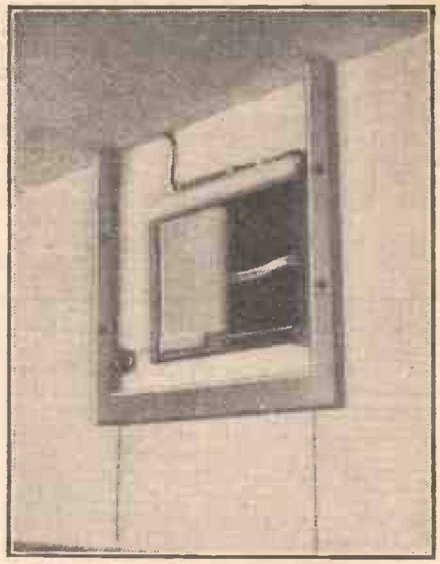


Fig. 12.—The author's installation.

Any space left between the fan box and the surrounding wall should be blocked with sponge rubber, fibre glass, etc. Failure to do so will result in air from outside bypassing the fan, and partly defeating its object.

Suppliers

The tape-recorder motor is available for £2 from Frith Radiocraft, Ltd., 69-71, Church Gate, Leicester.

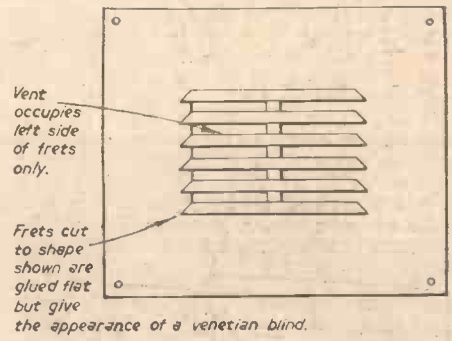


Fig. 13.—The finished appearance of the facia.

Brass pulleys (¾in. or 1in. diameter) are available from Broughton and Jones, Ltd., Market Place, Leicester.

The remaining electrical items and the metal and Formica are all readily available at shops dealing in these materials.

The World's Largest ATOMIC POWER STATION

To be Built in Scotland with an Installed Electrical Generating Capacity of 360,000 kW. from Two Nuclear Reactors

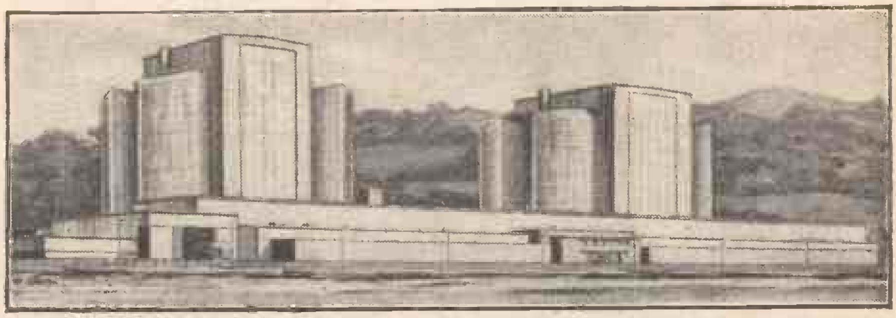


Fig. 1.—An impression of the complete nuclear power station.

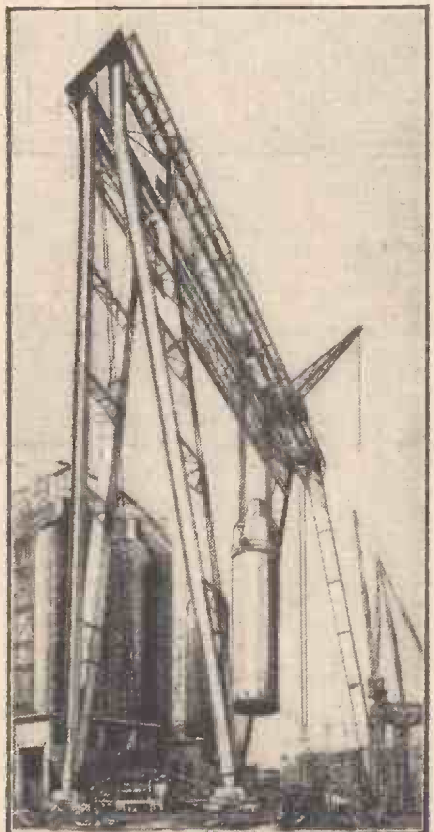


Fig. 2.—An impression of the nuclear power station under construction, showing the 300-ton Goliath crane.

THE station has been designed by the G.E.C.-Simon-Carves Atomic Energy Group, and the G.E.C., as main contractor, is to be responsible for the whole project. The completed station will appear as in Fig. 1.

Power will be derived from the heat generated by a controlled nuclear fission chain reaction in two nuclear reactors. The principle of operation will be similar to that of the Calder Hall reactors in that the natural uranium fuel will be contained within a pile of graphite moderator material and the heat extracted by circulating carbon dioxide gas under pressure.

The generating capacity of the station will be 360,000 kW. and the total output of electrical power is guaranteed to be not less than 300,000 kW., rising to 320,000 kW., all of which will be fed into the National Grid. Furthermore, the station has been designed to operate on base load, so that every day between five and six million units of electricity will be sent out to consumers. The saving in coal from this one station will amount to at least one million tons a year.

Each reactor, with its eight steam raising units, will weigh about 70,000 tons, the entire structures being supported on thick concrete rafts.

The erection programme will be greatly assisted by a specially-built Goliath crane—the largest in the world. Its 200ft. span will enable it to straddle the construction site, and it will be capable of lifting up to 300 tons at a time (Fig. 2).

Reactor Core

The cylindrical core of each reactor, 28ft. high and 50ft. in diameter, is built up of 2,000 tons of graphite blocks containing vertical channels for the fuel elements and control rods (see Fig. 3). Each of the 3,288 fuel channels contains 10 individual fuel elements stacked in a column one on top of the other. The element consists of a bar of natural uranium metal sealed in a magnesium alloy can which is finned to assist heat extraction. The total charge of uranium in the two reactors is 500 tons.

Pressure Vessels

The reactor core rests on a grid made of steel plates arranged in "egg-box" fashion. Surrounding the sides and top of the core is an inner steel shell made of relatively thin steel plate.

A 70ft. diameter spherical pressure vessel, welded from 3in. thick steel plate and weighing nearly 1,000 tons, completely encloses the core and inner shell. The double-shell construction enables the best materials to be used for each purpose—a temperature resistant steel for the hotter, inner shell, and a tough, non-brittle steel for the spherical vessel which has to withstand the full working gas pressure.

Protection from nuclear radiation is provided by a 9-10ft. thick concrete biological shield surrounding the core and forming one face of the 180ft. high reactor building.

Charge and Discharge

Charge and discharge of the fuel elements in a channel, 10 at a time, is accomplished by a single remotely-controlled machine situated in a shielded chamber beneath the reactor.

For a base load power station it is obviously undesirable to have to shut-down the reactor to change the fuel. The charge/discharge machine is, therefore, designed so that the removal of spent or damaged fuel elements and the charging of fresh fuel can be carried out while the reactor is on load and under pressure. The charge/discharge machine is controlled from a room in the reactor building where the sequence of operations is viewed on closed-circuit television screens.

Steam Raising Units

Heat is extracted from the nuclear reactor by a coolant gas, carbon dioxide, circulated throughout the

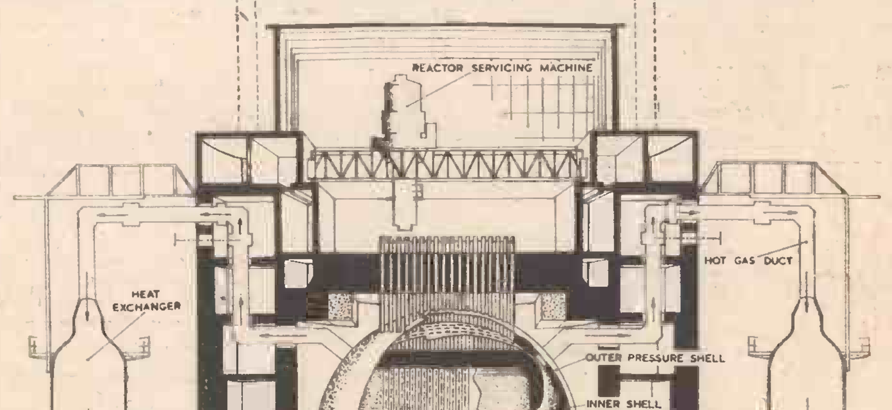


Fig. 3.— 'he nuclear reactor, showing the direction of gas flow through the reactor core and heat exchanger.

system under a pressure of 150 lb. per sq. in. Gas passes upwards through the fuel channels in the reactor core, becomes heated, and is led away to the steam raising units where it gives up its heat to water with the formation of steam.

Eight units are radially disposed in pairs round each reactor. They contain banks of steel tubes through which the water and steam flow; as with the fuel cans, the steam raising unit tubes are finned to provide an extended surface and thus improve the efficiency of heat transfer.

In the base of each 210-ton unit is an electrically-driven 2,200 h.p. blower, which recirculates the cool gas through the reactor.

Turbine Hall

Steam from the steam raising units is piped over a bridge to the 700ft. long turbine hall containing six 60,000 kilowatt dual pressure turbo-generator sets. Apart from all the ancillary feed heating and condensing plant, the turbine hall also houses the main control room in which the control of the reactors, heat exchangers and turbo-generators is centralised.

Cooling Pond

Between the two reactor buildings is an 18ft. deep cooling pond in which the irradiated or spent fuel elements are allowed to "cool-off" radioactively before being re-processed.

A Swing Filter for the Enlarger

A Useful and Inexpensive Accessory for the Amateur's Darkroom

By J. C. LOWDEN

Fig. 1.—The swing filter.

MOST of the better models of commercial enlargers are sold fitted with a red filter covering the lens. This filter is pivoted in such a fashion that it may be kept over the lens while the test strip or print paper is positioned prior to the actual printing. When the operator is ready to begin, all that needs to be done is that the filter be swung clear of the lens aperture. At the end of the specified time the filter may be swung over the lens, acting as a safe screen until the lamp is switched off.

This filter costs only a few pence and was made in a few minutes using only simple tools. It is shown in position in Fig. 1.

It was built to suit the lens panel of the focusing unit described in the October, 1956, issue of PRACTICAL MECHANICS, but it can, with slight modification, be adapted to any model of enlarger.

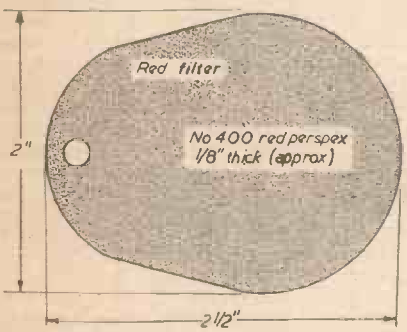


Fig. 2.—The shape of the filter.

The Screen

The screen is made of Perspex, the colour for best results being No. 400 Red. Perspex, plain and coloured, is advertised in the columns of this journal, and can also be purchased in the various plastics shops now to be found in most of the bigger towns. The Perspex is sawn to the kite shape as shown in Fig. 2. A hole $\frac{1}{8}$in. clear is then drilled in the smaller end.

After sawing, the Perspex may be smoothed up with a file along the edges, finishing off with fine glasspaper.

The Bolt and Tube

The bolt is a standard $\frac{1}{8}$in. diameter round-headed bolt 1$\frac{3}{4}$in. long. (These measurements are by no means critical—any similar size will suffice.)

The tube is a 1in. length of tubing of any metal or plastic, the bore being large enough to permit the bolt to be passed through. The length of 1in. is adequate for most standard lens barrels to be cleared, but anyone using an improvised lens might need to use a longer bolt and tube. Details are shown in Fig. 3.

The Spring

This is simply a scrap of spiral spring as can be readily salvaged from discarded electrical fittings. Not more than two or three turns are needed.

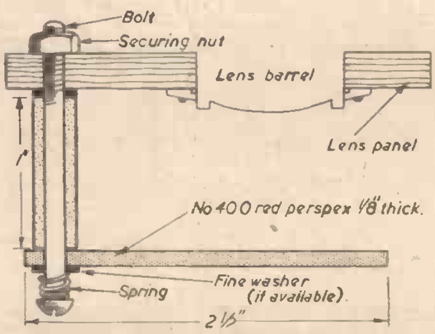


Fig. 3.—Details of the bolt and tube.

Fig. 4.—The size of the filter in comparison with a 35 mm. cassette.

Locating the Pivot

Since there is no uniformity in the shape and size of lens panel, the pivot hole must be located by trial and error. Once the pivot point is located, a hole $\frac{1}{8}$in. clear is drilled to accept the bolt.

Assembling the Unit

First slide the spring down the bolt to the head, then slide the screen down until it rests on the spring. If a fine washer is available, this may now be fitted before the tube is placed over the bolt. The protruding screwed end is now put through the hole in the lens panel, and a nut screwed hard down to hold the swing filter in place. Fig. 4 shows how the size compares with a 35 mm. cassette.

A NEW SERIES

Applications for FOREIGN PATENTS

By "ATTORNEY"

The Patent Office, Chancery Lane.

Valuable Advice to the Inventor on Patent Procedure Abroad. This Month West Germany, Holland, India, Italy and New Zealand are Dealt With

Federal Republic of Germany (West Germany)

PATENTS are granted in West Germany for a term of 18 years from the date of filing the German application. The West German Patent Office is situated in Munich. Applications are examined to determine whether they disclose a novel invention, possessing an adequate technical advance, having regard to what was previously known or used. An invention is not regarded as novel under German Patent Law if, before the priority date of the patent application, the invention has been publicly used in Germany or has been described in printed publications published within the preceding 100 years. German or other foreign patent applications laid open to public inspection, but not yet printed, may be detrimental to a later German application for the same invention. The novelty of an invention in a new application may also be affected by previously registered *Petty* patents to which special reference will be made later.

A German patent application may be filed in the name of the inventor or joint inventors or in the name of assignees thereof. It is, however, necessary for the applicant to file a declaration of inventorship in which the name of the true inventor or inventors is given. If the applicant is not the inventor, the applicant must state how he became possessed of the invention. Unless the inventor requests otherwise, his name is published on the German patent specification when printed and in the Letters Patent when issued.

Germany is a party to International Convention arrangements under which a German application may be afforded priority on the basis of a corresponding United Kingdom application filed not more than one year before the date of the German application. If a Convention application is made in Germany by an assignee of the United Kingdom applicant, it is necessary to file an assignment document executed by the assignor and legalised by the German Consul. The assignee must sign a declaration of acceptance of the assignment but it is not necessary for the declaration to be legalised by signature before a Notary Public or the German Consul. There is provision in the German law for assignment of an application after filing thereof in the German Patent Office and for assignment of a patent after grant.

Under German law, any third party who at the time of filing a German application has made genuine, practical arrangements for using the invention may acquire so-called prior user rights. Third party rights can generally not be claimed in connection with use of the invention by the third party between the United Kingdom and German application dates, i.e. in those cases where the German application is filed under Convention arrangements.

The German official examination is severe and if objections are raised against an invention on the ground of lack of novelty or inventiveness, a very careful and comprehensive response must be filed. The period allowed for reply to official objections varies according to the domicile of the applicant and other circumstances. If an application is rejected, an appeal may be lodged with the Appeal Department of the Patent Office. If the examiner, however, decides that the invention appears to be patentable, a publication decision is issued and the documents, including a printed copy of the specification and claims, are laid open to public inspection for a period of three months to enable anyone to oppose the grant of a patent on various grounds, such as that the invention is not novel or lacks a technical advance. The official file of an application may be examined by an opponent, who can then ascertain the arguments advanced by the applicant during prosecution of the application before official publication thereof. If no opposition is lodged or if an opposition is rejected, a patent is granted.

Annual renewal fees have to be paid in order to keep a German patent in force. Accumulated fees must normally be paid within two months from the date of issue of the official decision to grant a patent. No renewal fees are payable on patents of additions which, as in many other countries, are obtainable in Germany.

Although, at present, German Patent Law does not require a patented article to be marked with the patent number, such marking is permissible and may be indicated briefly by the letters D.B.P. The appropriate designation for patents granted before 5th May, 1945, is D.R.P.

An additional form of protection is obtainable in Germany for constructional improvements which do not possess sufficient technical merit to justify the grant of a patent. This is known as Gebrauchsmuster (Petty patent) protection. In case of doubt as to which form of protection is applicable, it is advisable to file simultaneously an application for a patent and also an application for a conditional Petty patent (Gebrauchsmuster). If the patent application is refused, a request may be made for the Gebrauchsmuster application to be registered in lieu thereof. If desired, however, an application may be made for an independent Gebrauchsmuster. Registration can be achieved in a comparatively short time and is of assistance if it is desired to deal with infringements before the corresponding patent application matures into a patent.

Gebrauchsmuster protection is frequently valuable and does not need to possess the high level of inventiveness necessary to support a patent. The monopoly period for a Gebrauchsmuster is, however, relatively short. The term is for an initial period of three years from the date following the date of application but may be extended for a further single period of three years subject to the payment of a renewal fee.

Application fees are from £42 and renewal fees rise from £7 15s. at the third year to £151 for the last year of the patent term.

Holland

Patents are granted for terms of 18 years from the dates of grant and extend automatically to Dutch New Guinea, Surinam and the Dutch Antilles. Patents granted after December 27th, 1949, however, do not extend to Indonesia, which is now an Independent Republic with a Patents Act of its own.

Holland is a party to an International Convention which enables a Dutch application to be filed with a claim to priority on the basis of, for instance, an application filed not more than one year earlier in the United Kingdom. Third party rights can be claimed by anyone in the Netherlands who has made *bona-fide* preparations to use an invention covered by an application, if such use has occurred before the application date or, in the case of a Convention application, before the date of the United Kingdom or other basic application. These third party rights cannot be assigned except in connection with the good-will of the business.

A Dutch patent application may be filed in the name of the inventor(s) or his assignee, and the latter may be an individual, firm or corporate body. An assignee application does not have to be supported by an assignment lodged with the application except in Convention cases when an assignment of priority rights must be filed in the Dutch Patent Office.

Applications are given strict official examination, particularly as to whether the invention is novel or possesses sufficient technical advance having regard to what was previously published or used anywhere in the world. A foreign application which, though not printed or published, is laid open to public inspection in a foreign Patent Office may be relied upon if it anticipates an invention in a Dutch application. There is provision in the Dutch Patents Act for the Examiner to require an applicant to give full information about official objections raised against corresponding applications in other countries. Particulars of such corresponding applications have to be furnished to the Dutch Patent Office as soon as possible after the filing of the Dutch application. Official objections raised against a Dutch application must be responded to within prescribed periods. If the Examiner eventually decides that the application relates to a patentable invention, he advises the Application Department concerning publication of the application. If a favourable decision is arrived at by the Application Department, the application is published in the Dutch Official Journal, providing a publication fee is paid beforehand. The application remains open to public inspection for a period of four months to allow anyone to oppose the grant of a patent. During this period a third party who has prepared to use the invention as above mentioned may enter a claim to have such use officially recognised.

Upon grant of a Dutch patent, the first annual renewal fee must be paid before the end of the month following the month of grant.

Articles or products made according to a Dutch patent should be marked to indicate the existence of a patent by the words "Ned. Octrooi Number . . ." An infringer of a Dutch patent may avoid damages against him if, under certain circumstances, he is able to show innocent infringement. A claim for infringement may be based on acts performed after official publication of a patent application as well as after grant of the patent concerned.

Application fees are from £37 5s. and renewal fees rise from £8 17s. 6d. at the second year to £19 5s. for the last year of the patent term.

India

India has entered into reciprocal arrangements with a number of countries, including the United Kingdom, under which an application filed in India within 12 months from the date of filing a corresponding United Kingdom application is afforded priority as to its effective date.

Indian patents are granted for a period of 16 years from the date of filing the Indian application or from the priority date, if claimed. There is provision for the granting of patents of addition to so-called parent patents. These patents of addition normally lapse with the main patents.

An Indian application may be made in the name of an individual, firm, company or communicatee and it is not necessary for the inventor to be one of the applicants. If, however, the inventor is not a party to the application, it is necessary for him to endorse the application or to execute an assignment in favour of the Indian applicant.

Indian applications are officially examined as to novelty of the invention, and the Examiner's search is mainly confined to prior Indian specifications. Objections, however, may be raised on the basis of prior United Kingdom specifications which, after publication, are received and filed by the Indian Patent Office. It is to be noted that the novelty of an invention in an Indian application or patent can only be assailed on the ground of prior publication in India, but not elsewhere.

Upon acceptance of an Indian patent application, the acceptance is notified in the Official Gazette of India and the specification is printed and laid open to public inspection. Opposition to the grant of a patent may be lodged within four months from the date of publication of acceptance. The sealing of an Indian patent must normally take place within two years from the date of application and a sealing fee must be paid within the prescribed time. In certain circumstances, an extension of the sealing period can be obtained.

In the case of an Indian application filed with a priority claim, it is necessary to lodge in the Indian Patent Office an officially certified copy of the basic specification which, in the case of a basic United Kingdom application, may be the provisional and complete specifications.

Annual renewal fees are payable on a patent but not on a patent of addition. The renewal fees commence with the fifth year of the patent, counting from the date of filing the Indian application or the priority date.

Marking of patented articles with the number and year of the patent is obligatory under the Indian Patents Act. Failure to adopt such marking would enable an infringer to escape damages on the ground that he was not aware of the existence of the patent. As in other countries, there is provision in the Indian Patents Act for the granting of a compulsory licence if the monopoly rights under a patent have been abused or if the patented invention has not been worked in India within a prescribed period from the date of sealing the patent.

Application fees are from £28 10s. and renewal fees rise from £7 2s. 6d. at the fifth year to £14 12s. 6d. for the last year of the patent term.

Italy

Patents are granted in Italy for a period of 15 years from the date of application, and patents of addition remain in force for the unexpired terms of the main patents to which they relate.

Italy is a party to an International Convention under which an Italian application filed in Italy within one year from the date of filing a corresponding application in the first Convention country, e.g., the United Kingdom, is afforded priority as to its effective date. An Italian application may be made by the inventor or his assignee. If an assignee applies in Italy under Convention, a form of authorisation or assignment must be executed by the inventor and legalised by the Italian Consul. This assignment must be filed in the Italian Patent Office within three months from the Italian application date. Special documents and procedure are necessary if an Italian patent is assigned after grant.

Applications are at present only officially examined as to form and to determine whether the invention relates to patentable subject matter. An official search to determine novelty of an invention in an application is not at present carried out. An Italian patent, however, is vulnerable if the invention has been previously published, either in Italy or abroad.

If an Italian application is filed with a priority claim, it is necessary to file an officially certified copy of the basic application in the Italian Patent Office within six months from the date of the application and this must be accompanied by a translation into Italian. At the time of application it is necessary for the applicant to pay printing fees which vary according to the number of pages of the specification. It is also necessary to pay stamp duties based on the number of sheets of the specification and drawings. Additional stamp fees are payable in respect of the sheets of the priority document and the translation thereof.

