THE WEEKLY FOR EVERYONE WITH A HOBBY

HOME CRAFTS
WOOD WORKING
MODEL MAKING
AMATEUR MECHANICS
ETC. ETC.

Hobbies

2D

March 14th, 1931.
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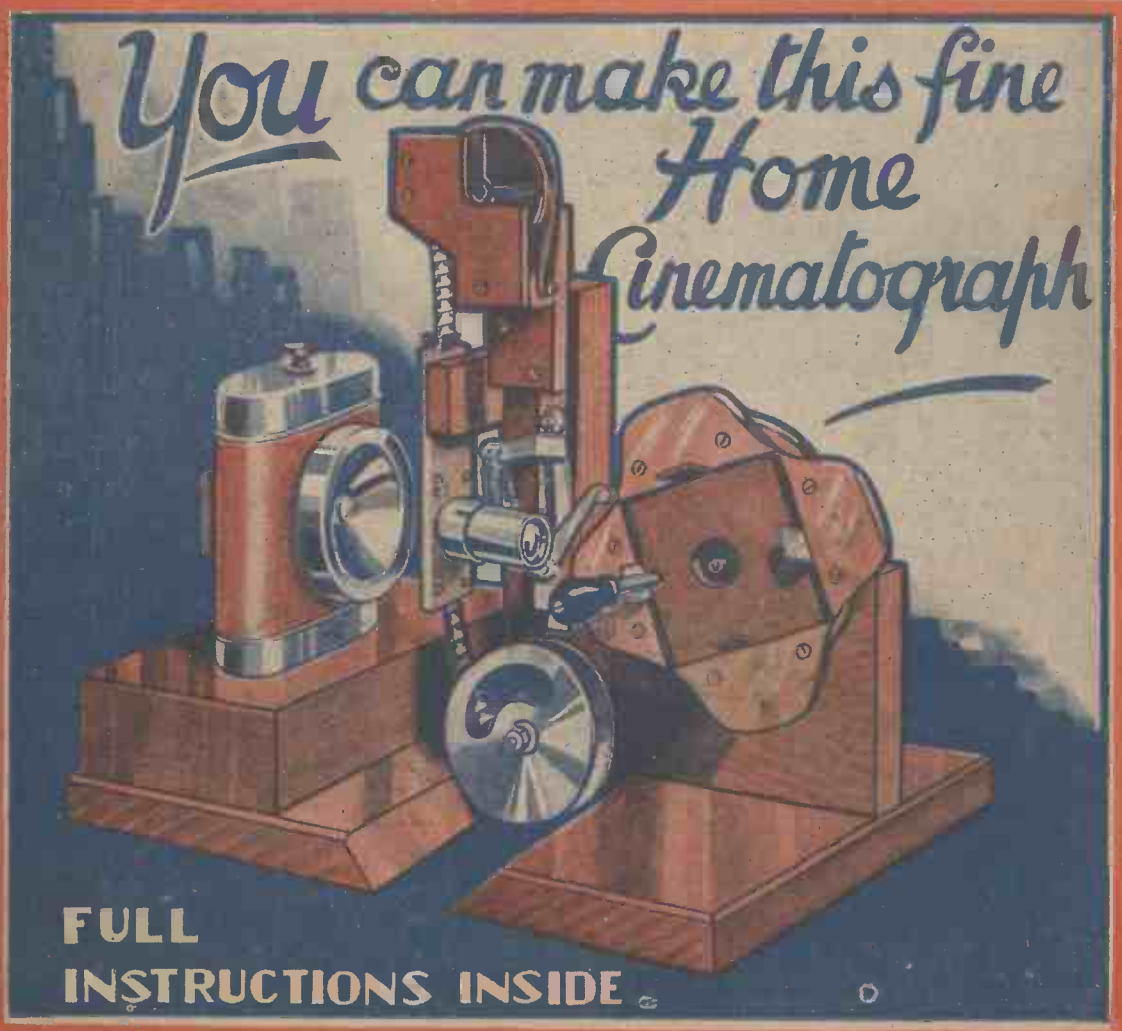
Published every Wednesday.



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Hobbies

Vol. 71. No. 1847. Published Every Wednesday March 14th, 1931

THIS WEEK'S CLEVER IDEAS

A New Type of Petrol Lighter.

ALTHOUGH we do not anticipate that a great proportion of our readers are pipe smokers, it is possible that one day they will be, and that is our excuse for drawing attention to the new form of lighter shown in the sketch here. The ordinary type of petrol lighter produces a vertical flame, and as such it is extremely difficult to light a pipe with it because the flame will project vertically from the wick in whichever position the lighter is held. This lighter projects a horizontal flame, and is particularly suited, therefore, not only for lighting pipes but for cigarettes as well. It is manufactured by John Beattie and Co., 23, Holborn Viaduct, London, E.C.1. It is an interesting reflection that the flint lighter, which is really a recrudescence of the old flint-and-tinder box, should be so popular to-day and should largely have ousted a device—namely, the match—which superseded it.

A new lighter which projects its flame horizontally.

A Low-Voltage Model Dynamo.

THE little dynamo shown below is intended for 2½-volt lamps. It is solidly made and specially recommended for use in connection with the Bowman steam engine No. 135. Although only 4in. high, it has quite a generous output, and gives trouble-free service. The amateur mechanic and model-maker will find dozens of uses to which this dynamo may be put. It is obtainable from most model stores or from Bowman Models, Dereham, Norfolk.