Italian patents, but not patents of addition are subject to the payment of annual renewal fees to keep them in force. The first annual fee must be paid at the time of filing the application. Marking of patented articles or products with the Italian patent number is not obligatory, although advisable.

Application fees are from £39 and renewal fees rise from £4 5s. at the second year to £19 5s. for the last year of the patent term.

New Zealand

Patent Law and practice in New Zealand is similar in many respects to that of the United Kingdom and has the following main provisions:

An ordinary patent application may be accompanied by a provisional specification which must be followed within 12 months by a complete specification, if necessary with drawings. An ordinary application may, however, be accompanied by a complete specification in the first instance.

A Convention application must, however, always be accompanied by a complete specification. New Zealand is a party to an International Convention, and a Convention application has to be filed within one year from the date of the first application in a Convention country where the invention has first been protected.

The patent term is 16 years from the date of filing the complete specification, this being the date of the patent. In the case of patents applied for after September 1st, 1951, renewal fees are payable before the expiration of the fourth, seventh, tenth and thirteenth years of the patent term. Patents of addition to main or parent patents are not subject to renewal fees and expire with the main patents.

If an application is made in New Zealand by any one other than the inventor, particulars of the inventor must be given on the application document. The application may, however, be filed in the name of the inventor, either alone or jointly with another party.

An invention is not novel under New Zealand patent law if it has been disclosed in New Zealand in patent specifications (or official abridgments thereof) published not more than 50 years prior to the priority date of the New Zealand complete specification; this priority date may be the date of the provisional specification or the Convention date, in the case of a Convention application. Prior publication of the invention in any other document, or prior public use of the invention in New Zealand also affects novelty of an invention put forward for protection in a New Zealand application.

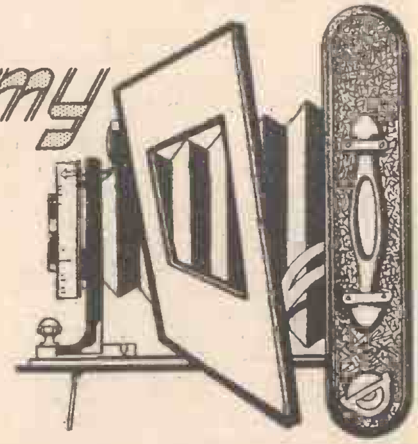
An application is examined to determine whether it is novel and conforms to certain other requirements. The Commissioner of Patents may require information concerning corresponding applications in certain other countries, including the United Kingdom and may wish to be informed of particulars of prior publications officially cited in those countries. If the Commissioner discovers an earlier patent likely to be infringed by performance of applicant's invention, he has power to insert a specific reference by number to that earlier patent in the applicant's specification. The reference can be avoided if the applicant can show there are reasonable grounds for contesting the validity of the claims in the earlier patent.

The application must normally be placed in order for acceptance within 15 months from the date of filing the complete specification in New Zealand. Upon acceptance, the application and specification are laid open to public inspection for a period of three months to enable anyone to oppose the grant of the patent on any one of a number of prescribed grounds, including the ground that the invention covered by the application is obvious and does not involve any inventive step. In the event of no opposition being lodged against an application, the applicant must request the sealing of a patent within a normal period of four months from the date of publication of the complete specification.

New Zealand patent practice follows that in the United Kingdom in many other respects. For instance, a patentee may apply to have the patent endorsed "Licences of Right." The patent is then subject to only half the normal renewal fees. An application may also be made to amend a specification after official acceptance, but no amendment will be allowed which would cause the specification, as amended, to claim matter not in substance disclosed in the original specification. The amendments to be permissible must be by way of disclaimer, correction or explanation.

Application fees are from £33 15s. and renewal fees rise from £6 15s. at the fourth year to £16 15s. for the fourteenth and succeeding years, inclusive, of the patent term.

Large Camera Economy



Some Masking Methods to Provide an Increased Number of Smaller Negatives

By H. A. ROBINSON

LARGE cameras can be bought cheaply in the second-hand market. As instruments they are often bargains, having excellent lenses, good shutters and a high class of workmanship. Indeed, they are sometimes so good that the lesser informed buyer is at a loss to understand why they should be offered at such reduced figures.

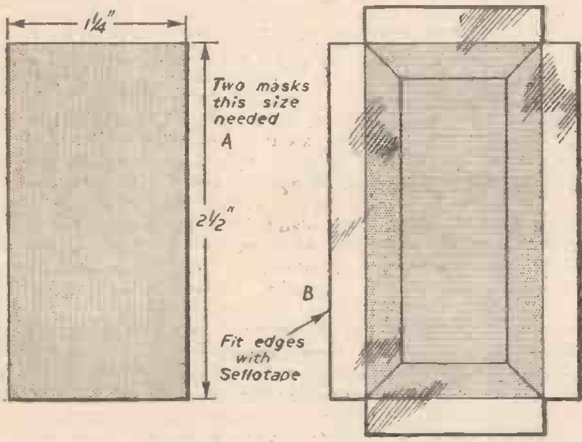


Fig. 1.—Mask dimensions and method of fitting Sellotape.

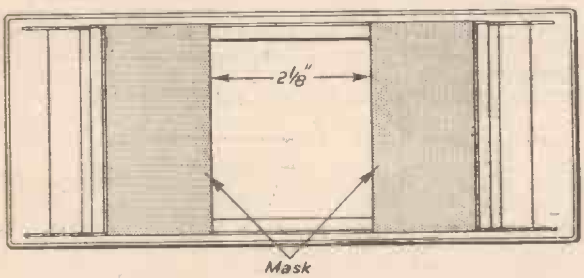


Fig. 2.—The masks in position.

The answer, however, is simple. They are too expensive to run with the present prices of films or plates. Also they are bigger than the now accepted standards.

Some of them, however, can be easily converted to take a smaller size picture; and by making possible more pictures to a roll reducing the cost of each.

Converting a 4¼in. x 2½in. Camera

One of the most satisfactory (and easiest) conversions is to adjust a 1A Autographic Kodak to take sixteen pictures instead of the usual eight. The 1A picture is fairly large, being 4¼in. x 2½in., and the reduced picture works out at 2⅛in. x 2½in., which has about the same area as the very popular 2¼in. square.

The 1A film can cost nearly four shillings, that is, almost 6d. a negative. By converting to a "sixteen on" the cost comes down to 3d. a negative, which is the same as for a 2¼in. x 2¼in. film.

Using a bigger camera has certain other advantages. The lenses on the instruments are of longer focal length, so the subject comes out larger and more completely fills the picture space without having to stand too near. To get the same filling with a short-focus lens one would have to move close in, with the result that anything well forward like a hand or foot would come out exaggerated in size.

To convert a 1A to the smaller size some backing paper from a film and a little Sellotape are required. Cut two rectangles of the paper 1¼in. x 2½in., A in Fig. 1. See to it that the pieces lie flat and are not slightly curled. A hot iron will bring about perfect flatness.

Now surround these with Sellotape, letting the tape overlap a quarter inch on all sides as at B. Press the tape into good contact with the paper.

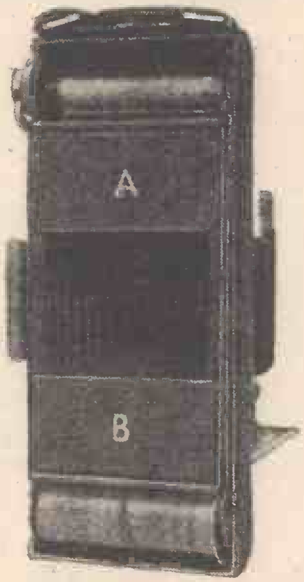
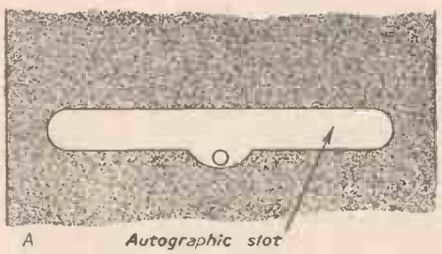


Fig. 3.—An actual conversion. Masks are marked A and B.



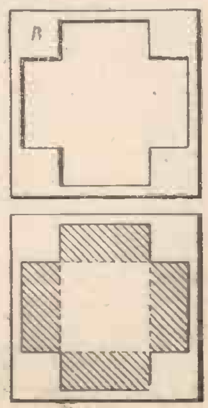


Fig. 4 (A, above).—Details of the autographic slot. (B, right). —How the viewfinder is used.

Prepare both masks first and then place them in position over and at either side of the 4¼in. x 2½in. frame which comes to view when the back of the camera is taken off. They are so fitted that there is 2⅛in. between their inner edges, the Sellotape on these edges being turned under to give added stiffness and a smooth finish.

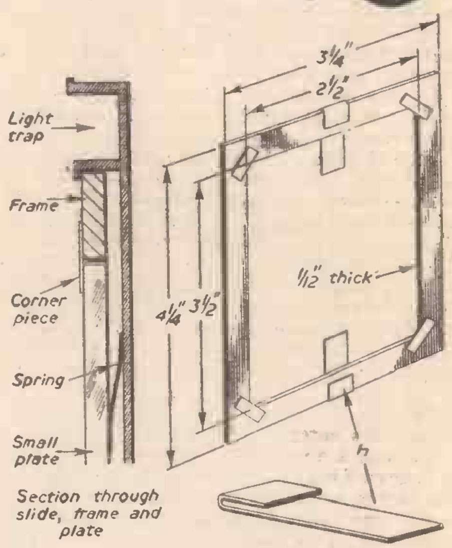


Fig. 5.—Cross section of slide, frame and plate and perspective of frame.

The flaps of tape at the top and bottom of the masks, it will be found, lie well over the metal surround and hold nicely to it when pressed down. That at the farther side to the opening goes a good distance down under the film roller.

If correctly fitted the usual picture space has now been closed down by two very robust masks (as in Fig. 2 and the photograph Fig. 3) which do not interfere with the movement or register of the film.

When winding the film through the camera the red window can no longer be used, and the autographic slot (A in Fig. 4) is used instead. It might be thought that some red celluloid would have to be placed below to prevent fogging, but experience has shown that so long as the slot is not exposed to bright light it can be used for seeing the backing paper marks unaltered. Its cover, however, is only moved back just before winding on the film and pulled forward again immediately the next picture has been spotted.

To use the slot, after putting in the film, wind till the hands appear. Continue winding till the last of the hands is under the slot and the film is seen for exposure No. 1. After this the *left-hand* numbers on the film, which are for "sixteen on," give the necessary positions down the length of the roll, the numbers in turn being positioned under the slot.

Lastly there is the question of the viewfinder. Fortunately 1A finders are well suited for use with the smaller size. Their shape is as at B in Fig. 4. Ignore the extensions and the clear centre portion is the area used for the new format. The extensions can be masked off, but this is really not essential.

Adaptation for Smaller Plates

Another very practical way of cutting down costs is by the introduction of adapter frames in the dark slides of a plate camera to take smaller size plates than those intended.

Adapter frames are not always too satisfactory on account of register troubles, but the frame shown in Fig. 5 forces the smaller-sized plates always to be in the correct plane by its very layout.

These particular adapters allow 3¼in. x 2¼in. material to be worked through a ¼-plate camera. The cost per negative is approximately halved, but the picture area is reduced by only 36.6 per cent. This comparatively small reduction is due to the method of holding which permits the smaller plate to be used from edge to edge, except for a negligible cut-off at each corner.

To make a frame, a shape as in Fig. 5 is cut from 1/12in. zinc, 4¼in. x 3¼in. (i.e., ¼-plate) outside measurements and 3¼in. x 2¼in. inside. The inner measurements should be "easy" as plates are not always precisely cut and some latitude is necessary. On the other hand there must be no marked looseness.

Across the corners of the inner opening now solder thin pieces of tinplate ⅜in. x ¼in., pressed down very flat and finally filed to wafer thickness.

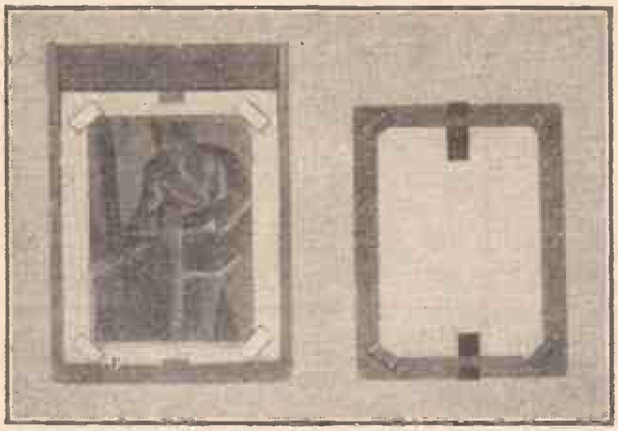
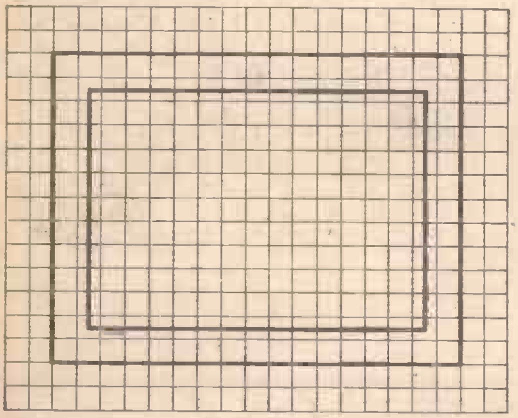


Fig. 7.—(Right) the reducing frame. (Left) the frame in a holder (painted white for clarity).



When in the slide the smaller plate is locked by the spring from behind which presses it against the corner pieces. For loading, however, two clips are necessary, these being shaped as H, Fig. 5, and made from thin but springy tin. The plate is laid in the frame and when the clips are slipped on at each side the frame and its load can be treated exactly like a complete ¼-plate and placed in the slide as such.

The cross-section shows how by the method of holding the surface of the smaller plate is exactly in alignment with the surface of the metal frame, which in its turn is automatically held in the correct focal plane by the lips of the slide as would a plate of that size. The reducing frame is shown in a slide in Fig. 7.

The frame could be cut for other sizes if desired, i.e., to allow ¼-plate material to be used through a postcard-size camera.

When working with cut-down sizes, a mask must be set round the viewfinder, whether it is of either the direct or reflex type, so as to give correct viewing. For the ¼-plate to 3¼in. x 2¼in. reduction the proportions of the mask are as shown in Fig. 6, others could be found by simple ratio.

Fig. 6 (Left).—Proportions of finder mask for ¼-plate to 3¼in. x 2¼in. reduction.

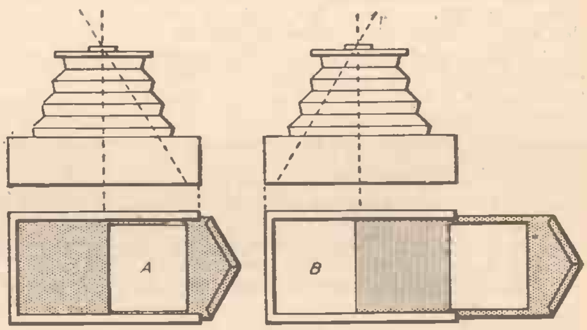


Fig. 9 (Right).—The plate (or roll-holder) cover in use.

Two Pictures on One Plate

"Two on one" pictures can also be taken on any plate, or film being worked through a roll-holder, by making the special dark slide or roll-holder cover shown in Fig. 8. The cover is from stiff tinplate and has an opening half the normal picture size taken out of the near side. The end is brought to a point and the tinplate folded over and pressed, this both to give strength and prevent cuts. A coat of matt black camera paint is finally applied.

This new cover is inserted in place of the usual cover when the slide or holder is in the camera. It is first pushed right home and exposure No. 1 made as A in Fig. 9. Then it is pulled half out and No. 2 can be taken (as B) on the farther side of the material, which is now ready to receive rays from the lens. Experiments are made with an empty slide to find just how far the cover must be drawn out and a line scribed back and front to show this position. The cover in the future is always pulled out till this line appears.

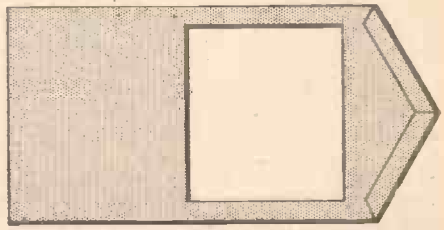


Fig. 8.—The dark slide or roll-holder cover.

The twin exposures made, the special cover is withdrawn and the usual one replaced, the film in the case of a roll-holder then being wound on for the second pair of pictures.

This is an excellent way of obtaining twice the number of exposures on any given amount of material. In view-finding for this type of half-pictures, it must be remembered that opposite sides of the finder are used alternately.

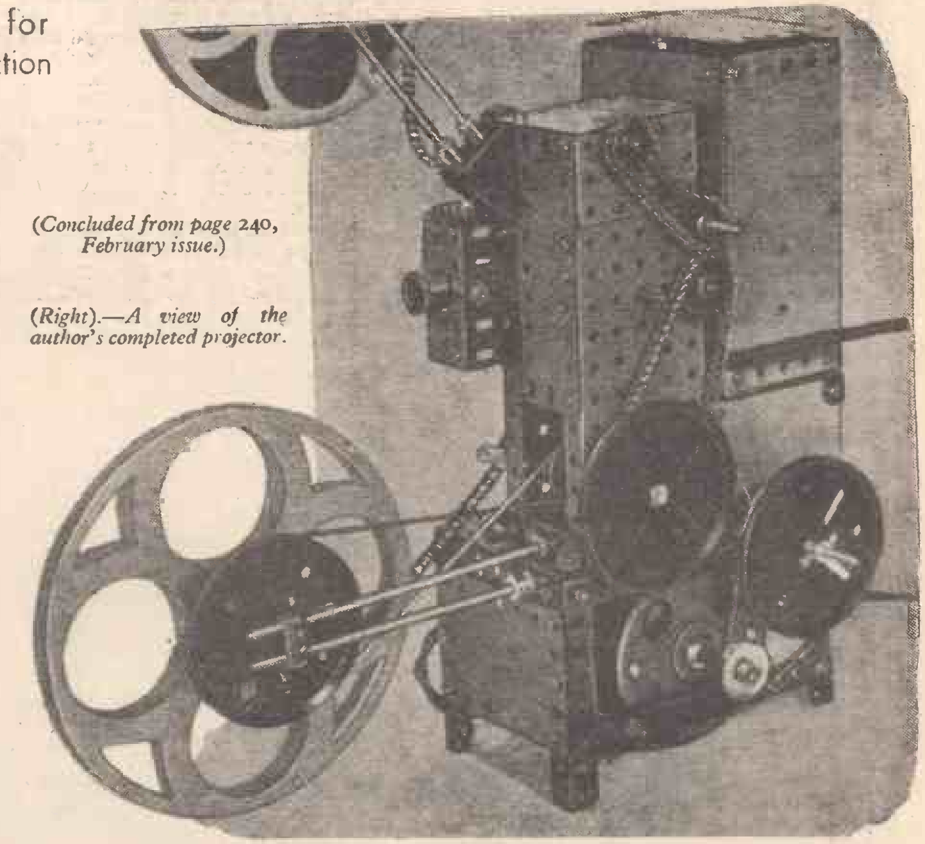
ANDY MANN .... THE PRACTICAL MECHANIC

MAKING A 9.5MM. CINÉ PROJECTOR

Full Constructional Details for Making Apparatus for the Projection of 9.5mm. Silent Films

By L. COGSWELL

(Concluded from page 240, February issue.)



(Right).—A view of the author's completed projector.

IF a transformer of the required current rating cannot be obtained, the secondary windings of an old mains transformer with a suitable lamination stack may be rewound to suit. A burnt-out TV transformer was stripped and rewound for the writer's machine.

The optical arrangement is the conventional "in line" type and is shown at Fig. 23. The diverging rays from the light source A converge at the condenser B, pass through the gate aperture C and shutter path D on to the objective lens E. The back rays are collected on the reflector F.

Lenses and their inherent aberrations are a subject for much discussion, but it should suffice to say here that only corrected lenses should be used. A good quality condenser, especially, is essential to permit the maximum amount of light to reach the objective. This does not, of course, mean that "super" lenses should be fitted to a "tin projector." If this were so, the expensive "super" lenses would be out of their class and the whole object of building a reasonably priced machine from odds and ends would be stultified.

Good quality sub-standard projection type condensers and objective lenses are frequently advertised in the lists previously mentioned. The "bargain" lenses that may be seen displayed in junk shop windows should be examined carefully for any possible surface defects and lenses with bruised barrel threads and retainers should be rejected, no matter how attractive the purchase price.

The condenser lens used is a single mounted plano-convex, 11/16in. diameter $f1.5$, and was the only type available to the author at the time. The buffer bracket was relieved between the sockets and a portion of the condenser bracket cut away so that the glass could be brought to within ⅛in. of the gate aperture (see Fig. 9). A larger condenser may be used, in which case the buffer bracket should be modified or re-positioned so as to clear the emergent beam. A smaller condenser may be used, providing the beam adequately covers the gate aperture.

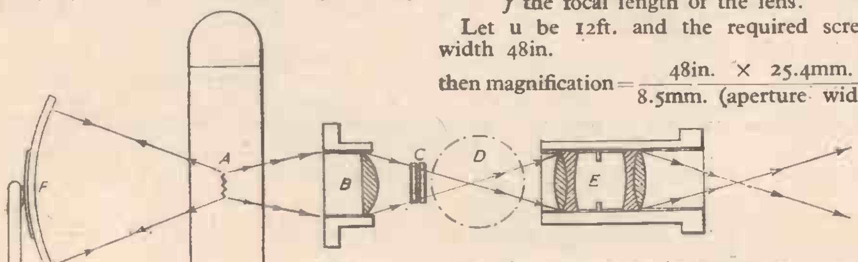


Fig. 23.—The optical arrangement in diagrammatic form.

The choice of screen size rests with the constructor. A common tendency is for exhibitors to exceed the scope of the illuminant with the "big picture." For the average apartment, a well illuminated screen of 2ft. 6in. width is preferable to a poorly lit screen 5ft. wide. The large screen, projected by the wide angle lens at short throw in a small area, especially, is overbearing to the viewer. Comfortable viewing within a realistic perspective should be the aim.

Due to the interposition of the barrel type shutter between the aperture and the objective, the shortest focal length lens that may be used with the machine is $f1$.

The focal length of the objective will depend on the screen size required and the distance of the objective from the screen surface. Using the lens formula :—

$$u = (M+1) \times f$$

and

$$f = \frac{u}{M+1}$$

where u is the distance from screen to lens
$M+1$ the magnification greater than 1
f the focal length of the lens.

Let u be 12ft. and the required screen width 48in.

$$\text{then magnification} = \frac{48\text{in.} \times 25.4\text{mm.}}{8.5\text{mm. (aperture width)}}$$

$$= 143 \text{ (approx.)} + 1$$

$$= 144, \text{ and } \frac{144}{144} = 1$$

An $f1$ lens would, therefore, be required to project a 4ft. wide picture at 12ft. from the screen.

A shorter focal length lens (were it possible to use one on the machine) would project a larger picture from the same distance but at a weaker screen lux, as the light intensity falls off with magnification. Conversely, a longer focal length lens, which may be used, will project a smaller picture from 12ft. at a stronger light intensity. A greater screen to lens distance would be necessary to obtain a 4ft. wide screen with a longer focal length lens and, to quote Lambert's Law: "The light intensity varies inversely as the square of the distance from the light source."

Projection lenses are stopped with a diaphragm between the glasses at a maximum fixed aperture consistent with rendering a satisfactory definition. Modifications to the aperture size are not normally needed but, should it be necessary to insert a diaphragm in an unstopped lens, the diaphragm should be carefully fitted between the glasses, as lenses stopped from the front or back cause curvelinear distortion—where the sides of the image appear bowed or caved, depending on which side of the lens the diaphragm is fitted.

The condenser and lens brackets were further yields from the scrap box and, with little modification, were adapted to the machine. The constructor may find similar oddments which could be utilised but, if nothing suitable is to hand, the brackets could be made as shown in the photograph, Fig. 9, for the condenser lens, and Fig. 10 for the objective. The dimensions of these items will, of course, depend on the diameters and length of the lenses obtained. An important point to observe is that the mounting faces of the brackets are square to the bores. The 11/16in. dimension from the mounting face to the bore centre of the objective lens bracket should be maintained to ensure that the centre of the objective will be dead in line with the gate aperture centre line.

The horizontal and vertical centre lines should be scribed across the end faces of both brackets as a reference for setting the components in position.

The Lamphouse

The lamphouse of the machine was made in two sections, namely, the base and the body.

Space for a fan was provided but, to date, the machine has been run without a fan, as heat dissipation by the natural convection of the cool air admitted through the perforated base plate and the exit of the hot air at the top

THE LAMP BASE		
Item	Description	Quantity
3	Perforated strip, 3½in. length	2
9B	Angle strip, 3½in. length	2
9C	Angle strip, 3in. length	4
9D	Angle strip, 2½in. length	2
9E	Angle strip, 2in. length	4
12	Angle bracket	As required
37	Nut and bolt	As required
62A	Threaded crank	2

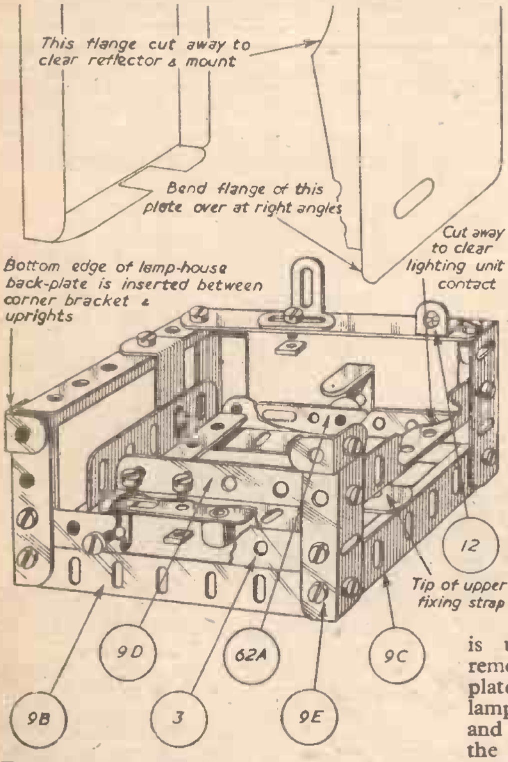


Fig. 24.—The lamp base. (See also Fig. 25.)

of the lamphouse is found to be adequate. Additionally, the inner lining of the lamphouse body assists heat dissipation by transferring the heat over a greater surface area. A fan may be fitted if desired (or if a higher wattage lamp is to used) to a spindle mounted on a bush bearing on the lamphouse body. Alternatively, a blower motor could be arranged to drive the machine, with the blower unit set in position beneath the lamphouse base.

The lighting unit is mounted on bearers within the lamp base. Provision is not made for sliding the unit to and fro as, at this position on the optical axis, the lamp will illuminate the screen quite evenly without "ghosting" of the lamp filament at the centre of the screen. The pre-focus setting of the lighting unit automatically positions the horizontal lamp filament square to the condenser.

The lamphouse was masked with standard flexible plates with ½in. wide insulating tape set at the uncovered perforations between inside and outside plates. Louvred plates (or sometimes complete lamphouses) are advertised in the various ex-Government surplus lists and, if of suitable size, these items could be utilised advantageously. Shim metal could also be employed satisfactorily. In the writer's case it was decided to put to practical use the numerous rigid and flexible plates already available.

The constructor may make a similar lamphouse which will suit the purpose quite well providing care is taken to avoid distortion in the structure and all potential light escapes are masked off.

The lamp base is shown in Fig. 24 with a list of standard parts required for the construction. The various brackets fitted to the frame and the lighting unit clamps may, if desired, be made from soft brass. The lighting unit is shown in position, with the reflector removed, in Fig. 22, and it may be noted that the rear clamp is secured to the lamp cap retaining plate of the unit at the tapped hole between the reflector lugs. Both front and rear clamps are fixed to screwed bushes mounted to the base, as indicated in Fig. 24.

Extreme care should be taken to ensure that the contacts beneath the base of the unit do not touch the lamp base bearers: a portion of the right-hand bearer is cut away to prevent this.

The construction of the lamphouse body may be seen from the photograph at Fig. 25. Two 5½in. x 2½in. flanged plates (Part No. 52) are connected by two 3½in. long angle strip cross members to form the sides of the housing. A 3½in. long perforated strip to which a screwed bush (Part No. 62A) is fitted is mounted immediately beneath the top rear cross member. A 3½in. x 5½in. flat plate (Part No. 52A) bolted to the flanges of the side plates forms the front of the lamphouse. A further 3½in. x 5½in. flat plate is used as a removable back plate to the lamphouse body and is fitted to the rear of the lamphouse by inserting the bottom edge of the plate behind the brackets fitted to the rear top of the rear corner members of the lamp base (the brackets may be seen in the photograph, Fig. 25). The top end of the back plate is secured to the body by means of the screwed bush, located at the centre of the rear upper member previously mentioned.

Referring to the sketch, Fig. 24, the lower horizontal flange of the right-hand lamphouse plate is bent over at right angles and the rear perpendicular flange of the same plate cut away to facilitate removal of the reflector and replacement of a lamp if necessary. The holes, shown elongated into a slot at the bottom of the face of the right-hand plate, permit the setting of the reflector screw from outside the lamphouse. The lower horizontal flange of the left-hand side plate is cut away to clear the bracket mounted to the side member of the base.

A 2½in. x 3½in. flexible plate (Part No. 190A) is fitted approximately ¼in. from the top surface of the lamphouse by means of a screwed bush mounted to the face of the top front cross member.

Three 5½in. x 2½in. flexible plates (Part No. 192) may be used for masking the sides of the lamphouse and back plate. The front of the lamphouse and the sides of the lamp base may be masked by cutting the flexible plate into suitable shapes and arranging the plates to cover as many perforations of the rigid plates as possible. All remaining uncovered perforations should be neatly masked between the inner and outer plates with ½in. wide opaque insulating tape, taking care to avoid chinks, as these will "project" inverted images of the lamp filament on the walls and ceiling surrounding the machine.

The lamp base may be fixed to the base of the machine with 14 S.W.G. mild steel straps, as shown in the perspective view in Fig. 4, with the front top member bracket of the lamp base screwed to the flange of the picture head plate.

A line located from the centre of the lamp cap holder of the lighting unit should be

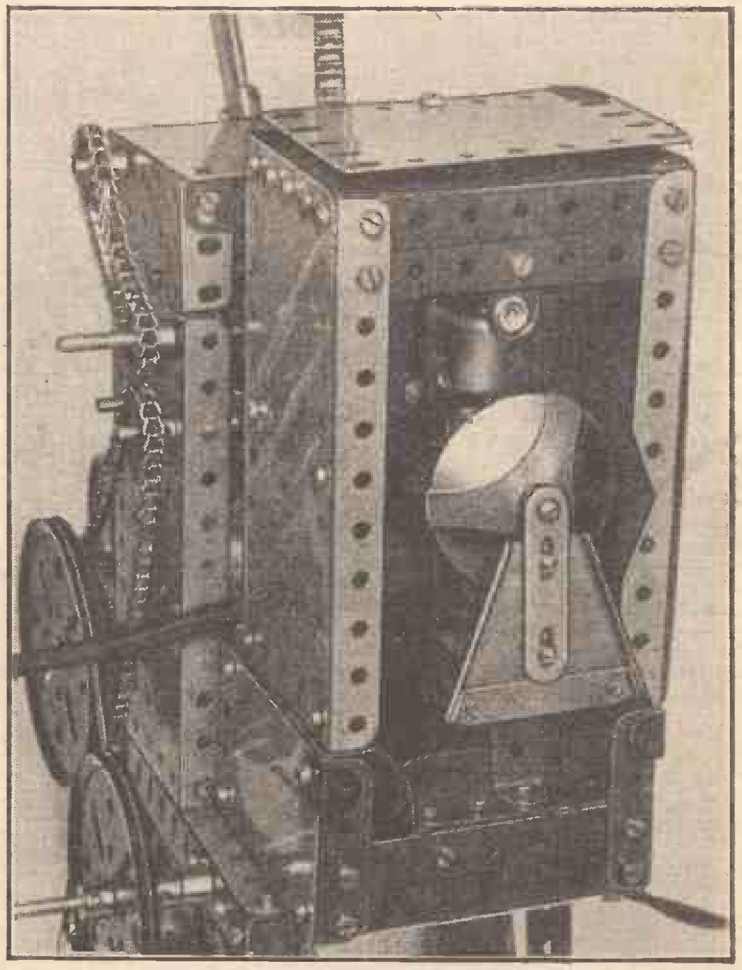


Fig. 25.—A rear view showing the lighting unit.

lightly scribed longitudinally across the length of the top face of the unit body. The lighting unit should be clamped in a central position between the vertical edges of the bearers and care taken not to overstress the bakelite base.

Bring the lamp base into correct alignment with the gate aperture by setting an 11/16in. wide parallel bar from the outside face of the picture head plate in line with the centre line scribed on the top face of the lighting unit, and finally tighten the lamp base in this position.

The lamphouse body is bolted to the lamp base and the vertical centre line of the condenser bracket position scribed, using the same setting block. The horizontal centre lines of the condenser and objective lenses may be marked off by setting the base of the machine in the horizontal plane and transferring a line picked up from the horizontal centre line of the gate aperture to the lamphouse and picture head faces.

The position of the condenser bracket fixing holes should be marked off from the centre lines scribed on the front face of the lamp body and the bore aperture cut approximately 1/16in. larger in diameter than the actual bore of the condenser bracket. The condenser and lens brackets should be finally fixed in position, after carefully checking that the centres of the respective components are in correct alignment with the gate aperture. A matt white screen should be set at the required distance, in line and square to the optical axis of the machine, and, with the lamp on and reflector removed, the gate aperture should be brought into focus. Any uneven screen illumination should be rectified by careful adjustment of the height or central position of the lamp. The adjustment should be carried out with the lamp switched off, and on no account should the machine be knocked or moved while the lamp is on.

As the lamp base bearers are set lower than the required height to bring the lamp filament to the centre of the optical axis, it may be found necessary to pack the bearers. Any packing slips that may be used should lie flat on the bearers, to ensure that the lighting unit is evenly seated. The right-hand packing slips must be cut away to clear the contact beneath the unit.

The reflector should be replaced and, with the back plate of the lamphouse removed, the reflector should be carefully adjusted to give the "maximum illumination." Although, due to the length of the lamphouse, the reflector cannot be extended to its full length, a position about 1in. from the lamp filament should give satisfactory results.

To prevent light escapes, the gate bracket, intermittent movement and objective lens may be "boxed in," using similar rigid and flexible plates. It would be convenient for the side plate of the gate box to be hinged, to enable inspection of the pull-down mechanism and cleaning of the gate aperture.

Projecting

It is advisable to use a dark or darkened room for projection tests. A fair appraisal of the machine's performance at the various settings cannot be made in the semi-light, as the screen brightness cannot be assessed. Additionally, flicker and flutter are accentuated in the half light. An almost imperceptible screen flicker in a darkened room is quite pronounced when the screen is exposed to daylight. Likewise, a minute vibration of the image—not unduly distracting when viewed in a dark room—appears as an obvious flutter or "dance" when viewed in the half light.

With the projection lamp on (in a darkened room) and the machine running without a film, flicker will be noticeable, but this will be considerably reduced when the film is running. The lamp should not be left on with the film stationary in the gate, as this will cause blistering or embrittlement of the film. If desired, a square of heat resisting glass (obtainable in various sizes from opticians) may be fitted between the condenser lens and the gate bracket, although it may be found that this special glass adds slightly to the light losses.

An unsteady picture may be due to many variables. Rubber or spring band drives from the motor to the continuous mechanism may cause the intermittent movement to shudder, which would give rise to an unsteady picture. The importance of a smooth, free running mechanism is essential and cannot be overemphasised. All moving parts should be lubricated with light sewing machine oil. A "bobbing" claw will cause the picture to jerk erratically. The trace of the claw should be closely scrutinised whilst the machine is running, preferably at 24 f.p.s. The claw trace should appear as a stationary rectangle and should not "bob" or "dance." Should the claw trace be found to be unstable, then all aspects of the intermittent and continuous mechanisms should be checked, i.e., cam form and follower, alignment, freedom of operation, meshing of gears, concentricity of spindles, etc.

Again, an unsteady picture may be caused by the guide. Lateral swaying of the picture could be due to the guide strips being spaced too far apart, or to side-play in the sprocket spindles. As previously mentioned, due to the long guide, little or no pad pressure should be necessary to impart a damping effect to the film. If, however, clearance exists between pads and film, the film will flutter in the guide and an unsteady picture will result.

The constructor may well obtain a very steady picture on the first trial run and an erratic picture on subsequent runs—an idiosyncrasy not uncommon to cinematograph projectors. This may be due to one of the foregoing points previously checked as O.K. suddenly becoming "unstuck." A more likely cause would be that the film used at subsequent runs was thicker (or thinner) than the film used at the trial run. Experiments were made on the machine with the paper separators already referred to and back plate compression springs of different ratings, until an "optimum mean damping" was obtained. A very stable image is achieved with the guide described and, using silent copies of sound films at 24 f.p.s.

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No Atomic Car Yet

DR. CLAYTON LEWIS, chief engineer of nuclear research at the Chrysler Corporation, U.S.A., said recently that, unless something completely new is discovered, the possibility of an atomic car engine being introduced is unlikely for some time. A car weighing less than a ton would at present require an engine weighing over two tons. He went on to say that, if an efficient means of storing energy was invented, indirect propulsion of nuclear generated power would be attractive. It would probably completely change the car industry.

Atom Sub Refuelling

THE announcement that the *Nautilus* is to be refuelled was made almost exactly two years after she first went to sea, during which time she has sailed more than 55,000 miles. The uranium core of her reactor will be removed and replaced by a new one of enriched uranium. The old core will be examined and the unused uranium reclaimed, which means that *Nautilus* could have sailed further, but reactor efficiency would have gradually deteriorated. A complete overhaul will take place at the same time as refuelling.

New Naval Fighter Passes Tests

A SERIES of trials was successfully completed recently by the Supermarine N.113, described as the most advanced aircraft ever produced for the Royal Navy. "Blown flaps," which are to be fitted on every production model, were used. This system is known as super-circulation and is a new aid to improving an aircraft's lift at high angles of attack and at low speed. A sheet of high pressure air is blown through the rear of each wing, this being fed from each engine compressor. Low-speed handling performance is thereby improved and approach and landing speed reduced, this being of particular advantage in landing on an aircraft carrier.

Australian Gas Fuel Project

THE possibility of Australian gas coal reserves being exhausted, made it imperative that the almost limitless reserve of brown coal in the State of Victoria should be utilised and a process adopted for its gasification. The process finally adopted was known as Lurgi High Pressure Gasification and this is an alternative to the carbonisation method of gas production used with hard black coals, by which coal briquettes are gasified in a mixture of steam and oxygen.

The initial output on completion will be 15 million cubic feet of gas per day.

First Commercial Atom Station

THE work programme for this project resembles a military time-table, and after only a week the Severn site has been transformed. Excavation of a great pit, 250ft. across, has been started to house the foundations of the first atomic reactor. These foundations will consist of 60,000 tons of concrete and 2,000 tons of steel reinforcement which will have to support the reactor and eight heat exchangers that will produce steam for conventional turbo-generators. There will be two such units in the complete station, which is scheduled to come on full power in time for the winter of 1960-61.

Vertical Take-off Plane Completes Trials

THE Short SC1 has successfully completed its first taxi-ing trials. It is a jet research plane which is designed to rise vertically and then change from hovering to forward flight.

Building a

A Simple Yet Sturdy Construction of

By E. HAWKSWO

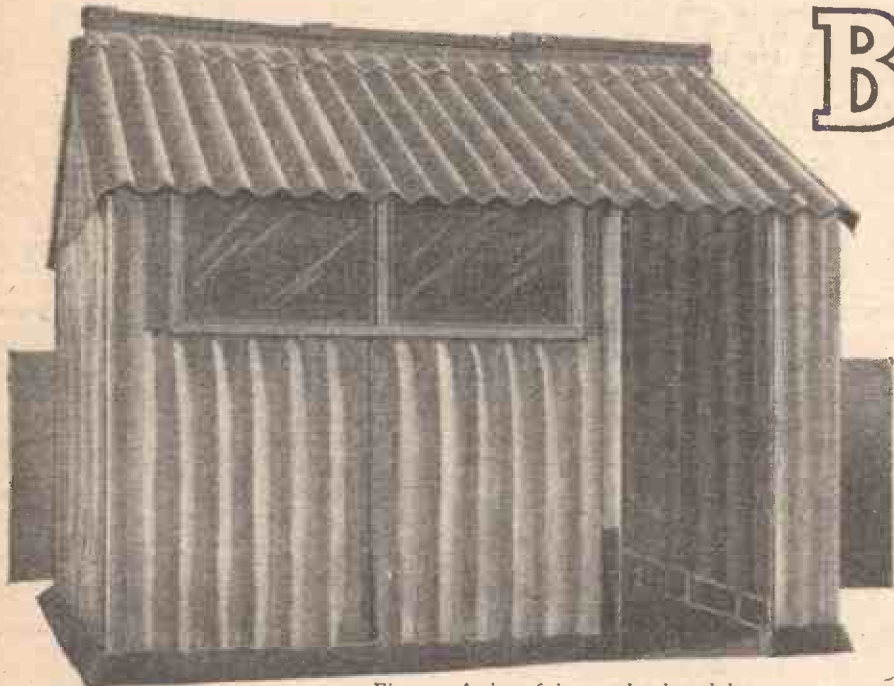


Fig. 1.—A view of the completed workshop.

THE basic requirements of an ideal workshop for the average home mechanic are:

1. Ease of construction without special tools, using locally bought materials.
2. Structure to be permanently weatherproof and be built off a sound, dry floor.
3. Maximum floor area for minimum outlay of cash.

This workshop design of five years' standing was erected by the author in three weeks of spare time effort. The floor is 4in. of concrete laid on a 5in. hardcore base and the structure is of steel and asbestos. There is 100 sq. ft. of floor area and the workshop cost less than £30 in materials. Two views of the workshop are shown in Figs. 1 and 6.

Cool in summer, warm in winter—due in no small measure to the temperature equalising effect of the white asbestos walls—the building's atmosphere is surprisingly free from rust-forming damp. A small lathe and other light workshop equipment requires but the thinnest of oil films to keep free from corrosion throughout the year.

A considerable saving in cost could be achieved by using secondhand concrete blocks and angle-iron obtainable from local scrap or demolition firms. It would be false economy, however, to try to save on the "Big 6" asbestos sheeting. Current prices of 6ft. sheets are about 16s. and it is strongly recommended that nothing but new material be used.

Reference to your local trade telephone directory—a mine of useful information—will put you in touch with builders' merchants and other firms supplying the materials.

The Floor Base

Twenty-six concrete cavity blocks are put down on the site to form a square. They may be partly buried in a shallow trench but if this is done earth from the middle should be removed to make way for the hardcore filling. Lay out the blocks as shown in Fig. 2, and check for levelness. The accuracy of the square can be determined by measuring with a piece of string diagonally across two corners. Mark the string, then check its length across the other two corners. When both diagonals measure the same the base is all square.

A 5in. deep layer of hardcore filling is now packed into the square and rammed solid. Any old brick ends, plaster or rubble are suitable. Top off to the level of the blocks with 4in. of concrete. You will require three bags of cement and approximately 15 cwt. of washed sand and gravel. Specify "half-in. down" of the latter. Level off with a long straightedge and go over with a trowel before it finally hardens to obtain a smooth floor.

Completed, the workshop base should measure 10ft. by 10ft. 6in.

The Steel Skeleton Frame

A quantity of mild steel angle will be required—either new or secondhand—of about $1\frac{1}{2}$in. × $1\frac{1}{2}$in. × 3/16in. New material is nearly 1s. 6d. per foot run, whereas good old stock can be bought for as little as 5d. This might need cleaning down with a wire brush, but after painting with red oxide or bituminous paint it will be as good as new.

The lengths required are:

Downrights, 7ft. long—six pieces.

Top, front and back rails, 10ft. long—five pieces.

Ends, 9ft. 9in. long—four pieces.

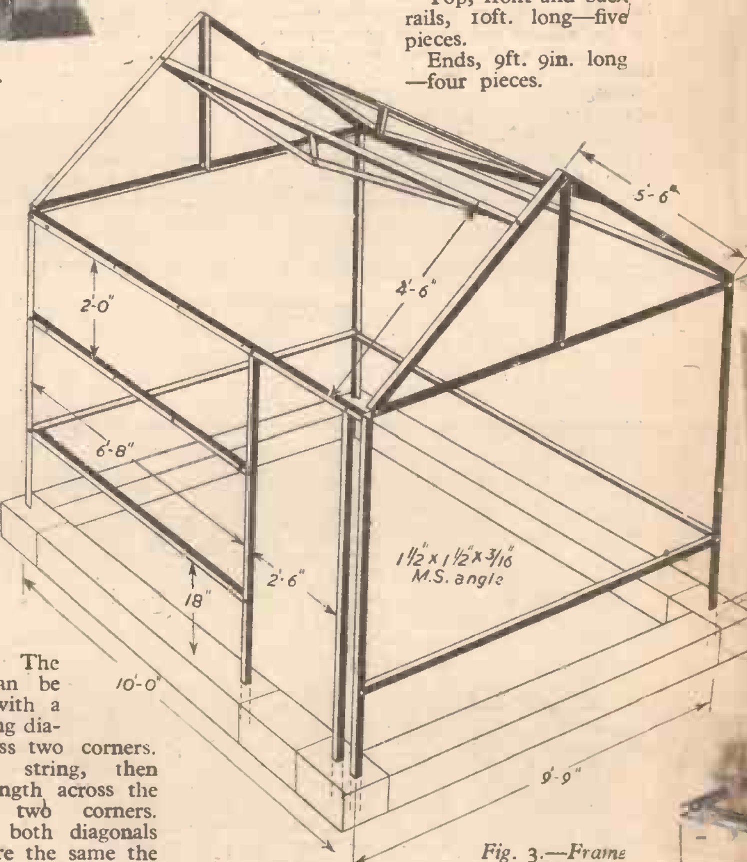


Fig. 3.—Frame assembly.