A very efficient Bowman model dynamo.

A Model Power Press.

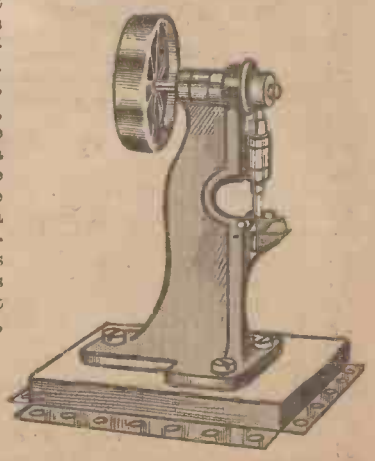
THE same company is responsible for the miniature press, also illustrated on this page. It represents a well-made reproduction of a real power press. Its working parts are of steel, and it is 4½in. high. It costs 2s. 11d.

A Curious Bicycle.

A NEW bicycle recently placed on the market is designed to overcome the loss of energy brought about by the dead-centre position of the driving cranks. The rider, in effect, increases his gear without that extra effort or push necessary when the pedals of an ordinary bicycle reach the dead-centre position. The chain wheel is oval, and the proper tension of the chain is maintained by a spring-loaded sprocket. The device has been tried out on the Continent with satisfactory results. It is marketed by The Sun Cycle and Fitting Co., Ltd., Aston Brook Street, Birmingham.

A New Cycle Valve.

ALL cyclists will be aware of the troubles associated with the Wood's type of cycle valve, in which valve rubber is used to maintain pressure in tyres. A new type of valve which will replace the ordinary rubber-tube valve without any alteration has recently been marketed by Messrs. Herbert's, 109-111, Northwood Street, Birmingham. The plunger has a throw-back valve with vulcanite seating, and it is a marked improvement on the Wood's valve which was produced almost thirty years ago, and has continued without alteration to be made in the form in which it was originally produced.



A miniature reproduction of a real power press.

NOTES AND NOTIONS from our READERS

Simple Engraving With Acid.

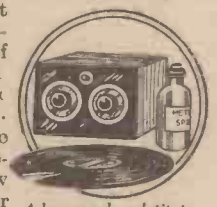
HERE is a simple method of engraving which is both cheap and permanent. Obtain a small quantity of nitric acid from the

Simple engraving with acid.

chemist. Now take the article to be engraved, cover it with candle grease, and trace the pattern or initials over it with a needle. Pour the nitric acid into the depression made with the needle and leave for a few hours. When the candle grease is scraped off a clear engraving is left on the article.—K. C. (Kent).

A Home-made Substitute for Ebonite.

WHEN constructing a wireless set, some people find that the ebonite panel is rather an expensive item. Here is a simple way of overcoming that difficulty. Obtain a piece of three-ply wood and cut it to the same measurements as the ebonite panel required. Now break up one or two old gramophone records into small pieces, put them in a jar, pour methylated spirits over them and allow the pieces to dissolve. When this is applied to the three-ply wood, and polished with a soft rag, quite a good substitute for ebonite is obtained.—W. M. (Kent).


A home-made substitute for ebonite.

An Easy Method of Breaking Coco-nuts.

AN easy way of breaking a coco-nut is first to remove the milk, and tie a piece of string as tightly as possible round the nut. When this is done tap the nut on any hard surface and it will break as perfectly as if it had been cut in half.—B. S. (Westmorland).


How to break a coco-nut.

THAT DODGE OF *YOURS!*

Why not pass it on to us? We pay Five Shillings for every item published on this page. Mark your envelope "Notes and Notions."

A Handy Tool Rack.

IT is most annoying, when doing an important job, to find that the required tool has been mislaid. By employing the idea shown in the sketch this difficulty can be overcome. Get an old piece of leather strap about 3ft. long, and nail one end to the wall of your workshop. Pass nails through the strap at intervals, and hang your tools through the strap as shown. It makes an excellent tool rack for the amateur woodworker.—F. W. (Liverpool).


A handy tool rack.

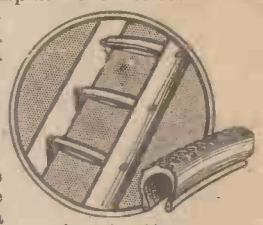
A Novel Use for Scissors.

TAKE a pair of scissors, preferably round-ended, and with a rat-tail file make a small semi-circular notch in the inside of each blade, as shown in the sketch. When they are shut the two little jagged points come together, and can be used for gripping and untying knots in string. The notches do not impair the scissors for cutting purposes.—K. M. (Shrewsbury).


A novel use for scissors.

A Use for Old Tyres.

THERE are times when the rungs of a ladder become slippery, making it rather dangerous to work on. This can be overcome by cutting strips from an old tyre and fixing them to the rungs, thus making a secure foothold.—P. S. (Stockport).


A use for old tyres.

A Soldering Iron Hint.

WHEN doing a small soldering job, the average soldering iron is often found to be too clumsy. By fixing a piece of copper wire to the bit, as shown in the sketch, a small job can be neatly done.—H. W. B. (Glamorgan).


A soldering iron hint.

An Easily-made Barometer.

A SIMPLE and effective barometer can be made in the following manner. Place a fused electric light bulb under water and nip off the small point at the end. The water will then fill the bulb. When hung outside in the open it makes an effective barometer. Rainy weather is likely when water drips from the bottom of the bulb, and fine weather when water remains undisturbed.—R. S. (Glamorgan).

An easily-made barometer.

HOW A PNEUMATIC ROAD DRILL WORKS

Simply Explained

by C. F. Eaton

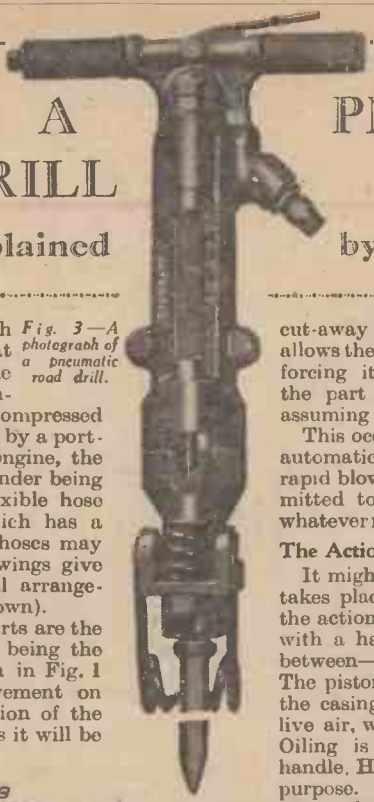


Fig. 3—A photograph of a pneumatic road drill.

THE pneumatic road drill is such a familiar sight nowadays that perhaps a few notes on the working of the machine may be interesting. In the first place, the compressed air for operating the drill is supplied by a portable compressor driven by a petrol engine, the working pressure in the storage cylinder being 80-100lbs. per square inch. A flexible hose joins the drill to this reservoir, which has a multiple connection, so that several hoses may be fitted thereto. The sectional drawings give a good idea of the general internal arrangements (also an external view is shown).

It will be seen that the principal parts are the cylinder, C, and piston, P, the latter being the only moving part, as the tool shown in Fig. 1 is of the valveless type, an improvement on the earlier designs. The construction of the piston should be carefully studied, as it will be noticed that the piston "rod" has been slightly cut away or reduced in diameter for part of its length; this is an important point and will be referred to again later.

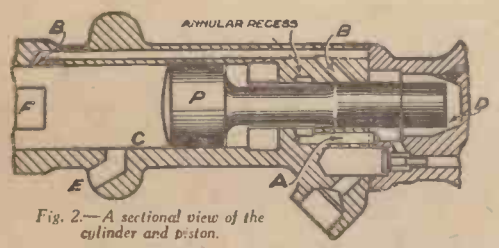


Fig. 2.—A sectional view of the cylinder and piston.

The Union and Mushroom Valve.

In Fig. 1 three ports are shown, A and B and exhaust port E. The compressed or live air enters through the union and mushroom valve, V, which is opened by pressing down the trigger, T, and passes through port B into the cylinder, C, driving the piston backwards. Directly afterwards, the exhaust port is uncovered by the piston, which causes the pressure to collapse, and also live air is now cut off from port B as the small end of the piston, or rather rod, covers it. Fig. 2 shows the position which the piston has now assumed, which puts port A in communication as the annular recess and cut-away part of piston rod now coincide, which allows the live air access to the back of the piston, forcing it forwards and delivering a blow to the part called the anvil block, F, the piston assuming the position as in Fig. 1.

This occurs with great rapidity, and is entirely automatic in action. The succession of extremely rapid blows striking the anvil block, F, are transmitted to the shank of the tool, S, and thence to whatever material the machine may be working on.

The Action of the Piston Rod.

It might be thought that reciprocating motion takes place, but this is by no means the case: the action may be compared to striking a chisel with a hammer and interposing a piece of steel between—the steel representing the anvil block. The piston rod never actually reaches the end of the casing owing to the cushioning effect of the live air, which is always present in chamber, D. Oiling is accomplished by filling the hollow handle, H, with oil, a plug being provided for the purpose. The movement of the piston sets up pulsations in the air contained in chamber, D, which causes the oil to slowly trickle through the small nipple, N, and lubricate the piston. The machine has rubber grips fitted to the handles, which absorb some of the shock.

Detachable Shanks.

The tools have square shanks and are detachable from the machine, a variety of types being available for different jobs, as described below. The tool is prevented from being pulled out of the machine by the spring shown in the outer view (Fig. 3); this abuts on the collar with which the tool is equipped. The most familiar use of the machine, and one which may be seen almost any day, is for breaking up roads prior to repairing, but there are many other uses, such as cutting asphalte pavements, removing slag from ladles at foundries, tamping trenches after filling in, digging clay, drilling holes for blasting, etc.