Truss tops and top rail braces, 5ft. 6in. long—eight pieces.

Truss uprights, 2ft. 6in. long—two pieces.

Top rail braces, 6in. long—two pieces.

Front cross members, 6ft. 8in. long—two pieces.

Assembling the Frame

Drill and bolt the steel angles—using ¼in. bolts—into sub-assemblies before attempting to erect on the site. Make the end trusses and top roof carrying rails as in Fig. 4. Unless the top sheet supporting rails are strengthened with a shallow "V" brace as shown, the weight of the "Big 6" sheets will sag the roof.

The shed front with its door frame and window cross braces can also be assembled

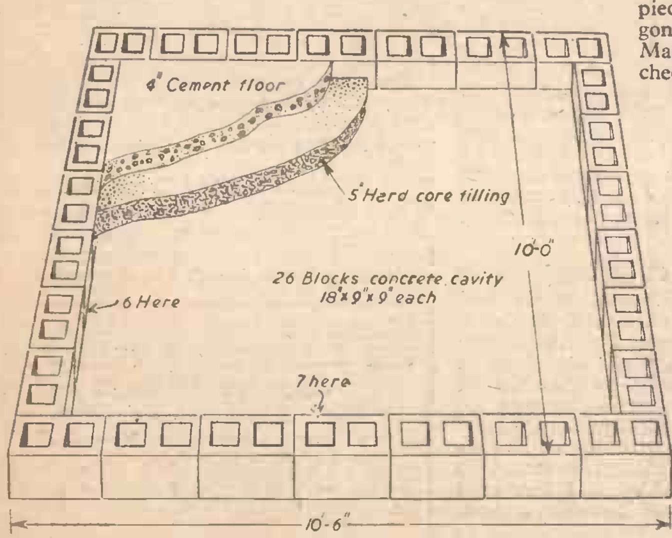


Fig. 2.—Layout of the 26 cavity blocks.

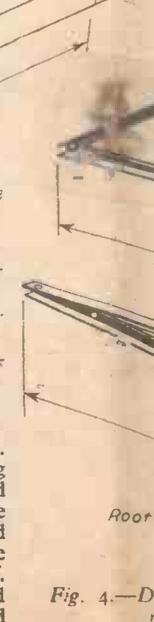


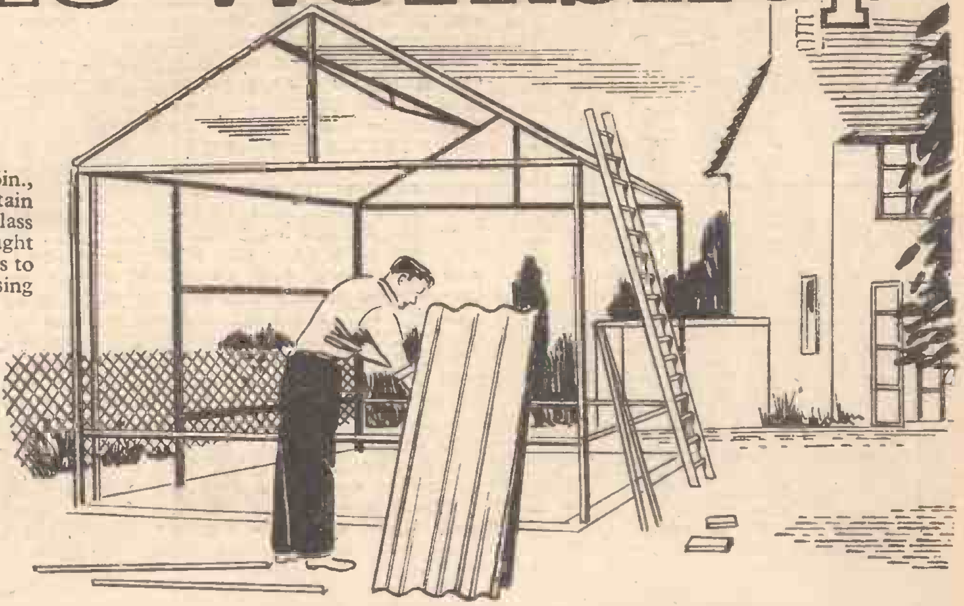
Fig. 4.—D

a Home Workshop

f Angle-iron and Asbestos

ORTH

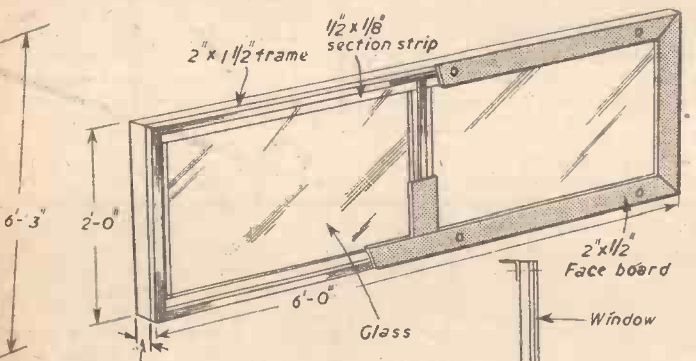
complete. The door width is given as 2ft. 6in., but this may be adjusted to suit certain conditions. My own door—one with glass panels—measures 2ft. 3in. and was bought secondhand for five shillings. If the door is to be made, Fig. 7 shows a sound design, using ⅝in. tongued and grooved timber, braced at the rear with cross battens.



When the rear frame has been bolted together, the building up of the steel skeleton on the shed base may be begun.

Start by placing the front and back upright in the block holes. Temporarily place a packing underneath the bottom rails to support the frames at the correct height. There should be 9in. of the downrights inside the blocks and 6ft. 3in. above. Roughly support the standing frames with external wooden braces, making sure the frames are 9ft. 9in. apart, then concrete the legs firmly into the block holes permanently. When set, bottom cross rails and trusses can be added, then finally the top sheet girders. If possible, all holes should be drilled when the frame is in the sub-assembly stage. This is much better than trying to bore holes while balancing on a pair of steps! On the ground the various assemblies can be tried together easily, then the holes marked off and drilled accurately. Fig. 3 shows the complete frame assembly.

Build up the windows in a single frame measuring 2ft. by 6in.; 2in. by 1½in. timber is used for the main frame with a centre downright to split the frame into two panels. A wooden strip ½in. by ⅛in. thick is fixed round the face edge of the frame and down the centre-strip middle to form a recess to hold the glass panes. A faceboard edge holds the glass in a kind of sandwich (see Fig. 5). The faceboard projects beyond the wooden frame edge—at sides and bottom—so as to overlap the edges of the asbestos sheets and give a weatherproof window fitting. Putty in the glass and add the faceboard after cladding the steel frame.



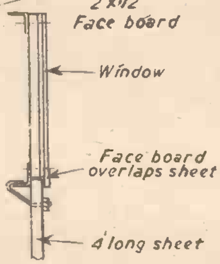
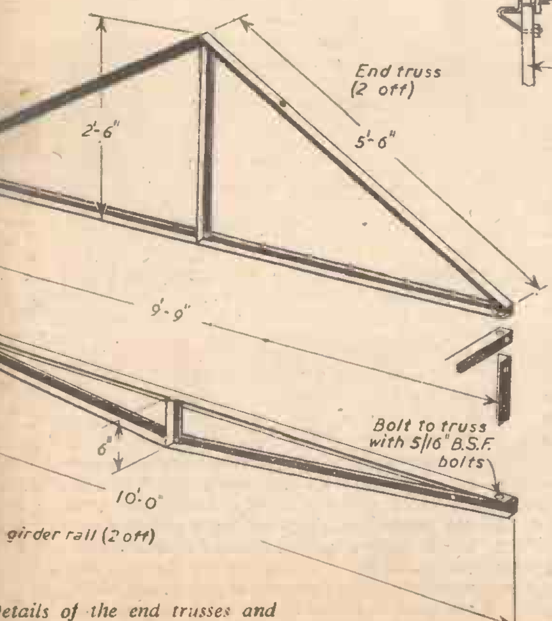


Fig. 5.—Details of the windows.



etails of the end trusses and roof carrying rails.

Cladding the Skeleton

Bolt the window frame minus glass and faceboard to the cross rails.

There should be a gap each side of the frame—between door post on one side and corner post the other—of about 4in. Hinge the door to open *inwards*. Owing to the overhang of the roof sheets it would not be possible to open it outwards. Make the door to close into the "L" of one door post angle.

Before starting to add the sheets, place a row of bricks round the base. These add an extra 3in. to the height of the walls—total 6ft. 3in.—and make it easier to seal the base of the sheets from the weather when cemented later.

Hang three "Big 6" sheets at the back attaching with straight hook bolts at the bottom rail and specially bent ones at the top as shown in Fig. 8. If care is taken when adding the end sheets and mating the corners, it will be found possible to obtain a neat corner joint without having to add later an outside corner covering strip. Two 4ft. long sheets are hung beneath the window frame and a strip cut from a 6ft. sheet used to fill the gap between door post and corner. Other short pieces of asbestos are cut and hung each

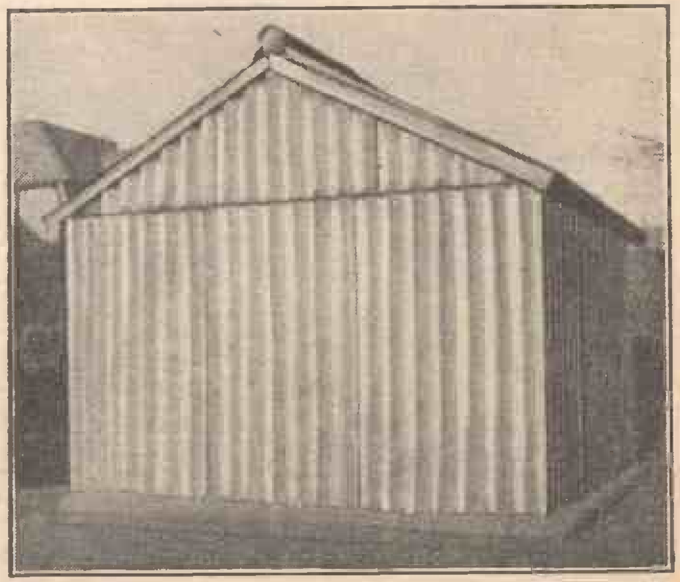


Fig. 6.—A further view of the completed workshop.

side of the window frame. It is these small finishing details that make or mar the completed appearance of the workshop; with patience a neat job will result.

Broken hacksaw blades held in pad-handles

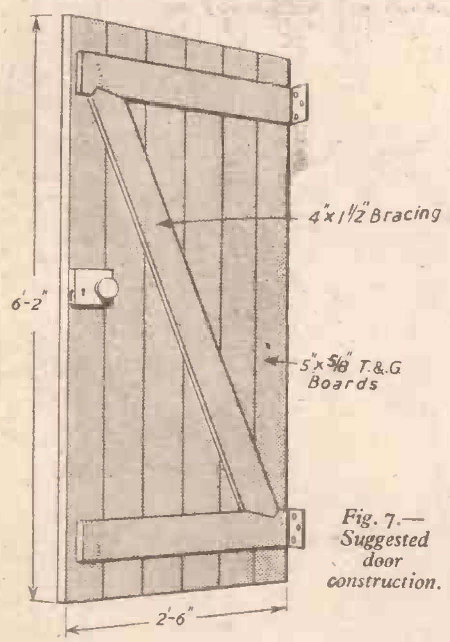


Fig. 7.—Suggested door construction.

are the thing to use for cutting the sheets. When cutting across the humps saw through them from one side of the sheet then turn it over and complete the saw cuts from the other. Filling in the spaces of the triangular trusses at each end is a simple task if care and patience are used.

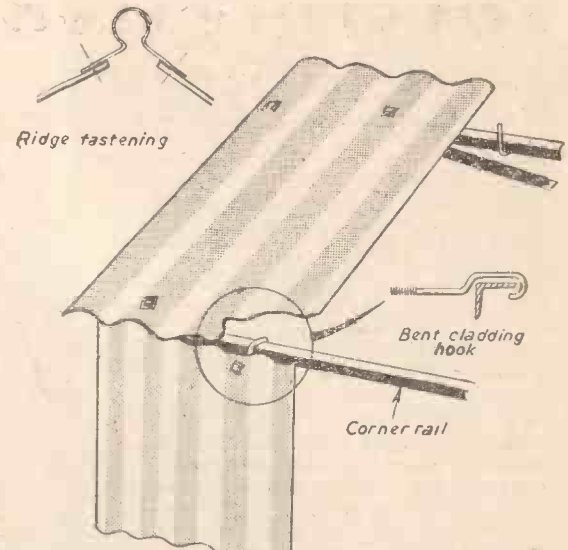
Six roof sheets are added, a pair at a time, and then the ridge placed in position. The ridge is in two overlapping halves and is bolted directly to the sheets. You may find a slight gap between roof sheets and wall top edges if the corrugations do not line up accurately. A handful of glass wool fibre packed in will cure this although it has never been done on the prototype. This ventilation—well protected by the overhanging eaves—may be a factor in the damp-free atmosphere of the workshop!

Ordinary hook bolts at the top girder rail and the specially bent ones at the top wall rail hold down the roof sheets. Corner strips are affixed at each roof-edge and the ridge ends blanked in.

Window glass can now be puttied in and the faceboard screwed on. If you've made a neat job the board will completely mask the sheet edges.

Mix up some cement (three sand: one cement) and point round the brick row at the sheet base. Slope a neat fillet from sheet to block edges and the floor will never be damp.

With each sheet weighing in the neighbourhood of 100lb. and all bolted together in strong box-like formation, the complete workshop will certainly never blow down!



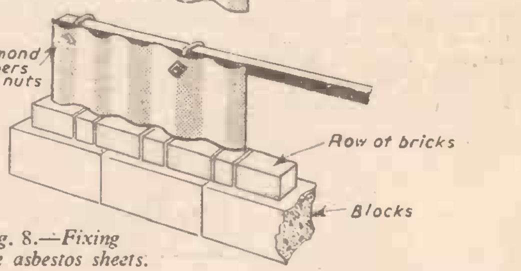


Fig. 8.—Fixing the asbestos sheets.

Finishing

The angle iron framework, already treated with red oxide or bituminous paint, will need no further attention, but the window frames and door must be given an undercoat and two coats of good quality paint. An existing bench which is too large to pass through the door must be moved on to the concrete base and the workshop erected round it.

Workshop Notes

A Barrier Cream

TO make this barrier cream shred or cut as finely as possible about a ¼ lb. of any kind of ordinary household soap into a clean tin. Add to this about a teacupful of water and half a cupful of any scouring powder for washing up. Bring slowly to the boil on a very slow heat and stir till soap is dissolved. Pour out and allow to set cold. The result will be a thick, substantial paste that when well rubbed into the hands and fingernails before tackling any dirty job will protect them to a surprising degree. The right consistency is quickly found after a little experiment.—D. GLADISH (Nottingham).

Bench Stop

WELD together a box about 2in. to 3in. square, the edges of the top being ground to a sharp edge (as shown in Fig. 1). Drill a ⅜in. clearance hole in both top and bottom, countersinking the top one. Weld a ⅜in. nut around the bottom hole, both holes being in line with each other. On unscrewing the bolt the spring around it forces up the top plate This is then in a position where the timber will press up against the sharp edge, which will keep it steady while planing the timber.—J. BULMER (Sunderland).

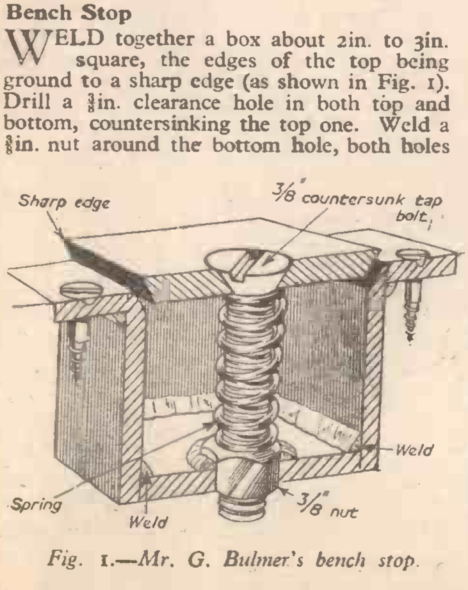


Fig. 1.—Mr. G. Bulmer's bench stop.

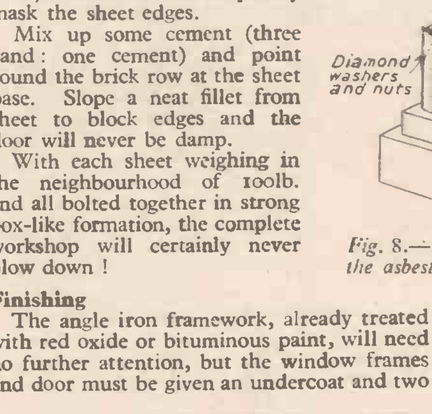


Fig. 2.—Mr. D. Jackson's paint stirrer.

A Paint Stirrer

THIS is made from a standard steel shaft and bushed wheel from a well-known toy construction kit. The wheel is cut as shown in Fig. 2, with tin snips from each hole to the edge. One edge is then turned up on each blade so that it resembles a turbine. The stirrer is used with an electric drill.—D. JACKSON (Warrington).

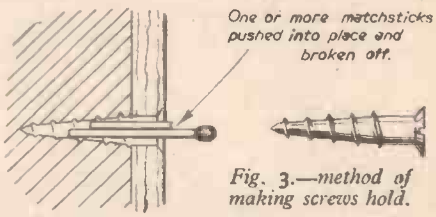


Fig. 3.—method of making screws hold.

Making Woodscrews hold

A SIMPLE but effective method of making woodscrews hold firmly in a worn or enlarged hole is to pack the hole with matchsticks, as shown in Fig. 3, breaking them off flush with the surface. The screw is then replaced, when it should bite firmly into its wooden packing.—A. G. CURTIS (Bristol 6).

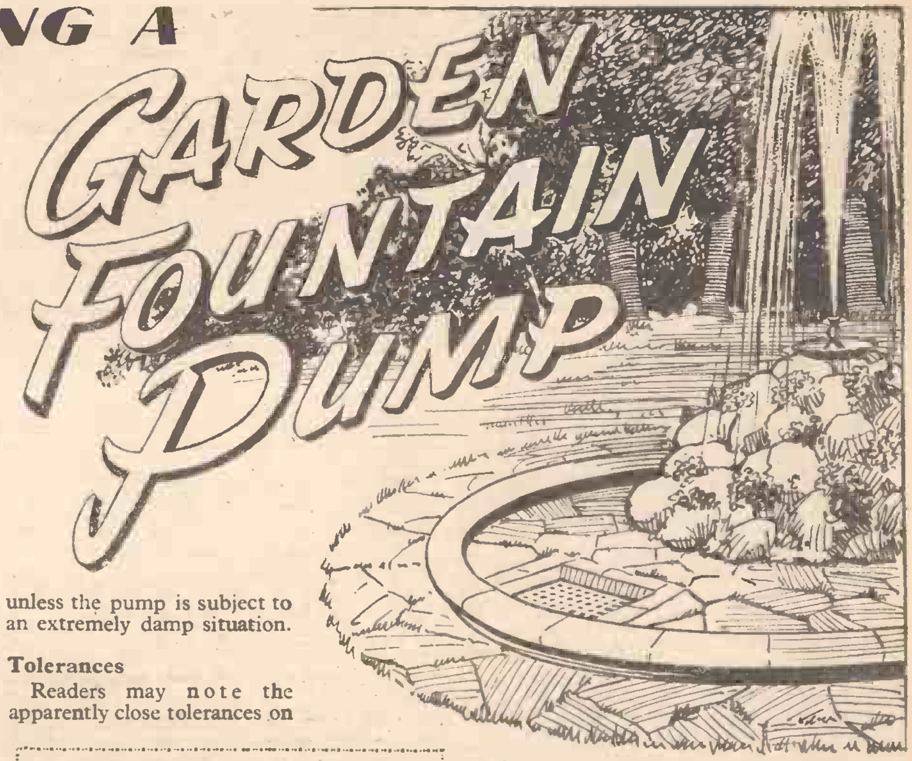
A PORTABLE POTTERS' WHEEL

(Concluded from page 283)

right-hand uprights of the frame. A certain amount of trial and error was necessary to set this at the correct angle and a temporary bracket was first tacked on and altered to suit, the permanent bracket being afterwards made from this.

The driving belt to the wheel is cut to suit from a length of about 5ft. 3in. of ¼in. round leather belting with ordinary wire fastener. It is tensioned by two thumbscrews in the base of the wheel frame which adjust the distance between the two units. The motor driving belt could be of the same material but ¼in. square rubber has been found adequate at the high speed and convenient for slipping on and off, or changing on the "stepped" pulley on the motor. It is tensioned simply by sliding the motor on the frame. Fig. 6 is a further view of the completed wheel

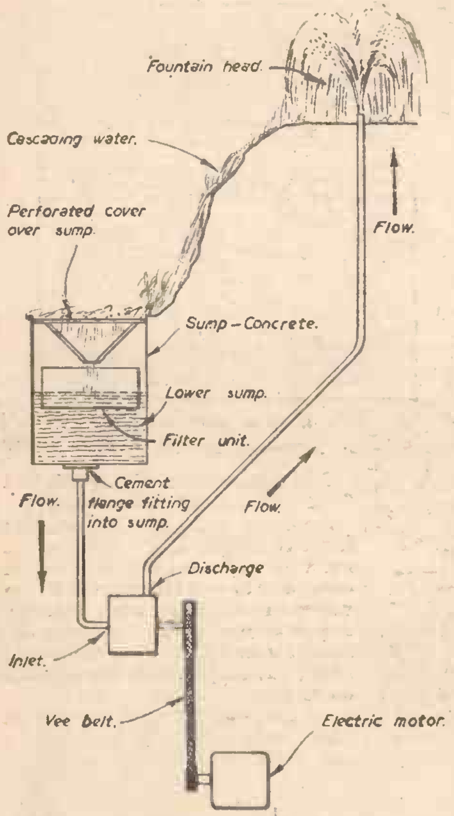
CONSTRUCTING A



BEFORE embarking on the actual pump construction some thought to the site is essential, because often this will save many hours of patient digging and wholesale cementing of a deep sump for the water. There is no point in making the water flow long distances before it cascades into the air, so endeavour to arrange the pump either underneath or adjacent to the fountain—remember water flowing along a pipe creates friction and requires pressure to overcome this and to provide a sufficient jet for an impressive flow. The general arrangement is shown diagrammatically in Fig. 1. This part of the work is referred to again later.