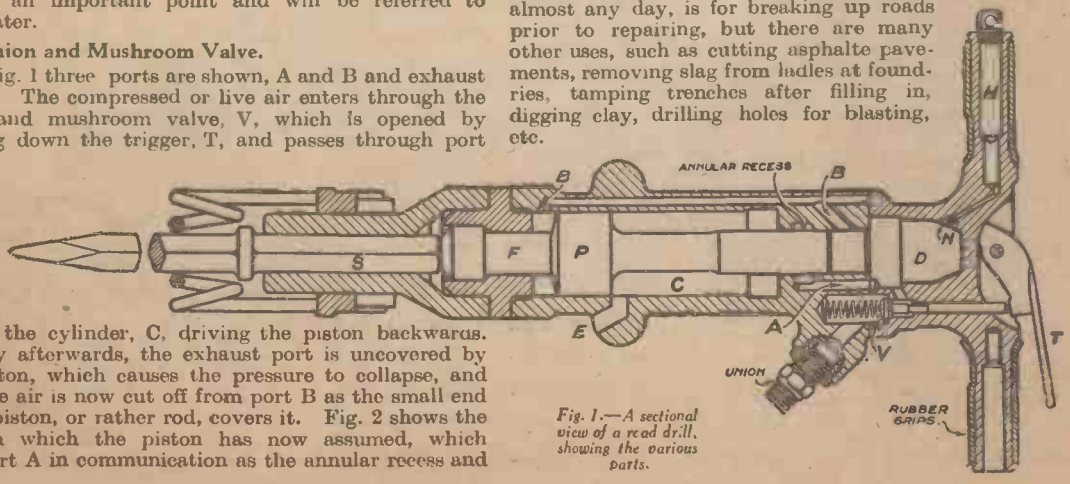
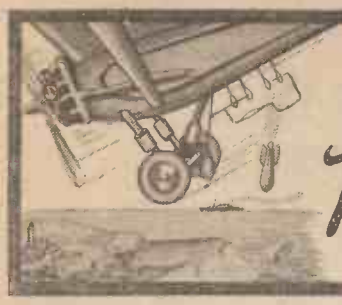


Fig. 1.—A sectional view of a road drill, showing the various parts.



Bombing by Model Aeroplanes!

AS an addition to the ordinary "stunts" possible with model aircraft of all descriptions, bomb-dropping will be found of great interest, particularly as it is applicable to all types of machine, from light paper gliders upwards.

Fig. 2.—The type of clip-on ring used for gliders

The best type of 'plane on which to use the apparatus is probably the "indoor" type of very light 'plane or glider, because indoors the results are more easily seen. Also, on account of the sudden changes in the flying angle that an outdoor 'plane is bound to undergo in a wind, the gear is liable to be erratic in action—though it often makes it more realistic.

The simplest arrangement is shown diagrammatically in Fig. 1, and consists of a gear which will release a single bomb just as the aeroplane begins to glide down after a climbing flight.

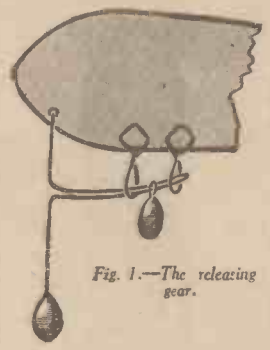


Fig. 1.—The releasing gear.

The Releasing Gear.

It consists, as shown in Fig. 1, of a weight of plasticine arranged like a pendulum swung from the nose of the 'plane. In the case of the gliders, this weight takes the place of some or all of the nose weight, always necessary with these 'planes. The wire on which the weight is hung is bent so as to make the "release pin," as shown clearly in Fig. 1. This pin is arranged to pass through two rings clipped or bound on to the fuselage, and the "bomb" (made, as shown, from plasticine) is suspended from it between the rings. The type of clip-on ring used for gliders is shown in Fig. 2, while those for spar type may be seen in Fig. 7.

Fig. 3.—The bomb being released as the plane glides downwards after a climb

It will readily be seen that, when the 'plane begins to glide downwards after a climb, the weight will swing forward and release the bomb (Fig. 3).

When you have experimented with this arrangement until you know quite well how best to use it, try going on to the more complicated two-bomb gear, shown in Fig. 4. This needs more care in adjusting, of course, but can quite easily be made to drop a bomb when the machine first begins to dip, and then to drop another one as it flattens out in its glide. It also has been used successfully on paper gliders as well as on power 'planes.

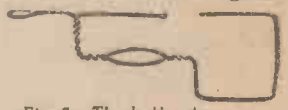


Fig. 5.—The double release pin.

The Double Release Pin.

In the arrangement shown it will be seen that the double-release pin is of a special form (shown enlarged in Fig. 5), and is quite separate from the swinging weight, to which it is attached by the ring in its end. The front bomb, which is released first, is surrounded by the ring-shaped part of the sliding release rod, and, so long as it still hangs, prevents *backward* movement of the weight and release pins. The rear bomb is suspended from a pin made, as shown, by bending back the end of the release rod.

As the machine climbs, the bomb stays in position, since the release gear cannot move backward. As soon as it begins to descend (or, by suitable adjustment, at the top of the climb), the weight and release gear swing forward, dropping the front bomb. The machine continues to glide down, but flattens out a little on account of its reduced weight. This flattening out causes the gear to swing backwards, thereby releasing the second bomb (see Fig. 6).

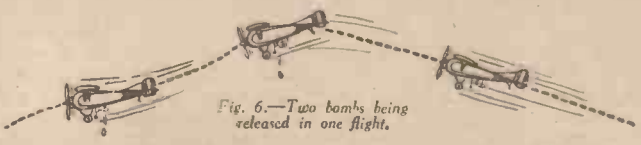


Fig. 6.—Two bombs being released in one flight.

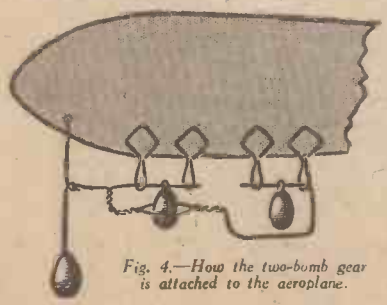


Fig. 4.—How the two-bomb gear is attached to the aeroplane.