Pump Construction

Fig. 2 illustrates a cross section through the pump, which is of the rotary type. It is so easy to make that no castings are needed. Most of the materials are readily available from the scrap box with the addition of a few screws to hold the parts together. While the dimensions given in the drawings will ensure that you can pump water to a good height, deviation from the figures, if not too drastic, is feasible and should not produce a severe reduction in the jet.



Note:- Motor and pump are housed in seperate compartments.

Fig. 1.—General arrangement of the fountain and pump.

The main detail is a large piece of brass or bronze bar which is bored and recessed on both sides as indicated at Fig. 3. Cast iron or steel are alternatives, but these metals rust when in contact with water and the pump will not operate for many weeks before attention becomes necessary. For those readers who may not possess such a large piece of the former material they can bush the steel member with every success and then rust will not create this trouble. Generally corrosion of the outside is overcome by painting, and a yearly application is enough, unless the pump is subject to an extremely damp situation.

Tolerances

Readers may note the apparently close tolerances on

A Spectacular Garden Adjunct : Some Interesting Work for the Amateur Turner

By K. VERDEN

this and other parts and they will perhaps suggest that such accuracy is not really essential. While agreeing that one can make one piece fit the other and thus avoid tolerances of this nature, the work of boring and facing is no more difficult than trying to make the various pieces fit correctly. In fact you must eventually apply a micrometer and slip gauges when ascertaining the dimensions of different parts, so while engaged on this work it does not require a great degree of skill to machine the details to the figures stated here. On the other hand should you make a slight error and perhaps bore a recess too deep one can fairly easily "adjust" the mating part accordingly.

Concentricity is a major factor with this detail and after initially boring the centre hole and the recess one side a spigot is turned from a scrap end of bar and the body fitted to it; whereupon the second operation of machining the opposite recess is completed.

The End Caps

While the R. H. cap shown in Fig. 3 is easily turned from a single piece of material I doubt whether many readers possess so large a piece; consequently some improvisation is necessary and this problem is solved by making the boss as a separate item. When these tactics are used the main cover is then made from thick plate if this is available. Rough turn the item all over and thread the bore where the boss is eventually assembled. This latter is merely a short piece of bar threaded to suit the hole, and when both items are screwed together and the end lightly riveted over to prevent any vibration tending to slacken the boss from the cover, the fabricated item is once more chucked and the remaining operations of turning the locating spigot and boring the hole are completed.

Special note should be made of the eccentric hole and if the disc is faced carefully the lines made by the tool are an excellent guide to indicate the exact centre of the flange. Very lightly centre pop the spot where the tool marks disappear into a mere dot—in other words the lines are so close they are just a dot and then set the oddlegs and mark off a distance of ⅛in. from this point. Centre pop this line carefully and reset the detail in the chuck with the centre pop rotating truly; the tailstock centre is a great aid in operations of this nature—simply bring it forward until it matches with the mark and then tighten the chuck jaws. An alternative method requires the insertion of a piece of ⅛in. thick packing between one jaw and the bar material and when the operation of turning and facing is finished the jaw is loosened, the material removed and the jaw once again tightened on the bar. By this means the body

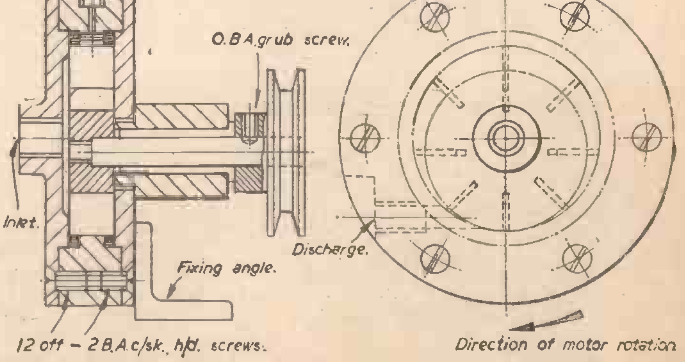


Fig. 2.—Cross-section through the pump.

is moved over ⅛in. and one can then commence the boring process.

Fabrication is perhaps not necessary for the other cover and this is either turned from a piece of plate or a slice off a bar 3⅛in. in diameter. If the plate method is used and the shape is anything but circular, hold the material to a chuck faceplate and bore the centre hole. Having carried out this task, set a vee tool in the lathe tool box and mark a circle to correspond to the pitch circle of the holes. Only a light mark is needed and this is an excellent guide when marking off the actual hole centres.

The Rotor

Aluminium was used in the prototype of this pump and this material gave every satisfaction, but other materials will, no doubt, give the same good results. Drill and tap the central hole and countersink one side a little to prevent the shaft from slackening when that item is assembled (see Fig. 3). If this shaft is centred prior to fitting it to the rotor body, then these are available on which to mount the assembly during the final turning stages. This procedure is essential in order to ensure concentricity, and failure to observe these rules will make the pump operate stiffly and, in very bad cases, the severe rubbing action set up will prevent it rotating.

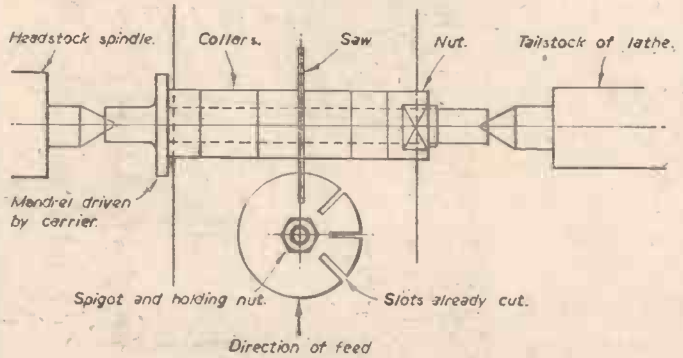


Fig. 4.—Machining the rotor slots.

Very accurate spacing of the blade slots is unnecessary, so marking the lines with a protractor is applied on this occasion.

Once this has been accomplished the rotor is set up by attaching it to a specially turned spigot and this detail is located in a lathe bolt slot. Fig. 4 depicts this set-up.

A cutter a little less in width than the blades is inserted in the mandrel and a series of cuts taken where the marks correspond on the body detail. As the shaft stands vertically when attached to the lathe table, this is the side on which the marks should appear. Careful feeding to depth is essential, using a light feed, otherwise there is a risk the cutter will "grab" at the body, with immediate fracturing as the result. The reason for using a cutter a few thousandths of an inch smaller than the width of the rotor slots is to allow for the cutter when running out of truth, as they all do very slightly, to cut the correct size slot, and it also enables a reader to gently fit the blades to the slot until they slide easily and without undue shake. This milling operation requires carrying out with some degree of care in order to secure good fitting blades.

Facing the Assembly Blades

The items are still slightly longer than the faced rotor, so each is inserted and the eight parts wired to prevent them falling out. A few turns of copper wire will hold them sufficiently to allow a sharp facing tool to pass across without disturbing them, but do not damage the rotor body by tightening the wire too much. Let each blade protrude over each side a little, and do not attempt to take very heavy cuts; a matter of .005in. at a time is ample and should not pull the blades from their anchorage. I used a thick plastic for these rotor blades and they worked freely and gave every satisfaction. Do not make the fit between the slots and blade too close—a fit almost what one might call a "rattle fit" is preferable because this ensures that the blades cannot stick and so refuse to pump.

Assembly

Before commencing to assemble the pump details give the question of mounting it on the site some thought, because some further holes must be drilled in the body before the rotor items are put together. A simple angle fixing is easy to make, and only requires the drilling and tapping of a pair of holes in the side wall of the body. However, make sure that these holes do not pierce the bored holes, otherwise this means that you must plug them with small pieces of brass before using the pump, and this is an operation that does not improve the general good looks of this accessory.

The rotor blades are already in place, and as the slots will undoubtedly vary a little I suggest that you tie them temporarily with string until you are ready to offer the rotor to the body.

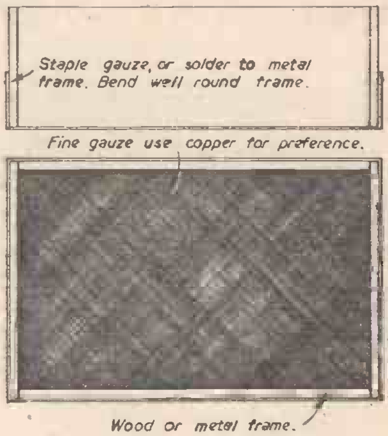


Fig. 5.—A simple filter unit.

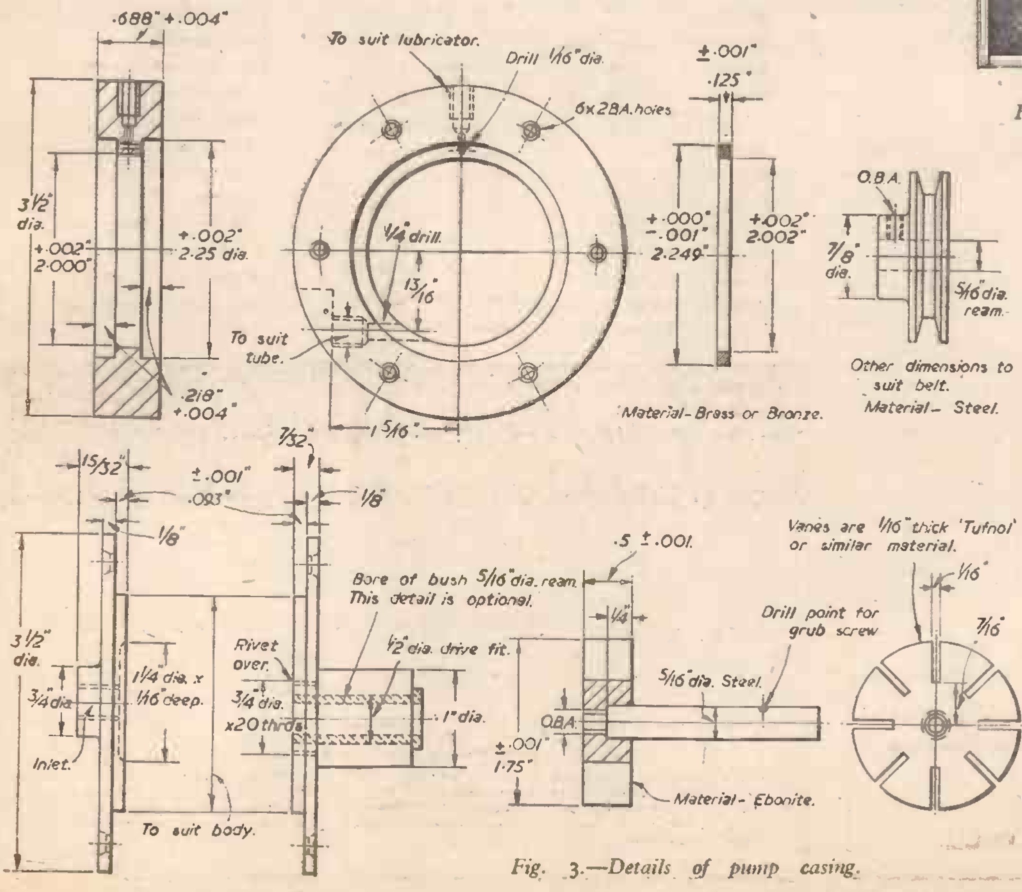


Fig. 3.—Details of pump casing.

Make sure all the chips are shaken from the tapped holes otherwise these have a rather disconcerting habit of finding their way into the main details, and chips are not conducive to long running in a pump where the inside parts are rotating. Assemble one cover, that with the long boss, and then add the rings and rotor, finishing off with the opposite cover plate.

As the work proceeds you must check to see that the shaft moves freely and without binding.

In cutting the slots in this manner the bottom surface is radial because the cutter is not fed across the rotor, but this is not detrimental in any way and the inner edge of the blades can be left flat as the radius is rather large.

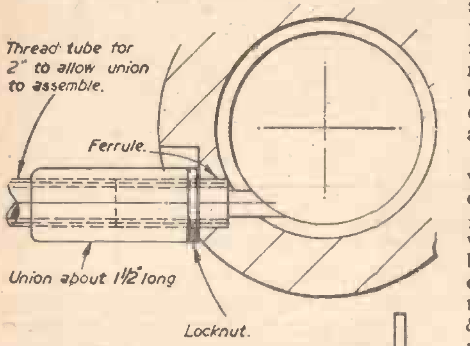
Siting and Filtering

Long pipes create friction and reduce the force of the jet, so the best situation for the pump is close to the fountain. Generally, a fountain of this type takes the shape of a rockery with the water cascading from above, and one must admit that it makes a pleasing sight. Unfortunately, the water brings with it particles of dirt and falling leaves which will very soon clog the pump

(Continued on page 305)

unless some means are taken to exclude them from the operating parts.

Fig. 5 illustrates a simple yet effective filter unit which can be made easily. The body is merely a square box covered with



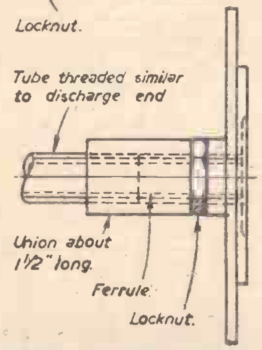


Fig. 6.—The pipe connections at the inlet and outlet.

gauze, which is readily available from good ironmongers. A piece about 18in. square is sufficient. I used wood for the body of my filter—it obviously needs replacing much quicker than a metal container, but it allows you to tack the gauze easily in place, using small staples. The clean water drains away through the lower hole to the pump and this flanged item is threaded to suit the tube. A fitting might be found in the shops, but it may also be home-made.

The other parts which fit on the pump at the inlet and discharge points are also home-made, and when laying out the actual fountain site run ½in. pipes where they are not seen and connect up as shown in Fig. 1. You will find it more convenient if you arrange the filter unit in one sump, and the pump and motor in another—in fact, I consider this an essential precaution where electricity is concerned, otherwise there is the risk of an accident.

The pump is shown as being driven by a vee belt, and a 1/16 h.p. motor will drive it effectively. However, the consumption of a ⅛ h.p. unit is so low there is no reason why you should not use one of these. Vee belts are obtainable from most tool dealers, or they can secure them on request. Failing this source of supply, try Messrs. J. H. Fenner & Co. Ltd., of Marfleet, Hull, who are actual makers and should have a suitable size in stock. With this type of drive you must arrange the motor on slides to enable you to pull it backwards and so tighten the belt. A flat plate about ¼in. with elongated slots to correspond to the bolt holes, serves the same purpose. Cut clearances for the bolt heads and cement the plate to the floor.

The action of the unit is now as follows. Water enters the filter and falls through the gauze into the lower sump. It drains from there, as the arrows in Fig. 1 indicate, to the inlet side of the pump, whereupon the rotor expels it through the discharge side to the fountain head where it cascades once again to a drain sump prior to piping away to the filter.

Fig. 6 shows the inlet and discharge pipe connections; these can be brazed if the facilities are available, but threaded joints are suitable for this type of connection.

I have specified a very simple fixing for the nozzle, and during the winter when the pump is inoperative a screw cap will prevent insects and dirt from entering and filling the pipe. This is shown in Fig. 7.

With an eye to possible pipe blockage, it is advisable to assemble all the pipes with a view to easy dismantling should this become necessary. You can hide them easily under pieces of rock or even bury them in the ground, so long as they are accessible to allow you to unscrew the joints for cleaning purposes. Try to avoid sharp corners in the pipe if possible because you can often tap the sides of a piece of tube and free any foreign matter if the bends are shallow.

Despite the fact that a sump into which the water must drain is essential, it does not mean you must let it fall some feet below ground level. Remember every foot the water falls it must be pumped up again, and

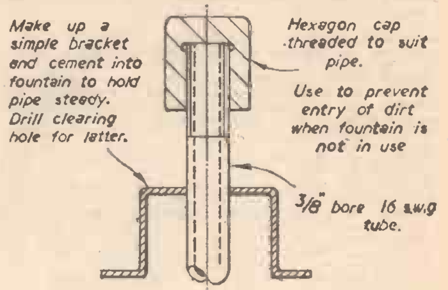


Fig. 7.—The nozzle and cap.

these sumps are often arranged a foot or so above ground level if the fountain arrangement allows this.

I cannot advise readers too strongly on the question of first drawing a proper plan of the fountain, say to a scale of 2in. or 3in. to the foot according to the construction.

If this pump runs at a high speed there is no need to submerge it—hence the reason why I have adopted a belt drive and installed it in a separate compartment to the filtered water. It will throw a jet approximately 5ft. to 6ft. high with the rotor running about 1,000 r.p.m.

Fishkeeping and Your Holidays

By I. W. BRASSINGTON

FISH keepers should find that they can quite safely leave their fish for a week without making any special arrangements for them. It is advisable, of course, to check all the electrical appliances, to be as sure as possible, that the thermostat is working

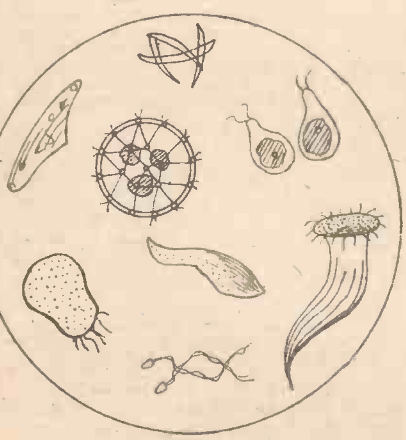


Fig. 1.—Microscopic life in water.

correctly, and that the fish are in good health when you leave them. Do not ask a friend to feed them while you are away—unless he is also an aquarist—for your helper will almost certainly succumb to a desire that your fish shall be twice their present size by the time you return. The results will almost certainly be disastrous.

If you are going away for a longer period, there are one or two things you may do to help bridge the gap in regular attention. The problem is twofold. First comes the question of food and secondly that of ensuring that the plants get enough light to keep them growing.

Problem of Food

It is absolutely fatal to put extra food in the tank on the morning of your departure. The only type of food which may be given in extra quantities, is Daphnia (water-fleas), which will stay alive for two or three days in the tank, until most of it is eaten; but for the two or three days benefit to be gained in this way, it is not worth the risk involved. It is far safer—and therefore better for the fish in the long run—to feed live food such as Daphnia, Micro-worm, chopped earthworm, etc., for a couple of weeks before your holiday, in order to build up the general fitness and stamina of the fish and they will then come to no harm for, possibly, three weeks. In an established tank you will notice fish browsing for hours at the glass sides and amongst the plants. They are sucking at the Algæ which collects there—and obtaining quite a lot of nourishment in the process. Apart from this, there are often microscopic free-swimming forms of Algæ (zoospores) present, so that an established tank is not so devoid of nutriment as one would at first suppose.

This is an important reason for not changing the water in an aquarium, the constant aim being to encourage a tank to "mature," i.e., to contain these microscopic plants and animals, samples of which are shown in Fig. 1.

Problem of Light

During the summer I estimate that the heater is only working for an average of about three or four hours daily, and as this approximates fairly closely to the length of time for which artificial light is required, it is possible to work both heater and lights together. The thermostat, of course, is an automatic switch and, if the lighting circuit is made to pass through the thermostat, the lights will operate at the same time as the heater so that, while you are away from home, the plants and fish will get a certain amount of light each 24 hours. Fig. 2 shows how this change-over may be done. You will notice that when the switch is at A, the lights will be controlled in the normal way, but when the switch is at B, they will be controlled automatically by the thermostat.

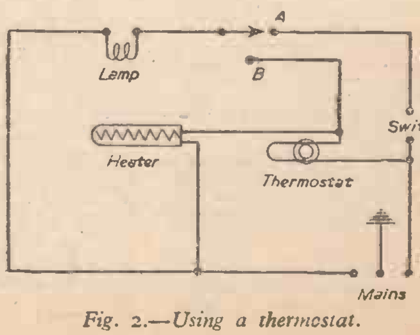
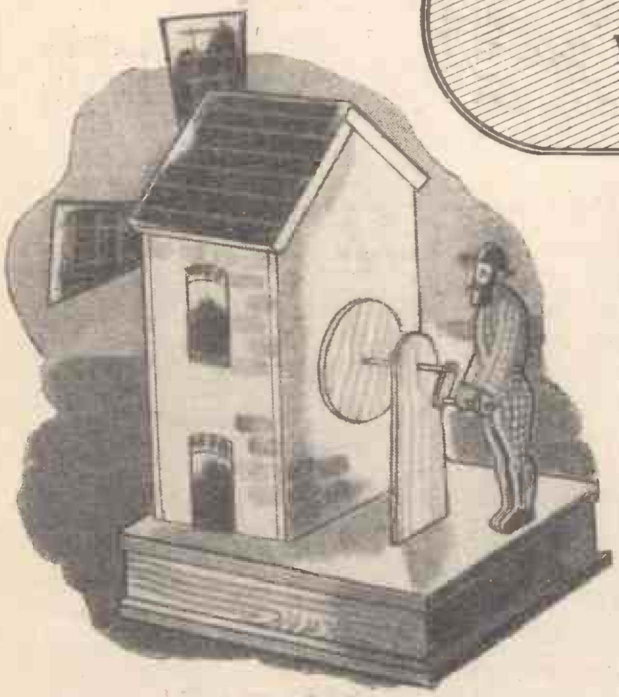


Fig. 2.—Using a thermostat.

JUNIOR SECTION

A working model WINDMILL

The Wind Turns the Sails and the Movable Figure Turns the Grindstone



THE mill house is built up upon a box-shaped base, consisting of a top and bottom and four sides. The top and bottom measure 7in. long by 5in. wide. The sides are 1in. deep, the two long ones being 6½in. long and the shorter ones 4in. long.

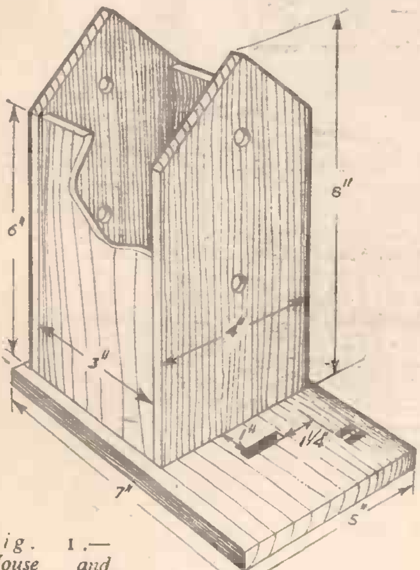


Fig. 1.—House and baseboard construction.

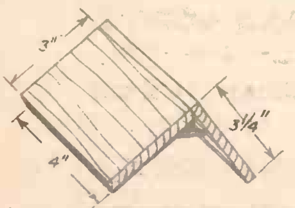


Fig. 2.—Roof construction and Fig. 3 (Right) outside spindle support.

The four sides can be glued to the bottom piece of wood, but before the top can be fixed in place it must have three mortises cut in with the fretsaw as shown in Fig. 1. The plotting out is simplified if the actual position of the mill house is first drawn in outline on the piece of wood forming the top of the base, and the mortises then set out from this.