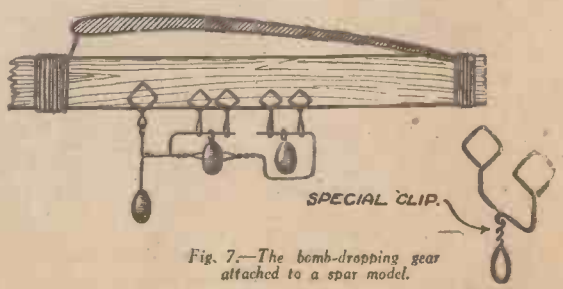


Fig. 7.—The bomb-dropping gear attached to a spar model.

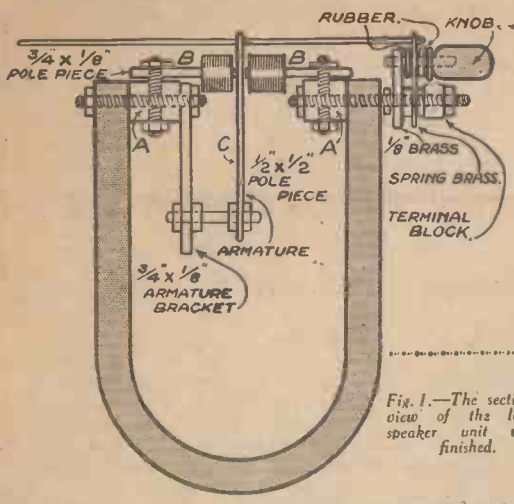


Fig. 1.—The sectional view of the loud-speaker unit when finished.

THE CONSTRUCTION OF A POWERFUL LOUD-SPEAKER UNIT

By J. H. Reed

THE loud-speaker unit about to be described is of the two-pole balanced armature type and possesses the virtues of cheapness, ease of construction—see Fig. 1, there being only eight simple parts to make—and considerable power. One in use by the writer, operating a 9in. cone, will stand up to the output of a three-valve amplifier coupled to a gramophone pick-up without giving any sign of chatter or overloading, and yet producing far too much volume for comfort.

The materials required can probably be found in the scrap box, and consist of the following: A permanent magnet from an old magneto, obtainable from a garage for a few pence; a piece of soft iron 3in. by ½in. by ½in., a further piece 3in. by ¾in. by ⅛in., two loud-speaker bobbins (2,000 ohms), another piece of soft iron 4in. by ¾in. by $\frac{1}{16}$in., a length of 2B.A. studding and a dozen nuts, a length of 8B.A. studding and two nuts, a piece of brass 5in. by ¾in. by ⅛in., a piece of springy brass about 2in. by ½in. by 1/32in., a small ebonite knob, tapped 2B.A., and a small piece of $\frac{3}{16}$in. or ¼in. ebonite about 2½in. by ½in., with two small terminals.

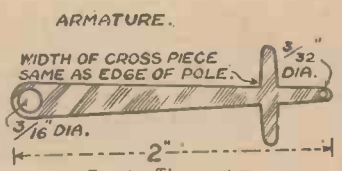


Fig. 4.—The armature.

The Magnet.

One very important point to note is that the magnet *must* have holes ready drilled near its extremities, any other type being useless, as it is impossible to drill through the poles without first softening the magnet and thus demagnetising it. Also, of course, it should be capable of supporting at least its own weight. A magnet from an old Bosch single-cylinder magneto gives very good results, and it should be borne in mind that all the measurements given refer to this size of magnet only. It is, however, perfectly simple to alter the dimensions in accordance with any other magnet.

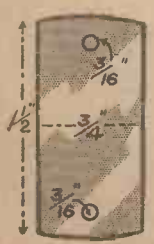


Fig. 5.—The armature support.

The Pole Pieces.

The first step is to prepare pole pieces, and these are made from the 3in. by ½in. by ½in. soft iron. They should be cut to the shapes shown in Fig. 2 and filed up smooth. These blocks being prepared, they may be placed against the inside edges of the magnet with the long side touching the magnet, and so placed that the hole in the magnet is in the centre of the block. Mark through the holes in the magnet, and after removing the pole pieces drill them where marked, using a $\frac{3}{16}$in. drill. From the 3in. by ¾in. by ½in. soft iron now cut two pieces 1⅛in. long and drill two holes in each as shown in Fig. 3. Now try the magnet bobbing on them, and if they will not go on, file down the iron until a good fit is obtained. Remove the bobbins and put them aside to prevent the windings becoming damaged. The holes in the soft iron should also be slightly slotted in order to allow of adjustment.

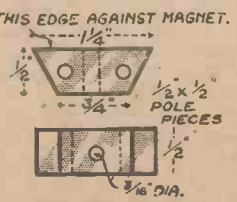


Fig. 2.—The pole pieces.

Now attach the ½in. by ½in. pole pieces to the magnet, using 2B.A. studding to secure them, and, placing the pieces of ½in. soft iron on top, use these as templates to mark holes in the thick blocks. Remove all four pieces and drill the ½in. by ½in. blocks where marked, using a $\frac{3}{16}$in. drill. When this has been done the whole should be assembled, allowing the 2B.A. studding to project beyond the sides of the magnet and poles.

The Support for the Armature.