The Baseboard Holes

The single mortise is placed centrally with the house and 1in. distant from it, the two other mortises 1¼in. distant from the end of this one and ½in. in width

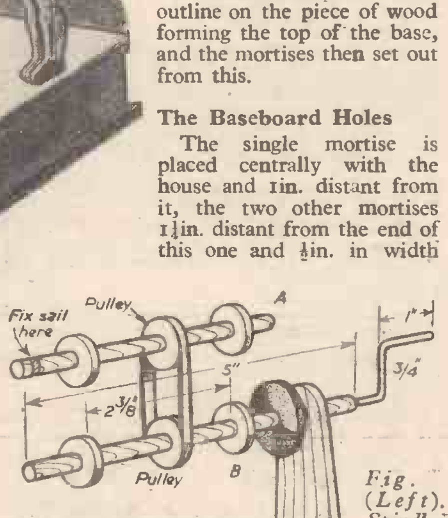


Fig. 4 (Left).—Spindle and pulley details.

away from it, as shown in Fig. 1. The large mortise is 1in. long and the smaller ones ½in. long. When the cutting has been completed and the top

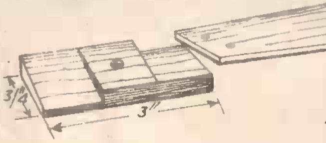


Fig. 5 (Above).—How the centre block is shaped and the sail fitted.

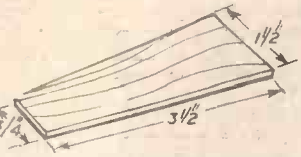


Fig. 6 (Left).—The shape and size of one sail.

glued on, the house can be constructed. For the back and front of this two pieces are required, 8in. long by 4in. wide, cut to the shape shown in Fig. 1, the roof slope being marked out to slope at 45 deg. The holes for the spindle connected to the sails are made 6in. from the bottom and that for the rod connected to the figure is 3½in. up.

The House Portion

To get both pieces exactly alike, one piece should be cut out and the holes bored and then used as a template. The two sides of the house are quite plain rectangles, 6in. long by 3in. wide, glued in between the back and the front. The roof consists of two pieces

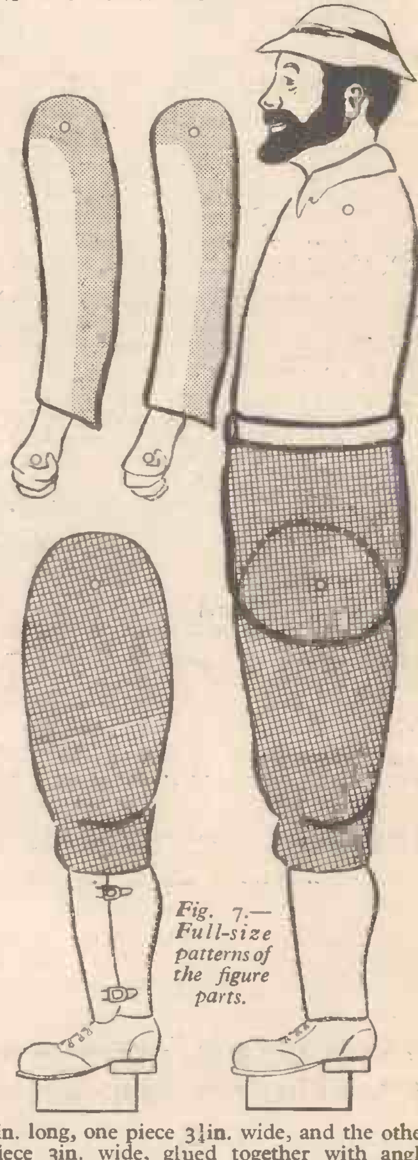


Fig. 7.—Full-size patterns of the figure parts.

4in. long, one piece 3¼in. wide, and the other piece 3in. wide, glued together with angle blocks inside, as in Fig. 2. Do not fix the roof to the house, as access to the interior will be necessary from time to time to adjust the bands which pass over the grooved wheels in the house. The angle blocks referred to above consist of waste pieces from the front and back of house, and will be glued ½in. from the edges of the roof pieces so as to form a fixing for the roof.

The upright to support the spindle at the back of the house is made next and Fig. 3 shows the shape and dimensions. It is then glued in the mortise in the base. The upper spindle is shown at A, Fig. 4, and consists of a piece of dowel rod, 5in. long, two circular washers and one pulley wheel, the diameters of each being ¾in. Cut holes in the centres

(Continued on page 309)

¼in. diameter for the rod, and form the pulley wheel by filing a groove all round with the edge of a half-round file, holding the wheel steady in the vice.

Fitting the Driving Spindle

Pass the spindle through the holes in the back and front of the house, threading on the two washers and the pulley, as shown. Allow the end of the rod to project 1¼in. beyond the face of the house ready for fixing on the sails. Space out the washers so that they fit loosely just inside the walls of the house and then run in some glue to fix them to the spindle. The pulley should be glued centrally between the washers. For the lower spindle a piece of rod 5in. long will be required, with two washers and a pulley similarly made to the above and glued on as at B, Fig. 4. Both spindles should work freely in the holes made for them. A handle of stout wire is bent up to the measurements shown and fixed into the end of the spindle. The grindstone is merely another wooden disc.

The method of making the sails is given in Figs. 5 and 6. The centre part or hub of the sails consists of two pieces of wood, 3in. long, ¾in. wide and ¼in. thick, shaped as shown in the diagram, Fig. 5. The length of each piece is divided into three, the centre division having a hole for the spindle bored through, and the two side divisions cut down at an angle, as shown in Fig. 5; the sloping surfaces can be made by paring away with a knife or a chisel. The sails are prepared from wood ⅛in. thick and shaped as Fig. 6. Each pair of sails may be made up independently and afterwards glued to the projecting spindle of the mill.

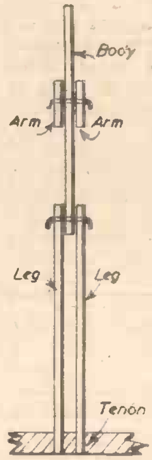


Fig. 8.—How the figure is jointed.

The figure is composed of five separate pieces, each piece being shown full size in Fig. 7, so they can be stuck down to ⅛in. thick plywood and cut out with a fretsaw. The paper pattern can be left on the wood and afterwards coloured.

The method of linking up the limbs will be easily understood from Fig. 8, and by the holes in each of the five parts. The legs, of course, are fixed to the base by means of the tenons, which are glued firmly into the slots or mortises.

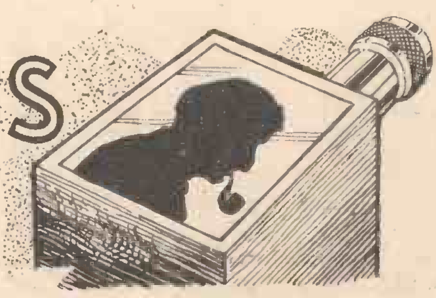
The body and the arms are attached to the legs by wire cut into short lengths, turned up one end for about 1/16in. and then passed through the holes loosely and finally turned down on the other side of the completed figure. The sectional diagram (Fig. 8) shows exactly how the limbs will appear when wired up, and how space between each must be allowed for free working of the model.

The holes in the hands of the figure are threaded on to the wire handle of the spindle, clearance being allowed for free movement of all the parts. The model may be finally painted and doors and windows added to individual taste.

The sails and the centre hubs may be stained or painted brown, and the base of the mill finished green. The thin cord band connecting the two pulleys inside is tied just tightly enough to grip the wheels; alternatively, a rubber band might be used. After adjusting the band and seeing that all is correct inside the mill, the roof is put on and the model then stood in the wind.

SHADOWETTES

Making Accurate Profiles of Your Friends



THE silhouette pictures of our great-grandparents are now highly prized, even more than photographs. The art of making them is a very old and difficult one, the side-view portrait being snipped out from black paper with a pair of scissors. Unless you are particularly gifted with your fingers, you are not likely to be able to produce good results by this method, but the "shadowette" system will enable you to make perfect silhouettes. An example is shown in Fig. 2. The principle is a very simple one, and most hobbyists will find all the requirements lying about their workshop.

How They are Made

The subject sits in a chair so that his shadow may be thrown upon a ground-glass or paper screen. He sits as close to the screen as possible, in order to obtain a sharp edge to the shadow. He will not have to sit still very long, because a "shadowette" outline can be made in 10 seconds, and a very small movement on his part will not matter. It will be found that a sharp shadow will be thrown by a strong light when the light is at a great distance; but as this is not usually practicable, a "magic lantern" or spotlight may be used.

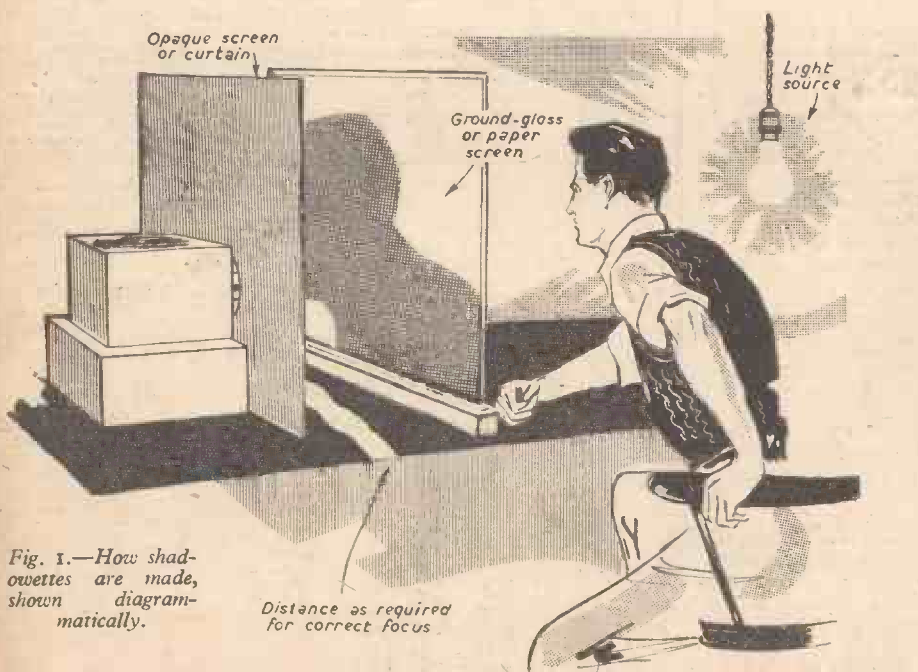


Fig. 1.—How shadowettes are made, shown diagrammatically.

A good source of illumination is a 100-watt electric lamp, with a small filament, at a distance of 10ft. from the "sitter." A condenser lens will concentrate the light. Or on the other hand an electric cycle or motor-car lamp with a parabolic reflector will project a suitable beam. The set-up is shown in Fig. 1.

The Recording Apparatus

A camera lens of from 4in. to 7in. focal length will be required, a plane mirror about 4in. square, a piece of glass about 6in. square, and, after several experiments have been made with these objects, a box of the right size. Exact dimensions for this box cannot be given because a great deal depends upon the

Fig. 2.—A finished shadowette.

focal length of the lens. This may easily be found by focusing some bright object such as a window in the room, upon a sheet of paper. The distance from the centre of the lens to the paper is the approximate focal length.

The lens is mounted on the front of the box, as shown in Fig. 3. Most lenses have a mount which may be screwed in position over an aperture in the box; but failing this the lens may be clipped in position by a couple of brass or steel strips. The mirror is arranged in the box at an angle of 45 deg. to the lens and the dimensions of the box *must* be such that the distance from the centre of the mirror to the mid-point of the lens is approximately equal to the focal length of the lens. The glass plate is let into the top of the box or, if preferred, the whole top of the box may be of glass. It is essential that the glass be larger than the tracing paper, so that a good working surface is obtained when making the drawing.

The "camera," when fitted up, is moved about behind the screen, with a sheet of tracing paper held on the glass plate, until the shadow image on the screen is in focus; this is the correct position for working. The room should, of course, be partially or, better, entirely darkened. It is an advantage also to arrange a curtain around the screen so that no direct rays fall on the operator, and the "camera" is hidden.

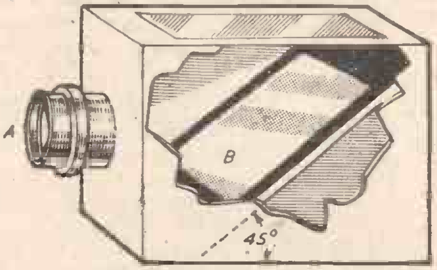


Fig. 3.—The "camera."

The Finished Silhouette

When the subject is sitting in the required position before the screen the operator quickly but carefully traces the outline of his features on the tracing paper with a sharp pencil. With practice a few seconds will suffice. The pencil outline is then inked over and filled in with a brush and indian ink. The silhouette picture may be mounted on card or in a white paper folder.

THE JUNIOR CHEMIST

No. 4.—Experiments With Phosphorus

TO the experimenter there is something curiously attractive about phosphorus. A substance that takes fire spontaneously and gives an unearthly glow in the dark merits interest, and many a pleasant hour can be passed in the "lab." experimenting with it.

Phosphorus is manufactured commercially by heating, strongly, calcium phosphate, sand and coke in an electric furnace. The gaseous products are led off and the phosphorus is caught under water.

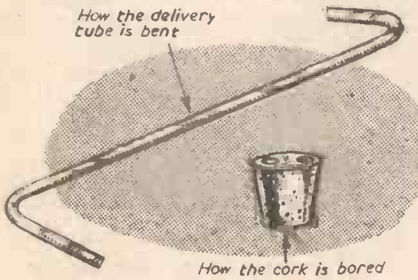


Fig. 1.—The cork and glass tube.

Before continuing it is as well at this point, perhaps, to comment on the dangerous properties of phosphorus and to emphasise the necessity for careful handling. These dangerous properties are: its spontaneous inflammability in air (it is on this account stored under water), and its exceedingly poisonous nature. Prolonged exposure to the fumes of phosphorus was formerly a cause of a disease of the jaw called necrosis amongst matchmakers. If the phosphorus is stored under water away from foodstuffs, however, there will be little cause for uneasiness.

Obtain from the chemist a few small pieces of phosphorus. These will be supplied immersed in water in a bottle. Always take care that the bottle is well filled with water and that each piece of phosphorus is completely immersed in it.

The Skull and Cross Bones

Draw faintly on a piece of rough drawing paper a skull and cross bones. With a pair of tweezers remove a small piece of phosphorus from the bottle and, using it as a pencil, go over the outline on the paper. When this is accomplished quickly drop the phosphorus back into the bottle and hang the paper from the ceiling. Now turn out the lights and behold the ghastly spectacle!

Ghostly Hands

Dissolve a piece of phosphorus about the size of a pea in a little warm olive oil. Smear your hands with the oil and go outside on a dark night and scare your friends! A word of warning—wash the stuff completely off your hands with warm water and soap afterwards. The luminosity is due to slow combustion of the phosphorus.

A Smoke Screen

This experiment is to be performed out of doors. Place a piece of phosphorus in an evaporating basin and set fire to it with a match. As the substance burns dense white fumes of phosphorus pentoxide are given off. If there is little wind the fumes will hang around like a white fog. The particles that make up this fog are worth a little examination. Perform the experiment again with a piece of glass completely covering the evaporating basin. The fumes condense on the sides of the basin and also on the glass plate. When the reaction is complete and the basin is cool scrape the white powder adhering to the latter and to the glass on to a filter paper. Run $\frac{1}{2}$in. of water into a test tube and pour the powder into it. Notice how vigorously the powder and water unite and the heat generated in the reaction. The test tube now contains a solution of metaphosphoric acid. To prove the presence of acid add a few drops of blue litmus solution. A red colouration immediately appears. This property of phosphorus pentoxide renders it of great value to the chemist as a dehydrating agent, that is, a substance which will absorb water.

The Rings of Fire

This experiment entails a fair amount of preparation in the way of fitting up apparatus but is well worth while.

The apparatus required consists of a glass flask, a wire gauze, a tripod, a length of glass tubing, a sound cork which accurately fits the neck of the flask and a bowl of water. With the cork borer, bore two holes in the cork of such size that the glass tube is a good tight fit (see Fig. 1). Fit a 3in. length of tube through one hole. The other hole accommodates a piece of tubing bent as in Fig. 1.

Now arrange the apparatus as shown in Fig. 2. The flask and gauze stand on the tripod over the bunsen burner. The long bent tube from the flask dips underneath the water in the bowl. Place in the flask (using the tweezers) a piece of phosphorus the size of a pea and add about 4oz. of solution of caustic potash. Connect a rubber tube to the short length of glass tube projecting from the cork and attach the other end to the gas jet. Turn on the gas for a minute, letting it run through the apparatus and bubble up in the bowl. Turn off the gas and put a paper clip over the rubber tube. This seals the entrance to the flask and the gas jet may now be disconnected. For reasons to be explained later we have now filled the flask and tube with coal gas.

Apply gentle heat to the flask with the bunsen flame turned low. At first, bubbles of coal gas will be discharged from the end of the delivery tube, but later, when the contents of the flask are warm, bubbles of phosphine gas are liberated. Immediately these bubbles reach the surface of the water in the bowl they take fire, leaving well-formed rings of white smoke. Since the gas is spontaneously inflammable, it is now evident why we filled the apparatus with coal gas. If this precaution had not been taken, premature ignition would have occurred in the flask, resulting possibly in an explosion. Perform the experiment near an open window and adjust the source of heat so that the bubbles are delivered at the rate of about three a minute.

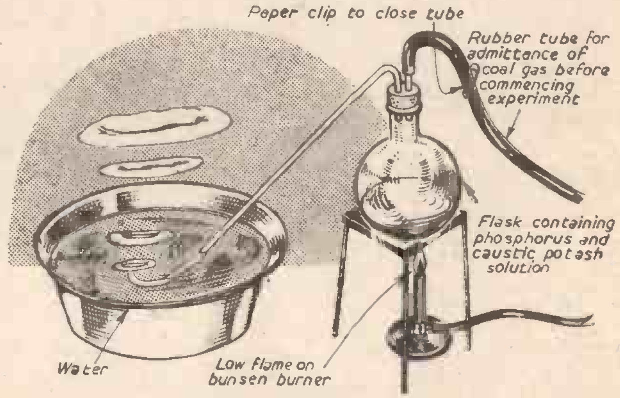


Fig. 2.—How the apparatus is set up.

The amateur who desires to take a short cut may perform the experiment using an acetylene generator containing instead of carbide, calcium phosphide. The same precautions must be taken, i.e., the generator must be first filled with illuminating gas.

Pour away carefully the residues from the phosphorus experiments down an outdoor drain.

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STEAM CARS, Boats and small stationary Power Units are described in "Light Steam Power." Your copy and comprehensive illustrated lists of drawings and castings for 3/6. "Light Steam Power," Kirk Michael, Isle of Man, U.K.

Letters to the Editor

The Editor Does not Necessarily Agree with the Views of his Correspondents

Space Visitors

SIR,—In your issue of January, 1957, appears a detailed article on space visitors by *Theorist*. He makes, in my view, some misleading statements.

The face of Venus away from the Sun when at perihelion is *not* at a temperature lower than *anywhere* else in the Solar system (column 1, page 203).

The discussion of Jupiter's radio emission is quite misleading in the context of space visitors. The phenomena recorded so far are thought to come from violent atmospherics. It is not valid to the discussion.

Why should the finding of ice caps on Venus disprove the existence of hot arid wastes and dust storms ? (column 3, page 204). A planet can have ice caps, desert and dust without much trouble, witness the little-known planet Earth.

Mars does *not* possess oxygen (top line, column 1, page 207). *Theorist* says it does ! If he will read that most erudite work " The Atmospheres of the Earth and Planets," a Symposium sponsored by Yerkes Observatory and edited by the eminent Gerard P. Kuiper, he will read that there is no ozone layer owing to the absence of oxygen in concentration. Vaucouleurs, the expert on Mars, says " a long search at Mount Wilson observatory has failed to detect any trace of oxygen in the Martian atmosphere."

Theorist says the Martian polar caps are *not* areas of hoar frost. He thinks they are composed of much more solid material (column 1, page 207). Kuiper reports that they are H_2O frost. Vaucouleur reports that Kuiper worked with a spectroscope on the 82in. McDonald reflector and obtained infrared spectra showing the caps to be frozen water and that Dollfus has actually reproduced the same amount of polarized light as comes from the Martian Caps by evaporating a thin layer of white frost at low pressure and temperature under an electric arc.

Theorist's assumption that vigorous plant life occurs on Mars and the " logical " deduction that animal life is also present is quite untenable on the evidence. The plant life (if it is in fact plant life) is of a very lowly order ; lichen or algæ. The climatic conditions are, however, so severe it is reasonable to question even their survival. The night temperature is 70 deg. below zero F. The air is terribly dry.

So much is said of the canals that it must be pointed out that most reliable observers do not believe they exist. *Theorist's* " having won their water supply from the frigid polar regions, etc." is a most misleading conception. No astronomer has ever shown them to contain water and the word canal is a misnomer based on the Italian word " canali " used by Schiaparelli, not for canals as we know them, but to mean simply fine markings.

Finally, it must be pointed out with as much cogency as possible that evolution is not proven even here on Earth. Only in England and America are we scientifically frustrated by Darwin's dead hand. Let *Theorist* read the erudite work " Is Evolution Proved ? " by Dewar and Shelton, Hollis & Carter, 1947. Let him read Vol. 4 Encyclopédie Francaise on " Life," written by Prof. Lemoine of the French National Museum of Natural History, where he says " We have then to admit, with the majority of zoologists, that evolutionism, whatever be its form, no longer satisfies the intellect." There is no suggestion—to my mind—that " the life impulse is no frail transient manifestation of nature " as *Theorist* puts it. On the contrary, it would seem to be a very frail and delicate thing. To quote Eddington : " In the main the universe is antiseptic, too hot or too cold." His suggestion that the existence of water *ipso facto* means conscious life forms and tissue colloids is in complete opposition to our knowledge that highly diversified fauna on Earth appeared *per saltum* in the Cambrian strata.—FRANK W. COUSINS, F.R.A.S. (Greenford).

SIR,—The past two articles in the December and January issues on F/S and the possibility of life on other worlds were most interesting.

Further to this subject, on December 15th, 1956, it was reported on the seven o'clock News on the Light Programme of the B.B.C. that Dr. Slipher, the astronomer who is in charge of the observations of Mars, had stated that the canals of Mars were real and constructed by intelligent beings, who *may* now be extinct, and that one such canal was 1,500 miles long and uniform. This statement will be bound to cause people to think deeply, and they may well ask, are our calculations quite correct and is our assumption of the non-existence of other life (human) in our Solar system too dogmatic ?

There are, on our own Earth, people living under atmospheric conditions quite different to our own. Not long ago during a sports meeting in Mexico, most of the foreign competitors collapsed during their races, and had to be revived with oxygen. The Mexicans had no trouble at all, but it was some time before the foreigners could get used to the different atmosphere in Mexico.

In a recent TV broadcast it was stated that Indians in South America were moved from the hills to the lower plains, a drop of 12,000 ft. They were medically examined before and after their change of abode because of the effect of their change of atmosphere, and in case the difference in breathing at 12,000 ft. up in the hills, and breathing at the lower level, would affect their health.

Some of our boxers while fighting in South Africa have experienced the same difficulty. In many parts of the world people live at great heights without difficulty, but we would need some considerable time to adjust our lungs to such conditions. When Hilary and Tensing climbed Mount Everest they were able to breath at the top without oxygen, although for only a short while, but they were able to breathe. The same principle applies to greatly varying degrees of heat on this Earth.—R. W. J. ANSTEE (Bristol).

SIR,—On reading the article " Space Visitors," in your December issue, I noted with great interest the strong resemblance between the description of a " Saucer " as described by F. O. Bullivant and the description I gave you a year or so back of the sighting which was witnessed by my wife and self in the spring of 1942.

You asked me if I could describe the shape of the object, and my reply was that it was so bright and dazzling that to assess a shape was impossible. The words I used were " it shone as brightly as the reflection of sunshine off the chromium fittings of a motor-car," which agrees with Bullivant's description.

Another feature of its movements which I then gave and which I have since found almost invariably appears through all the accounts of " Saucer " sightings, is the almost instantaneous right-angle turn.

I observed these features at a time when talk of " Saucers " had not even been hinted at. I do not pride myself on being an outstanding observer, but with the years of experience I have had in astronomical pursuits, I feel I can claim to know when an object falls into any of the classes which would place it as one hitherto known to the observing astronomical world. The object which I described to you certainly was outside anything I had ever seen before, nor can I suggest an explanation of its composition or origin.—C. J. WILLIAMSON (Shetland).

Will Steam Power Return ?

SIR,—" Will Steam Power Return ? " I hope so and cannot agree more with your comment in the editorial, January issue, " This is a topic which should be ventilated." If half the money which has been spent on the development of the petrol engine had been spent on light steam engine development, road travel in this country to-day would not be so hampered by the fuel shortage.

I feel that the building of a steam car is well within the scope of the average engineer, with a 6in. screw-cutting lathe and a welding plant, and I intend to attempt one as soon as time permits.

The type of vehicle I have in mind is just a simple straightforward job with no " automatics " at the start (these could be added later). It will be a twin-cylinder engine, $2\frac{3}{4}$in. bore by $4\frac{1}{2}$in. stroke, geared at about $1\frac{1}{2}$ to 1 down to the back axle, and with Stephenson link motion and piston valves.

The boiler could be either of the flash type or water tube, such as the Bolsover Express, Corner Tube or Sentinel type, adapted for solid fuel burning, and an oil burner for starting up from cold. Working pressure would be about 300lb. per sq. in. with moderate superheat.

The above figures are not calculated, but offered as a basis for a practical discussion. —J. C. HAMLIN (Amersham).

SIR,—In "Fair Comment," January issue, you invite comments on steam cars. I am over 70 years of age and have a lifetime of experience of steam engines, mostly traction engines and steam wagons. I have also owned and driven steam cars, 16-20 and 40-horse "White's" and two 8-horse Gardner Serpollets. I have also dismantled Clarkson and Locomobile steam cars, and have instruction books on the White and Gardner and catalogues of Pearson & Cox.

They were lovely cars to drive and the acceleration was remarkable, no gear change was necessary and the car ghostly silent.

There were two serious snags; they required skilled men to maintain, but, much more serious, they were all very, very heavy on fuel (paraffin) and even the latest "Doble" with all the latest modern ideas would only give about 14 miles to the gallon.

Some motorists have the idea that steam has been neglected. This is not true: skilled steam engineers have always been trying to improve the steam engine, and the principle is the same, whether it is a loco, traction, a car or stationary, in all branches they are being superseded by the compression ignition oil engine.

A mechanic would not find it too difficult to convert a light motor car to steam; the engine would be simple enough, but it is the boiler (generator) and burner that are the heart of the problem. It would be a very interesting experiment, but otherwise I doubt if it would be worth while. A steam car could be made that would be reliable, but not economical.—CHARLES E. HOOKER (Kent).

SIR,—Over 50 years ago I had some experience with a steam car for 12 to 18 months. When hill climbing it was superb—providing all else was in order—but, there was too much "all else." One had to carry water for the boiler and keep an eye on it. One had to keep another eye on the water gauge; a third consideration was the maintenance of pressure in the blow lamp which used the fuel and raised steam; also the burner of this blow lamp could and often did choke with *very* minute particles of dirt in the fuel supply; nor did very careful filtering always remove this risk of the burner clogging and going off suddenly, when down went steam pressure from 650 to nothing.

I forget now at what point the safety valve lifted; but I do remember very vividly, when standing, especially an involuntary stand when the *cause* had to be located, pressure would, unless the burner was at once checked, rise to 850 and 900 p.s.i. almost immediately.

There was too much to look after—even compared with the 1906 I.C. engine cars, water tank, pressure to burner, burner clogging up with minute specks, water gauge to watch and water supply to boiler was somewhat of an art. Approaching a hill, this would be checked, and pressure got up to 950 p.s.i. Up we went, passing everyone, and putting water supply to boiler back to normal as we mounted the gradient.

The boiler was not a flash boiler, but a shell vertical, about 3ft. high and 3ft. dia. Top and bottom plates were pierced for fire tubes, expanded into end plates, tubes were ⅞in. internal diameter, and about 18 in number across the greatest diameter.

On varying load or after standing, the tubes would start to seep at the bottom plate, and on one trip to Leeds this was so bad that we pulled up and cut plugs of wood from roadside trees and tapped them into a dozen weeping tubes. We got there and back, but at a lowered rate of steaming.

The gauge glass was an early "Klinger" type, placed so that it could be seen from the driving seat.

I think the idea of the shell boiler, just described, was to provide a reserve of water and avoid the trouble of the flash boiler delivering very highly superheated steam unannounced and at varying times.

The control of burners was partly automatic, depending on speed, but had to be supplemented manually when hill climbing.

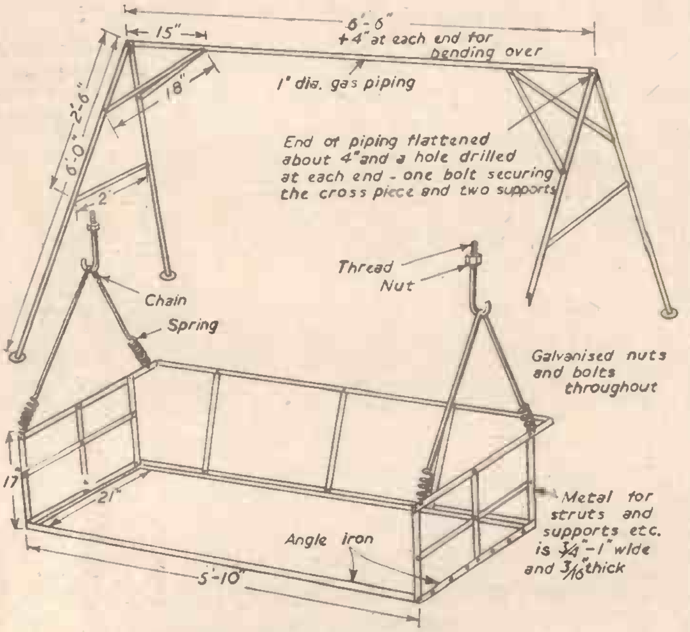
I forget the make; it was *not* a White. I fancy it may have been an Oldsmobile. A steam engine, *if* you could keep it provided with steam, with as little attention as the I.C. car is provided with petrol, would be a better prime mover than any I.C. engine; but this was the unsolved problem which beat the steamer.—W. T. WARDALE, A.M.I.E.E. (Sheffield 7).

A Swinging Garden Seat

SIR,—In reply to Mr. A. J. Stael's query in "Information Sought," January issue, some three years ago I made a garden swing seat for three people. The tripods and top cross-piece were made from 1in. dia. gas piping which I obtained from the local gas works second-hand and very cheaply. Having no forge of my own, a blacksmith flattened the ends of each of the tripod pieces for about 4in. and drilled a hole in each flattened piece. The top cross-piece was likewise flattened at each end, bent over at right angles, and a hole drilled at each end. Thus one bolt secures the cross-piece and two supports. It is absolutely essential to have an electric drill for all the ¼in. holes necessary. You will very soon become tired using a brace and bit.

The base of the seat portion is made from old bedstead angle iron, bolted together. These lengths and all the other pieces of metal were obtained from a scrap metal merchant for next to nothing. The only things I had to buy new were four springs and six hooks. I used galvanised nuts and bolts.

Finally, for the seat itself, I cut down and manipulated to size the springs and wire of an old iron bedstead (obtained from scrap merchant). This was the worst part, and a great deal of patient work was necessary. The rough sketch shows some of the main details and dimensions.—G. J. P. YOULL (Weston-Super-Mare).



Mr. Youll's garden swing.

Producing Dry Steam

SIR,—I should like to draw attention to B. H. King's design for dry steam in the January issue. Steam traps do not help in any way to produce dry steam, as the purpose of a trap is to remove condensate, which would normally impede the flow of steam. I would also like to offer the following details to answer J. Murphy's inquiry.

Put as simply as possible, dry steam can only be produced by super-heating steam. J. K. Brown's suggestions in the December issue are quite good, as he states, a safety valve is essential; these can be purchased for a few shillings, especially if only low pressure is required which, I think, is what will be required. They simply release steam when the maximum pressure for the safety of the boiler or pressure required is reached.

Also, I should like to point out that this system must be watched to ensure that there is sufficient water in the boiler, as to replenish this automatically would need a pump capable of overcoming the pressure in the boiler. The bigger the heating surface the faster the boiler will produce steam, and the more coils applied to the super-heater the drier the steam will become.—H. DAVENPORT (Manchester).

Lamp Device

SIR,—Regarding one of your "Information Sought" queries in the January issue, I may be able to help.

I have frequently made this lamp device in the form of sealed glass tubes of about ½in. bore. By inserting one through the cork of a vacuum flask to dip in hot water, a display of several hours duration is obtained. Alternatively, several tubes may be splayed out from the lid of a tin containing an electric lamp, to give a novel fountain effect.

The two liquids are simply water at the top and carbon tetrochloride at the bottom. The latter is obtainable as "Thawpit" or "Pyrene" fluid.

The tube must be evacuated until the carbon tetrochloride boils and expels the air. When sealed off, boiling commences in the lower fluid, if there is any temperature gradient from it to the *free space* left at the top of the tube. It is actually gas bubbles that raise blobs of the fluid to the water surface, where they burst and drop back the fluid.

If no pump is available, form a "neck" in the tube by stretching and *compressing* while twirling in a flame. Then introduce the liquids. Next, boil carefully, to expel the air. Seal with rubber cork and remove from flame at same time. Cool and seal neck by fine-pointed flame, which should cause it to suck in. (Carbon tetrochloride is non-flam. but attacks rubber in time.)—D. W. GODWIN (Stockport).

TRADE NOTES

Comb Jointing Attachment

MADE by S. N. Bridges & Co. Ltd., Bridges Place, Parsons Green Lane, London, S.W.6, and primarily intended for use with the Bridges Home Workshop Equipment, this latest attachment may be used, by means of an adapter, with any other make of sawbench up to 7in. diameter. It operates with a single circular saw blade to produce angle or spliced joints in timber, plywood, hardboard or plastics. It will comb any width of material. The joints are self positioning and no marking out is required. The attachment is accurate enough to produce joints which will fit without glue.

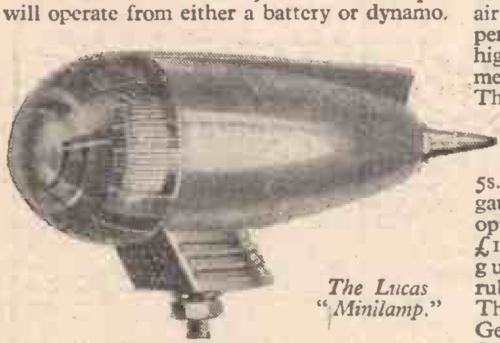
The retail price of the comb jointing attachment is £3 9s. 6d., including an adapter for a specific saw bench. When ordering, the name of the saw bench should be mentioned.

Bridges comb jointing attachment.

New Cycle Town Lamp

THE Lucas "Minilamp" is a new auxiliary cycle lamp that is now available for the British home market. Moulded in hard plastic, with a separate diakon lens, this small, lightweight lamp uses only a low current consumption providing sufficient light for town riding.

Designed for mounting on the mudguard with a one-screw fixture, the "Minilamp" will operate from either a battery or dynamo.



The Lucas "Minilamp."

Priced at 5s. (less bulb), it is manufactured in a variety of colours: blue, yellow, grey, green, red, black or white.

Cylindrical Grinding Machine

FROM the Myford Engineering Co Ltd., Neville Works, Beeston, Nottingham, we have received details of the Myford M.G.12 Precision Cylindrical Grinding Machine, which is intended for production work up to 3in. diameter or 12in. long and is currently being used in the manufacture of tools, gauges, fuel injection components, instrument parts, etc. The precision obtainable is such that, in the hands of a skilled operator, tolerances can be held to .00025in. Details of the features of this machine and attachments and accessories are available from the makers at the above address.

Aquarium Heater Replacement Service

THE firm of Warburton & Co., 78, Bredbury Green, Romily, Stockport, Cheshire, specialised in the repair of aquarium equipment and from them we have received details of a unique replacement service. By discontinuing individual repairs to heaters, pooling the unserviceable items received, adopting a standard size and form of repaired product, and using only such old parts as lend themselves to the standard form, they are able to produce reconditioned heaters, as shown in the photograph, at 5s. each, carriage paid. These are sold only in part exchange for broken heaters, but the size, make or condition of the latter are immaterial.

The Mini Compressor

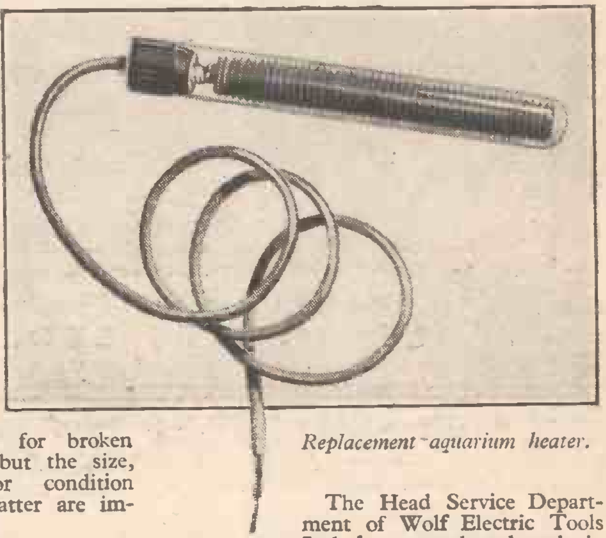
THIS is a universal electric motor and single cylinder compressor, assembled in one compact unit, delivering ½ cu. ft/min. and operating on 220/250 volts. The unit is intended for use by cycle and car owners and, from flat, will inflate a cycle tyre in 25 seconds and a car tyre in 4 minutes. It delivers air at more than 90lb. per sq. in., is 6½in. high and 6½in. diameter and weighs 7lb. The compressor unit, complete with flex and tyre connector costs £13 5s. A dial pressure gauge, available as an optional extra costs £1 19s. and a spray gun with a 12ft. rubber air line £2 17s. The makers are Gennar Ltd., 99, Old Street, London, E.C.1.

Shoe Repair Set

A BOOT and shoe repair set has now been added to the range of Wolf portable electric power equipment. The kit, which should be used in conjunction with the Cub drill and bench clamp, consists of a rotary rasp, a rotary edging iron, an arbor, a bristle brush and wire scratch brush and sanding drum assembly together with six abrasive bands. In addition

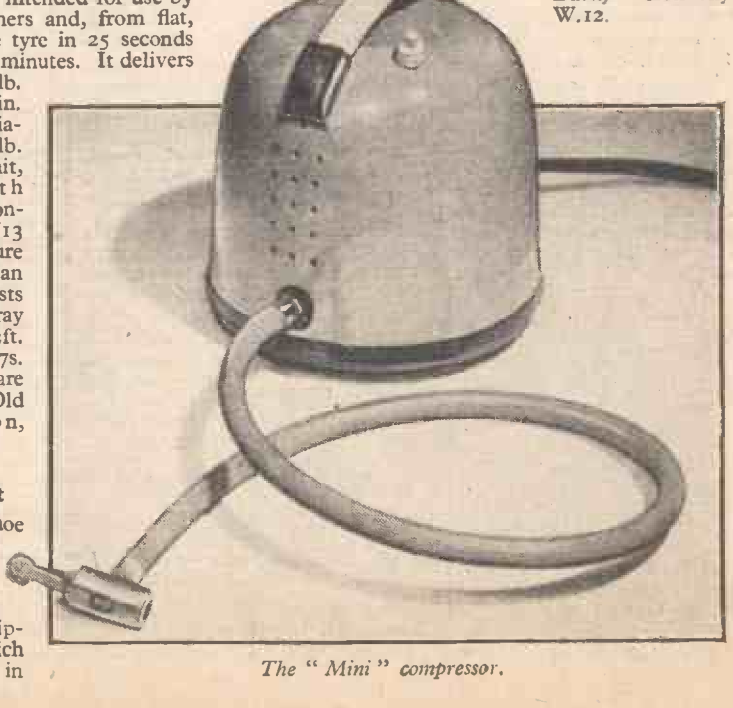
Wolf shoe repair kit.

there are two sticks of heel ball wax (black and brown) and two polythene bottles of liquid edge finish in the same colours. Price £2 17s. 6d.



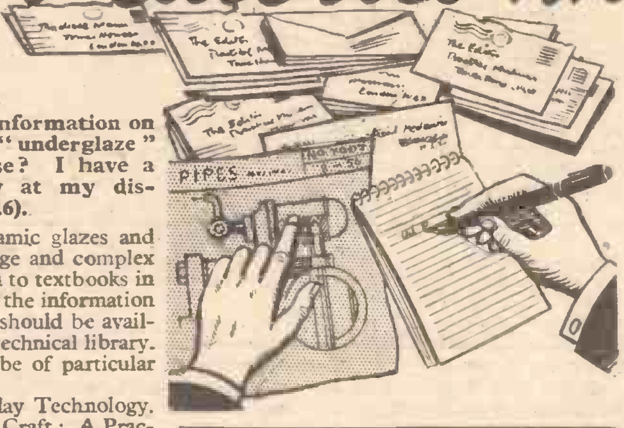
Replacement aquarium heater.

The Head Service Department of Wolf Electric Tools Ltd. has moved and tools in need of service should be addressed to Wolf Electric Tools Ltd., Head Service Department, Newlon Works, off Stanlake Villas, Stanlake Road, Shepherds Bush, London, W.12.



The "Mini" compressor.

Your Queries Answered



Ceramic Colours

WHERE can I obtain information on "body stain" and "underglaze" colours for pottery, please? I have a well equipped laboratory at my disposal.—G. A. Strand (S.W.6).

THE whole subject of ceramic glazes and colorations is a very large and complex one and we can only refer you to textbooks in which, we think, you will find the information which you seek. Such books should be available in any good reference or technical library. The following volumes may be of particular interest to you:

H. Wilson: Ceramics: Clay Technology.

C. F. Binns: The Potter's Craft: A Practical Guide for the Studio and Workshop.

A. B. Searle: The Clay-worker's Handbook.

A. B. Searle: Ceramic Industries Pocket-book.

H. and D. Wren: Handcraft Pottery for Workshop and School.

In addition you will probably be able to obtain one or two practical handbooks on pottery and ceramic colouring from Dryad Ltd., St. Nicholas Street, Leicester.

Re-colouring Snooker Balls

PLEASE inform me how I can re-colour a set of pure ivory snooker balls which have lost their colour.—B. A. Wheelwright (Bournemouth).

REMOVE as much as possible of the existing colour by means of warm methylated spirit then polish the balls with a paste of whiting and water, and immerse them for about five minutes in a mixture of one part hydrochloric acid and 20 parts of water. This dilute acid treatment extracts the thin film of gelatine from the surface of the bone or ivory. The balls are then immersed in a cold dye solution which is heated by means of a water-bath, slowly, to near boiling-point. At this temperature the balls should remain for about half an hour after which they may be removed and rinsed. After drying they should be rubbed with a little wax polish. Any water-soluble dye may be used, the correct strength being about six parts (by weight) of dye dissolved in 90 parts of water, together with two parts of Epsom-salt.

Recovering White Lead

I HAVE some white lead (in a small keg) which is some 10 years old and has gone hard because of neglect. Is there a method whereby it could be made usable as paint again, or is it of no use at all?—R. Hanny (Harrow).

WHITE lead will keep for any length of time in the dry, unmixed state, but it is often made up into an oil paste with linseed or other drying oil. What happens here is that the oil oxidises and becomes hard, so that the whole mass of material welds together.

In your case, if the top layer of material has heavily darkened, chip it away until you get to the whiter material underneath. Then dig out the rest of the material and macerate it into mortar consistency with paraffin. Spread it out to allow the paraffin to evaporate, then grind it as fine as you can. The resulting white or creamy-white material will be quite suitable for paint-making provided that you grind it finely enough.

Even the material which you reject—the discoloured stuff—can be put to a use. Mix it with linseed oil into a heavy paste and then use it for making pipe joints, etc. There is no need for any of the stuff to be wasted.

You will remember, we hope, that white lead is poisonous. It is a *cumulative* poison. This means that if small amounts get into your system they tend to be stored up therein until the total amount becomes a really poisonous dose. The precautions are, therefore, not to breathe any of the dust which may arise from the white lead powder, not to handle the material with cuts or abrasions on your hands, and not to get it down your finger-nails so that there might arise a chance of your taking some into your stomach when eating food. Given these simple and reasonable precautions, you are quite safe in handling white lead which, to-day, is a material of considerable value.

Paint Making

COULD you let me have a formula for a good paint for house decoration, both inside and outside use?—J. L. Wood (Heston).

THE following is a formula for an average gloss paint suitable for indoor use:

Fine, dry pigment ...	60	per cent. (by weight)
Raw linseed oil ...	20	do.
Boiled linseed oil (or Stand. oil) ...	10	do.
Paint driers	2	do.
Thinners (white spirit)	8	do.

This paint should dry surface-hard in 24 hours. If it does not do so, increase the amount of driers. If it dries substantially within that time, decrease the amount of driers, since too rapid drying tends ultimately to the destruction of an oil paint. A definite figure cannot be given for the percentage of driers since, in many instances, the pigment itself acts as a drier.

For an outdoor paint, much depends on the nature of the pigment used. For instance, titanium white tends to chalk out-of-doors and is, therefore, often unsuitable for such a purpose unless the special "Rutile" form of titanium white is used.

In general, however, an outdoor paint should contain a clear varnish instead of boiled linseed oil as in the above formula, and its thinners should be cut down to the minimum, the paint containing only sufficient thinner to make it flow freely from the brush. It is quite impossible to give any definite formula, because so much depends on the precise pigment used.

Plaster for Casting Dolls

I HAVE some moulds for doll manufacture. Please tell me what plaster to use.—H. Taylor (Barnsley).