The length of ⅛in. brass may now be cut and drilled to the sizes shown in Fig. 5. This is to act as a support for the armature, which may now receive our attention. From the $\frac{1}{16}$in. soft iron cut a piece, by means of shears or hacksaw and file, as shown in Fig. 4, and drill two holes, one near the bottom of ⅜in. diameter and the other near the top of 3/32in. diameter. Mount the armature by the method shown, allowing it to rest against one of the poles of the magnet, or rather against one of the thin pole pieces. The "cross" portion of the armature should just cover the end of the pole face.

From the remaining piece of ½in. brass cut a rectangle ¾in. by ½in., and drill a $\frac{3}{16}$in. hole $\frac{3}{16}$in. from one end, and slot it lengthwise. Also drill a further hole $\frac{3}{16}$in. from the other end, but this time of 5/32 in. diameter, and tap it to take a 2B.A. screw (see Fig. 6). Cut a piece of the spring brass ⅜in. longer than that just dealt with, mark it out in accordance with the holes just

Fig. 3.—Two pieces of brass should be cut as shown to hold the magnet bobbin.

drilled, but drill as follows: Bottom hole $\frac{3}{16}$in. diameter and slotted, and the hole near the centre of $\frac{1}{4}$in. diameter (Fig. 7).

Fixing the Armature.

Now comes one of the most important tasks. Screw up tightly all nuts supporting the poles and armature, adjusting the position of the latter so that when held off the poles by paper packing it is parallel to the sides of the magnet (see Fig. 8.) To the length of 2B.A. studding projecting through one of the sides of the magnet, and preferably on the opposite side to that carrying the armature support, attach the piece of $\frac{1}{8}$in. brass and also the spring, using the slotted holes in each case. The 8B.A. studding may now be threaded through the small hole in the top of the armature, so that one end rests against the brass spring just fitted. Keeping the 8B.A. reed rod perfectly parallel with the top edges of the magnet, mark where it touches the spring, which should then be removed and, where marked, drilled 3/32in.

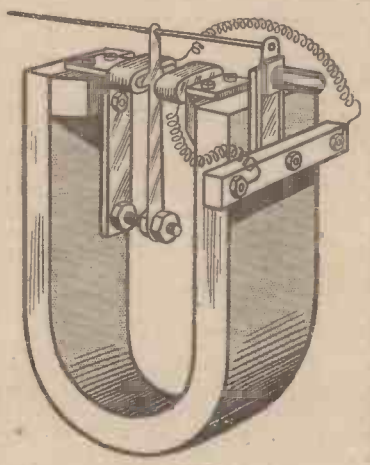


Fig. 8.—How the armature is fixed into place.

The Final Assembly.

The parts at present assembled should now be dismantled and all traces of iron and other filings removed, after which the final assembling may be commenced, proceeding in the following order. Loosely fasten the armature on its 2B.A. support, which should be tightly screwed to its brass bracket (Fig. 1). Replace one pole piece complete with its bobbin, and secure the armature bracket to it. Screw up as tightly as possible and remove any surplus studding. Attach the other pole pieces and coil and allow about $\frac{3}{8}$in. of studding to project outside the magnet. Screw up tightly and lock with another nut. Slip on the $\frac{1}{8}$in. brass piece and a further nut and again screw up. Next the brass spring should be slipped on, and this is also secured by a further nut. Between the spring brass and the $\frac{1}{8}$in. piece force a piece of soft rubber about $\frac{1}{4}$in. square and rather more than $\frac{1}{8}$in. thick, and in such a position that it covers the top (tapped) hole in the thick piece and the central hole in the spring. Cut out the centre so that there is a clear hole right through. Screw a short length of 2B.A. studding into the small ebonite knob, slip on a small washer, and follow this by a piece of rubber of the same size as that already cut. Push the end of the screw through the hole in the spring, so that it engages with the thread in the thick brass. Screw down tightly. Arrange the armature so that it is parallel with the sides of the magnet and midway between the poles, using paper packing to keep it equi-distant, and screw up very tightly. Remove the paper packing and allow the armature to rest against the face of the pole farthest from the adjusting knob. Again slip the 8B.A. reed rod through the small hole in the armature and screw on a nut. Push this reed rod along until its end just comes through the hole in the spring brass. Put another nut on the rod, but on the other side of the armature, and tighten both nuts down on to the armature to secure it. The end of the reed rod projecting through the brass spring may now be soldered in position and any surplus cut off.

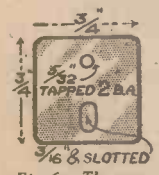


Fig. 6.—The rectangle piece of brass should be drilled and slotted as shown here.

Small Adjustments.

A small terminal strip of ebonite must now be secured to the piece of 2B.A. studding still projecting through the adjuster, terminals fitted and attached to the ends of the coils. Ease back the adjusting knob until the armature is centrally disposed between the poles of the magnet. Between either side of the armature and its corresponding pole slip a thick piece of paper or thin visiting card. Slacken the nuts holding the thin pole pieces (those actually carrying the coils), and move the pole pieces inward until the paper strips are lightly held. Screw down nuts and remove paper. Attach a cone to the 8B.A. reed rod in the usual manner, and connect up the unit to the output valve of a receiver or gramophone amplifier and switch on. Adjust by means of the small ebonite knob, and listen whether the armature strikes against either or both of the poles. If it does it will be necessary to increase the gap by loosening the nuts holding one pole piece and moving it away from the armature very slightly, afterwards screwing up the nuts again. Do not be disappointed if at this stage the volume is not very great, as the best results cannot be obtained without mounting the unit and cone. The latter should preferably be used in conjunction with a baffle board or cabinet, and the following method of mounting will be found quite satisfactory.

Mounting the Cone.

Construct a box of sufficient length and width to easily accommodate the cone it is intended to use, and make it about 6in. deep. A three-ply front should be fitted, with a large hole cut out to suit the cone. It is recommended that this should be not less than 9in. in diameter. Attach the cone by means of some soft material, such as flannelette, to the front or baffle. Procure a length of hard wood about 1½in. by 1in. and cut it to fit tightly inside the cabinet, and fix it near the back and about 3in. below the centre of the cone. By means of another but shorter piece of wood the unit may be clamped to the long strip, using packing if necessary to get it the right distance from the cone, the apex of which should be as close to the unit as possible.

Just a word of advice on drilling the iron pole pieces. If a bench drill or lathe is not available, mark out the centres of all holes to be drilled and take them to the local repair garage, where the job can be done in a few minutes and at the cost of a few coppers. To drill through $\frac{1}{4}$in. iron, or even $\frac{1}{8}$in., by hand is a very laborious job, and will involve much loss of time and probably temper as well, as, by having the holes drilled, the whole unit may be constructed in an hour or so.

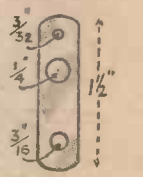
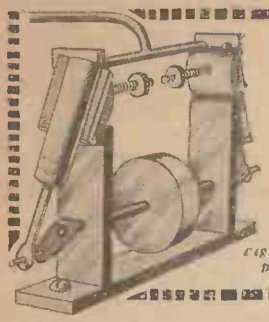


Fig. 7.—This should be slightly longer than the piece of brass shown in Fig. 6 and drilled as shown.



A Twin-Cylinder Model Steam Engine

Fig. 6.—The completed engine.

THE twin-cylinder engine shown in Fig. 1 can be made out of odds and ends, and gives very satisfactory results. It has a great advantage over the single-cylinder engine, because the running is very much smoother.

For its size it will drive comparatively large models.

With average intelligence and care, a smart and very useful plant can be made.

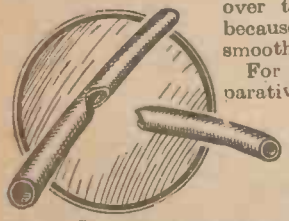


Fig. 5.—The steam pipe can be joined in the mitre fashion shown here.

List of Materials.

These consist of two oscillating cylinders ½in. stroke and ¼in. bore, 9in. of steam tube 3/32in. bore, a brass tube ¼in. long and ⅜in. diameter, a piece of lead about 1½in. square and ⅛in. thick, a steel rod 1¾in. long ⅜in. diameter, and two ⅜in. brass washers; 9in. of strip brass ½in. by 3/32in., a length of 3/32in. wire, a cocoa tin (1lb.) and a cork.

The only tools required are a file, a soldering iron, two twist bits ⅛in. and 3/32in., an old pair of scissors, and a pair of pliers.

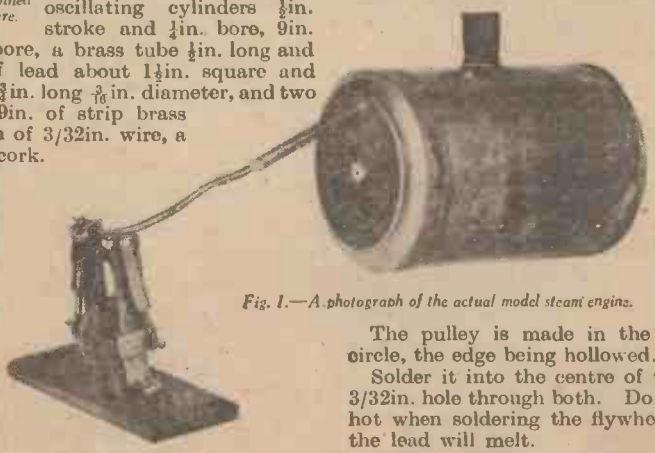


Fig. 1.—A photograph of the actual model steam engine.

The Construction of the Frame.

First cut three pieces off the strip brass. One piece 2½in. and two pieces 1¾in. The latter pieces must have the ends filed true and a hole ⅜in. in diameter drilled in each 11/16in. from one end. (See Fig 2.) The piece of steel rod must fit these holes easily.

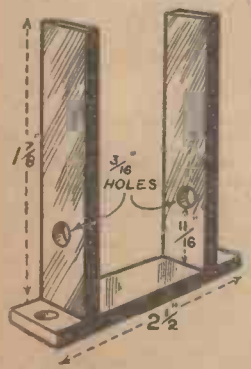


Fig. 2.—The frame for the engine.

Round the ends of the 2½in. piece of brass, and drill a 3/32in. hole ⅜in. from each end.

This piece is the base of the engine, and the two 1¾in. pieces can now be soldered to it 1¼in. apart, making sure they are upright. A glance at Fig. 2 will show you how the frame should look when finished.

The Crankshaft.

Cut out two "webs" from the strip brass as shown in Fig. 3, making the holes ⅜in. and 3/32in. respectively. The best way to get the holes correctly placed is to cut the webs to the correct size and then place one on top of the other, and "tack" the edges together with solder.