FOR your purpose you can use ordinary plaster of paris mixed with about 4 per cent. of its weight of powdered gum arabic or white dextrine. This will delay the plaster from setting for about one hour after mixing with water and it will increase its hardness when set. By using double this proportion of dextrine or gum arabic, the plaster will become very firm and it may be worked two or three hours after mixing, and it may even be carved and polished when set.

It is always advisable to brush over the dry, hardened plaster casts a solution made by dissolving six parts of cooking gelatine in 92 parts of hot water. This will strengthen the casts, will make them smoother and will provide a good surface to paint on.

Remember, of course, that the interior of the metal moulds must be well greased with petroleum jelly before pouring in the plaster, otherwise the casts may stick badly.

Dental Alloy for Modelling

COULD you give me a formula of white metals which may be moulded by means of chemical composition, similar to dental fillings?

This material is required for special

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modelling, where heat cannot be applied.—J. Pietrzak (W.5).

THE dental "alloys" used for the filling of teeth (the so-called dental "white metals") are, in reality, hard amalgams. That is to say they contain mercury. The majority of them nowadays are of secret composition, and you will not find a published formula which copies them exactly. Your best plan, we think, would be to approach one of the dental manufacturing firms in an endeavour to purchase a small quantity of these metals. We suggest the Amalgamated Dental Co., Ltd., 5-12, Broad Street, Golden Square, W.1, or Dental Mfg. Co., Ltd., Newman Street, W.1. Possibly, also, Messrs. Forster and Gregory, Ltd., Lonesome Chemical Works, Streatham Common, S.W.16, might be able to help you.

If, however, you wish to make your own experiments, the following composition has been given as a dental alloy:

Silver	71-78 per cent.
Tin	21-28 per cent.
Zinc	1 per cent.

The metals are used in powder form and are ground up with a little mercury or, alternatively, with a strong solution of mercury nitrate. The resulting amalgam which is formed is said to be hard and resistant to corrosion.

Oven Stoving

I AM looking for a method of stove enamelling or vitrifying in different colours the metallic caps of soda water bottles that are made from an alloy containing much zinc and which melts at 400 deg. C. There are on the market different materials or processes called isovitrification, where the stoving is done at about 180 deg. C., or rather the drying. The result required is a very hard brilliant surface impervious to the action of carbonic acid gas. I should be grateful for any advice.—A. Stinchcomb (Spain).

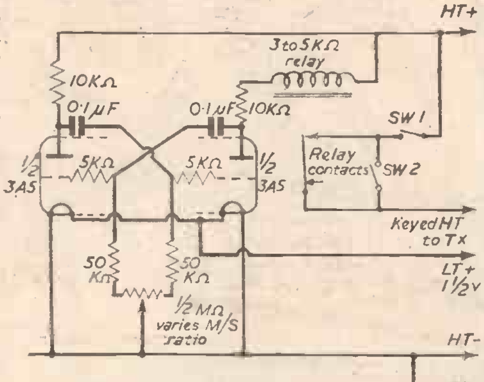
TRUE vitreous enamelling consists of coating a metal surface with a mixture of glass-forming ingredients with or without added pigment. The coated article is placed in a muffle furnace and fired for several hours at a temperature varying from 900-1,200 deg. C. At this temperature the ingredients in the coating react together to form a soft glass which flows uniformly in a thin layer over the article. The essential coating of a vitreous enamel, therefore, is always one of glass, and a high temperature is necessary for its formation. It would be quite impossible to put a vitreous enamel on a relatively low-temperature melting metal

The process which you mention is really one of oven stoving. The articles are coated with a hard paint enamel which is then "dried" for about two or three hours at a temperature not exceeding about 180 deg. C., or, more often, at a considerably lower temperature. It will be hardly possible for you to make the necessary enamel paints for yourself unless you can get the requisite materials, which we very much doubt. It would be better if you wrote to Messrs. Nobles and Boare, Ltd., 3, Cromwell Road, London, S.E.1, for particulars of their stoving paints. Another firm to write to is Messrs. Pinchin, Johnson, Ltd., General Buildings, Aldwych, London, W.C.2. A firm particularly specialising in the production of stoving enamels is Titanine, Ltd., Colindale, Hendon, London, N.W.9.

Multi-vibrator Control Box—Battery Version

PLEASE give me further details of the battery version of the multi-vibrator control box mentioned in "Radio Controlled Models," in the January, 1956, issue of "Practical Mechanics." I should like a circuit, using the 3A5 valve.—D. Clarke (Notts).

THE battery version of the multi-vibrator circuit you require has not been tried by the writer of the article to which you refer. The circuit given below is, however, conventional and no difficulty should be experienced in getting it to function satisfactorily. SW1 is normally closed (open for "space"); SW2 is normally open (close for "mark"). The 5 KΩ grid resistors are grid "stoppers"—they should not be omitted. To increase M/S *frequency*, reduce .1 μF condensers to .05 μF.



Battery multi-vibrator circuit.

Utilising the "Beck Symmetrical" Camera Lens

I HAVE a "Beck Symmetrical" camera lens, f8, which focuses at approximately 4½in. from the film. I believe it is quarter-plate size.

Is it possible to place a "spectacle" lens between lens and film to shorten the focusing distance and reduce the photograph size to 620 film? What kind of lens would I require for this? Will any distortion occur?—K. T. Baker (Bath).

YOUR Beck symmetrical lens would not cover a quarter-plate adequately (unless it is specially designed as a wide-angle lens, which we feel sure is not the case). A quarter-plate is normally only covered adequately with a lens of at least 5in. focus, and better still, by a 5¾in. or a 6in. lens. Hence, your Beck lens must have been originally intended for a smaller size of plate or film than quarter-plate.

The precise focal-length of the lens should be stamped or engraved on the lens mount itself. If, however, this is not the case, you will probably find that the exact focal length of the lens is about 4in. It is obvious, however, that the lens has been designed to cover the popular "120" size of film (i.e., 3¼in. x 2¼in.), and since the 620 film can be interchanged with this, the lens as it stands at present will cover the required size of film.

The lens does not require its focus shortening. If you do shorten its focus, the lens will not adequately cover the film-size.

Incidentally, a single lens for shortening the focus is *not* placed between the lens and the film, but in front of the lens. Single lenses (they are really forms of spectacle lenses) for this purpose, the so-called "supplementary" lenses, may be obtained from any large photographic dealer, as, for example, Messrs. Wallace Heaton, Ltd., New Bond Street, London, W.1.

Water Tank Repairs

I HAVE a large galvanised water supply tank which is perched on top of a 14ft. high stone base. This tank has developed pin-hole leaks in the bottom.

I do not wish to dismantle the tank if I can possibly avoid it, is there any sealing compound or cement with which I could cover the inside to a depth of about 2in. so as to make an impermeable bottom layer. This layer must not deleteriously affect the water for domestic use.

The water here has a high lime content which settles as a sludge on the bottom of the tank, and it would be difficult to dry out the bottom without possibly creating further leaks.—G. E. W. Hicks (Somerset).

DRYING out the bottom of the tank before mending the holes is an absolute essential, because if you used a plastic filling of any description it would not adhere unless the area were *completely* dry. You must, therefore, dry out the tank first, which should not present great difficulty. Merely run the water out as much as possible. Then use a baler and finally mop up the residual water on the floor of the tank. The pin-holes could then be lightly soldered, but if you cannot use solder, use a white lead paste or a white lead paste coloured pink by working in red lead.

The entire floor of the tank should then be covered with a ¼in. layer of medium hard bitumen (not tar). This will insulate all the defects and patchings in the tank floor from the water above. It is essential, however, to see that there is good adherence between the bitumen and the floor of the tank. The bitumen must, of course, be heated to softness, in which condition it can be applied with a broad trowel. Tar must not be used, since it will contaminate the water. If you are unable to obtain a bitumen in your area, you will have to use a black bituminous paint in several coats and give this time to dry out. A good bituminous paint is "Mariolene," manufactured by British Asphalt and Bitumen, Ltd., The Docks, Preston, Lancs. Another type of bituminous paint can be obtained from Wailes Dove Bitumastic, Ltd., Collingwood Buildings, Newcastle-on-Tyne. If you want to obtain an actual bitumen preparation for the purpose, try Messrs. Dussek Bros., Ltd., Thames Road, Crayford, Kent.

Mounting Maps

I HAVE a number of road maps on folded paper and wish to mount these dissected on linen. Can you please tell me the method and the necessary materials?—R. V. Walley (Richmond).

THERE are two ways you can mount the sections of a paper map on linen. Each panel of the map can be fixed around its edge, to the linen, with transparent ready-glued tape. If a small gap is left between each panel, the tape will stick to the linen.

The second way is to use one of the rubber-based adhesives, used by artists to mount their drawings on stiff backing. This adhesive does not fully dry and is always flexible, which is what you want. P. B. Cow, Ltd., of London, are one of the makers of this type of adhesive, which is marketed in artists' supply shops in tubes.

Information Sought

Readers are invited to supply the required information to answer the following queries.

Escape Mechanism for Models

I REQUIRE a large but simple escape mechanism similar to that in clocks for the purpose of making carefully balanced cut-out models move, using the idea of weights round the driving shaft as in Grandfather clocks. Can you help?—W. Bowskill (Retford).

Propagating Frame

PLEASE give me constructional details of an electrically-heated propagating frame, for use in a greenhouse, to take one, or preferably two, standard seed boxes.—W. H. Webster (Devon).

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MOTOR.—12 volt D.C., 1¾in. x 2in. approx. 3,000 r.p.m. with speed regulator in end cap. A precision job, 12/6, post 1/6.

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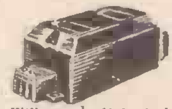

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THE Cyclist

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WHAT I THINK .... By F. J. C.

B.L.R.C.-R.T.T.C. Agreement

THE fight for power and control between the various cycling organisations is slowly drawing to a close, and the first move is the recognition by the R.T.T.C. of the B.L.R.C., which approves in principle that time-trials should be controlled by the R.T.T.C., road races by the B.L.R.C., and circuit races only by the N.C.U. A meeting between the various bodies will seek to develop this proposal.

This is a further blow to the N.C.U. at a time when it is struggling to put itself on a sound financial basis. Arrangements have already been put in hand to sell the present headquarters of the N.C.U., at 35, Doughty Street, London, W.C.1, in order to take advantage of present enhanced property values and to enable the union to move into more modern office accommodation. A purchaser at a satisfactory price has been found and the Union has found also satisfactory alternative accommodation. Full services of the Union will continue as usual. The finance and management committee recommends to the National Council meeting: that only one national council meeting be held annually, and that in January, instead of the two present badly sited meetings (from the sport's point of view) in October and March; that machinery be introduced which will make the union's centres financially self-supporting and able to retain the fruits of local effort.

The position of the N.C.U. must have been known to the delegates attending the National Council Meeting of the R.T.T.C. It can only be presumed, therefore, that they envisaged that the Union has finally lost national support in its attempt to submerge the B.L.R.C. during the past 12 years or so. Whilst one sympathises in the position in which the N.C.U. now finds itself, the present tendency merely indicates how unwise have been its counsels and how reckless in ignoring the advice which has been tendered to it during the past years. The League has proved stronger than the N.C.U. and the R.T.T.C. in spite of their combined efforts over a long period, and it must be said that neither of these two bodies emerges from the conflict quite scatheless, and each has lost considerable face in the eyes of the racing fraternity at this undoubted victory for the League.

Let us now hope that, having learned the error of their ways, they will in future live in amity with the League, which has brought a freshness to the sphere of cycling sport and forced a realisation that the methods of the past belong to those who live in it. The sooner they are removed from any position where they can exercise malicious authority, the better, and we hope that that will be the next step to prevent a recurrence of questionable tactics.

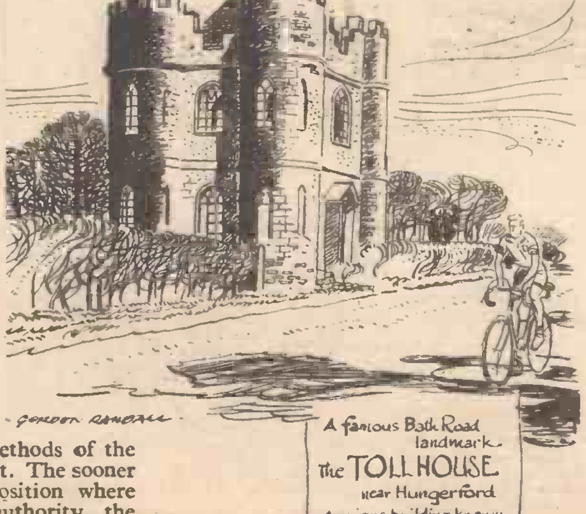
I am glad that my consistent support and advocacy of the League, both in print and with Government departments, has had effect.

Some Straight Words to the U.C.I.

BEARING on this matter, since it is comparable, the Union Cycliste Internationale has postponed its intended expulsion of the N.C.U., an expulsion which, in my view, it was not qualified to bring about. This weird body which, like most other cycling organisations, seems to have been conceived in hate and bred on it, was itself a dissident body in the early years of its formation, since it broke away from the International Cyclists' Association which preceded it, and which was founded by Sturmey, who at that time was well disposed towards the N.C.U. The I.C.A. did not meet with the full approval of the Frenchmen, and by the usual subterranean methods which seem common to cycle sport, it torpedoed it and formed the U.C.I. The arrogation unto itself of powers to expel the N.C.U. is just a piece of sneering impertinence which should not be tolerated, and might well lead to the formation of yet another body to take over world control of cycling sport. What the U.C.I. has done, others can do.

Car Door Dangers

A CORRESPONDENT takes me to task for my remarks in the January issue on the dangers of carelessly-opened off-side car doors. I do not withdraw my comments. Having witnessed a number of these accidents, it is my view that a number of them are due to the carelessness of the cyclist entirely and in others the cyclists have been guilty of contributory negligence. I readily admit that there are motorists who thoughtlessly open their doors without making certain that the road is clear behind them. Equally, it is the duty of a cyclist to see where he is going. I have witnessed cyclists riding with their heads down on many occasions when car doors have been opened. However, no matter who is to blame, there is an equal duty upon the cyclist to take care and to apprehend such thoughtlessness. For many years suggestions have been made that cars should be fitted with sliding doors as is the practice with some delivery vans to-day.



A famous Bath Road landmark — the TOLL HOUSE near Hungerford. A unique building known to many generations of road travellers

Amateurs and Publicity

AT the R.T.T.C. National Council Meeting the regulation relating to the display of makers' names on bicycles again arose, and one district council wanted the rules more rigidly enforced. Personally, I see no harm in the maker's name being displayed on a machine, and I dislike this rooted suspicion that a cyclist is endeavouring to obtain publicity in this way for a particular make. Certainly no maker to-day would pay for such trifling and ephemeral publicity for his wares. It would be almost valueless to him, and it is time that the R.T.T.C. lived in the present. One delegate naively suggested that the real culprits were newspaper editors, who, knowing the regulations, published such pictures. Only the editors of cycling journals would know the bulky rules which govern cycle sport. No one would suggest that the editor of a local or national paper would understand them. It would seem, however, that the R.T.T.C. itself has not read its own rules, for the rule is clearly and unambiguously stated. It is: ". . . nor shall the rider have the name of his machine or its makers so prominently displayed that it appears in photographs reproduced in the Press." This places the responsibility undoubtedly on the rider. A simple solution exists, however, and it is within the province of the R.T.T.C. to insist that all machines should have the name of the maker covered during a race and whilst within the presence of Press photographers. Newspapers are under no contractual obligation to the R.T.T.C. to enforce its rules. In any case, it is my own view that the rules regarding publicity should be considerably modified, as should the rules regarding advance publicity of time trials. They are quite out of date, unnecessary, and relate to a period when the trade amateur flourished. He does not to-day. Except for professional record racing, manufacturers do not rely upon the fleeting publicity of a win in the Bath Road 100 in order to sell a bicycle. It would not sell one machine. Quite apart from the maker's name appearing it is possible to identify some bicycles because of the individuality of their design. Year by year the R.T.T.C. at its annual meeting debates rules and it frequently adds to them or enlarges upon them. The rules have become altogether too ponderous and voluminous, and a small committee should be appointed to simplify them. Many of them could be collapsed into one simple, all-embracing rule. Such a committee should be composed of the younger brethren of the cycling movement.—F. J. C.

CYCLE CAMPING

What to Take and How to Carry it

THE mention of cycle camping to the unenlightened immediately calls to mind visions of a great mass of heavy equipment, including such items as tentpoles and blankets and with the inevitable frying-pan strapped on the outside, but nowadays there is good quality, lightweight equipment available and one person's kit may be packed into the space afforded by a pair of roomy pannier bags and a saddlebag.

The equipment carried should include a tent, a sleeping-bag, groundsheet, pressure stove, combined canteen and frying-pan, of the type shown in Fig. 1, two enamel plates, enamel mug, cutlery and a small canvas water bucket. Clothing and toilet gear are matters for personal preference, but take nothing that is unnecessary. To the end of the list it is always advisable to add a tin opener, two boxes of matches, a small torch and a long length of string. The food carried is another item which will vary from camper to camper, but it is of interest to note that special containers in polythene have been designed for such things as butter, eggs and salt and pepper.

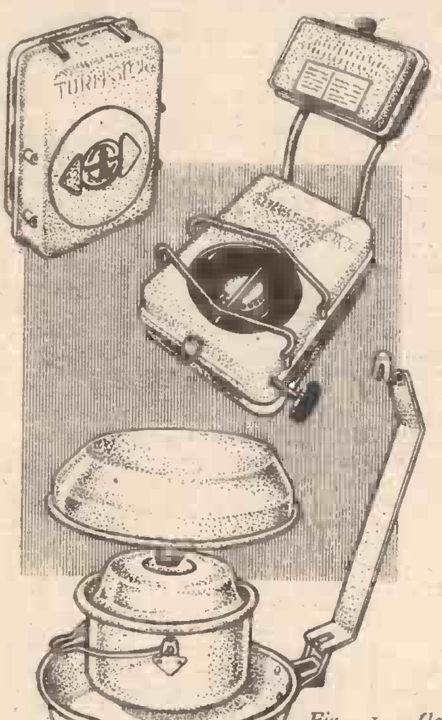


Fig. 1. (left)—The Turm-Sport camping stove and the Gilwell canteen.

Travelling in a party has its advantages as the equipment to be carried may sometimes be evenly divided between members to facilitate packing. If one large tent is carried instead of several small ones, the result will probably be a saving in weight and this principle may be applied also to frying-pans, billy-cans, canvas buckets, etc.

The Tent

This is, of course, the first item to be considered and its size will depend upon the number in the party and the sleeping arrangements being made. The type often used by the cycle camper is that known as the "hike" tent and this accommodates two people comfortably. A tent of this type is shown in the heading photograph. The tent poles are in three short sections and fit together by means of socket joints; the usual wooden tent pegs are replaced by metal ones of the meat-skewer variety, and when packed the complete item is contained in a waterproof case forming a cylinder about 18in. long and 8in. in diameter.

If your tent is one that has been lying in the box-room for some time, it would be foolhardy to use it without giving it a thorough overhaul. First, find out whether it is still waterproof, and the best way to do this is to pitch it on the lawn and leave it to be exposed to a few rain showers.

If it needs reproofing, an effective proofing solution may be formed by dissolving aluminium stearate in carbon tetrachloride. The strength is immaterial, but the best way to make this solution is to dissolve the stearate in warmed tetrachloride, adding a small quantity at a time and stirring constantly. The waterproofing is carried out by rubbing over the fabric to be treated with a pad impregnated with the stearate solution. The two chemicals mentioned are available from any well-known drug house.

Guy lines should be tested to see that they have not frayed or rotted and to make sure that they are still firmly attached to the fabric of the tent.

The Sleeping-bag

A down sleeping-bag is usually carried in preference to blankets as it occupies less space and is also warmer. Blankets are inclined to wander during the night when there is no heavy mattress for them to be tucked under, and a down sleeping-bag saves all the trouble of using blanket pins. At the present time there are many ex-Government surplus stores which can supply good quality sleeping-bags and they can, of course, be obtained also from the usual camping outfitter. Some bags incorporate a groundsheet—a further saving in space. For extra comfort the luxury camper might like to take an inflatable rubber mattress.

There are many types of stove available for cooking, using either solid or liquid fuels. Both systems are efficient, but remember to pack the stove and its fuel away from the rest of the equipment—methylated spirit does not improve the taste of food! A typical stove is shown in Fig. 1. Making a fire for cooking purposes in camp is an operation which calls for a lot of practice and no little skill, but even the expert will admit the advantage of the small stove when camp is made late on a wet evening and all the materials for fire-building are soaking wet.

Pannier Hints

The means provided by the manufacturer for fixing some types of pannier frames are small clamps which fit round the seat stays of the cycle in two positions—just above the mudguard bridge and at a point about 9in. above the rear drop-outs. The combination of vibration and weight of the loaded panniers often works the lower clamps loose, however tightly clamped in the first place, and if it is intended to do a great deal of camping and to make continued use of pannier bags, it is worth having special lugs brazed on to the seat stays. When pannier frames work loose it is usually because the clamps shift on the seat stay, and the brazed-on lug with the pannier frame bolted to it introduces the necessary permanency to the arrangement.

An alternative idea to make pannier frame fixing more rigid is to add an extra supporting bar on each side extending down to the rear wheel spindle, the ends being drilled and clamped under the rear wheel locknuts (see Fig. 2). The method of fixing to the pannier frames is a matter to be decided according to individual circumstances as is also the length of the additional supports. This type of arrangement may sometimes be found incorporated in pannier frames when they are bought.

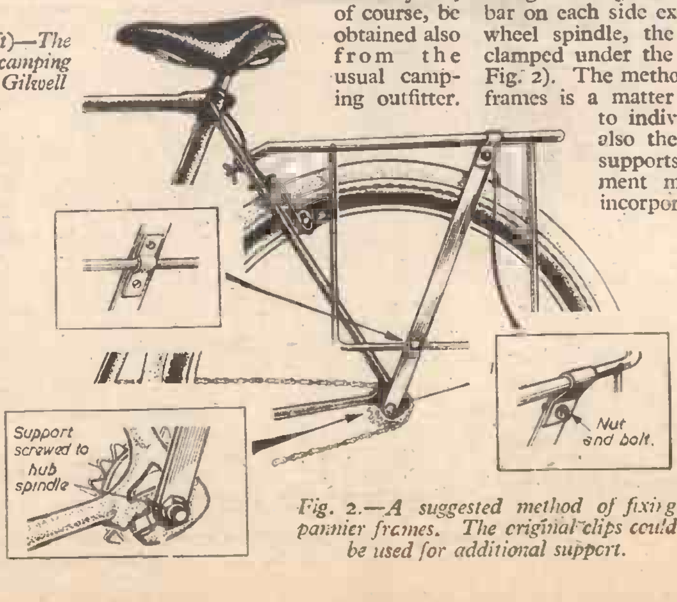


Fig. 2.—A suggested method of fixing pannier frames. The original clips could be used for additional support.

Loaded panniers and a large saddlebag can be surprisingly heavy and it would be advisable, whenever possible, for the occasional camper to change to a heavier-than-usual wheel to support extra weight. On a single-gear machine a larger rear sprocket would also be found an advantage, although the ideal solution is a variable gear.