Do the marking-out on the top one, and drill through them both, thus making sure they are exactly the same. They can then be unsoldered.

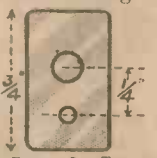


Fig. 3.—Two "webs" should be cut as shown here.

The crankpins (Fig. 4), which consist of ½in. pieces of 3/3 in. wire, can now be soldered into the 3 32in. holes in the "webs." They should be pushed well through the holes, as they can be filed off flush afterwards. Care should be taken to see that the pins are at right angles to the "webs."

One of the "webs" can now be soldered on to the end of the piece of steel rod and the rod filed flush.

The Flywheel and Pulley.

These are made from a piece of lead, see Fig. 4.

After scoring a circle 1½in. in diameter in the centre of the lead, cut it out with a wood chisel, and then file the edge smooth.

The pulley is made in the same way with a ½in. circle, the edge being hollowed.

Solder it into the centre of the flywheel, and drill a 3/32in. hole through both. Do not use an "iron" too hot when soldering the flywheel and pulley, otherwise the lead will melt.

Finishing the Crankshaft.

Take the steel rod on which is soldered one of the "webs" and after slipping a washer on to the rod, push it through one of the holes in the frame.

Now solder the pulley and flywheel to the centre of the steel rod. The crankshaft is now completed by putting the other end through the other hole in the frame, slipping on a washer, and soldering the other "web" to it, so

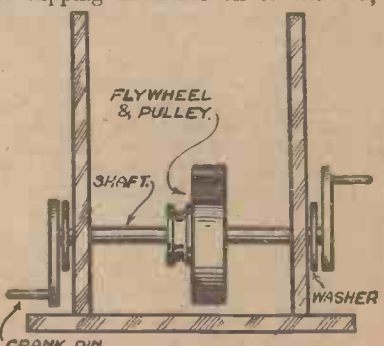


Fig. 4.—Details of the flywheel and pulley.

that the "webs" are on opposite sides of the crankshaft. A glance at Fig. 4 will make this quite clear.

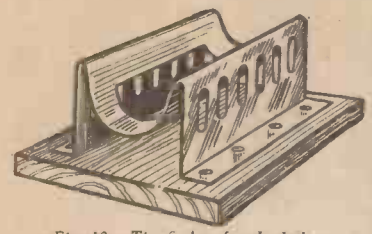


Fig. 10.—The firebox for the boiler.

With the bearings oiled the crankshaft should spin freely with a touch of the finger.

The Cylinders.

These have a cylinder block in which there are two holes or "ports." Remove the blocks from the cylinders and solder (port to the top) to the tops of the upright pieces of the frame, making sure that they are square. Now cut a piece of steam tube, the exact distance between the cylinder blocks, and solder the remainder of the tube into it in a mitre fashion as shown in Fig. 5. Be sure to make a good joint before soldering it. The steam tube can now be soldered over two of the holes or ports (see Fig. 6) so long as they are opposite ones. The ports to which the tube is soldered determine which way the engine runs. When soldering the steam tube, great care must be taken to avoid clogging the tube with solder.

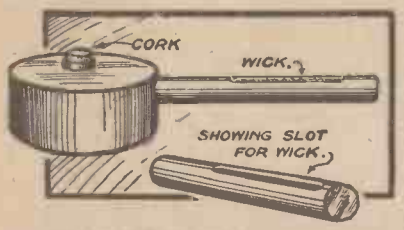


Fig. 9.—How the spirit lamp is made.

The cylinders can now be replaced, with the crank pins through the holes at the ends of the piston rods.

The engine is now finished, and should appear as in Fig. 6.

It should revolve two or three times when spun with the finger, and can be screwed down to a piece of hard wood through the holes provided.

Boiler.

To make the boiler obtain a cocoa tin, preferably a pound tin, and after soldering the seams outside and inside where possible, pierce a hole in the centre of each end, and solder a piece of wire through them to strengthen it (see Fig. 7).

Cut a hole in the top of the boiler and solder the short piece of brass plate into it, and place in a cork, which acts as a safety valve. (Fig. 8).

A hole is now drilled near the top at one end and into this the steam pipe from the engine is soldered.

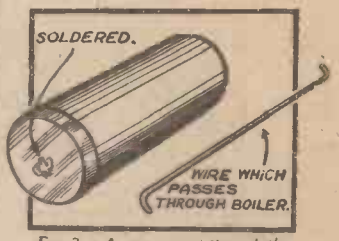


Fig. 7.—A wire passed through the boiler to strengthen it.

To Use Plant.

Fill the boiler about three-quarters full with water, and place it on a gas ring. When the water has boiled turn the gas low and the engine will run at a high speed with ample power to drive quite large models. If gas is not available, a spirit lamp can be made which will give quite good results (see Fig. 9). The water, in this case, should be put into the boiler hot.

The Firebox.

The boiler must have a "firebox" fixed round it if the lamp is used, the whole plant being fixed on to a board (see Fig. 10.)

If a gas ring is used the steam pipe can be bent so that the engine stands firm on a table or bench.

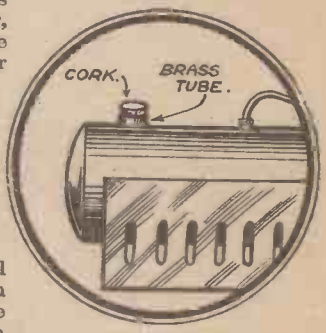
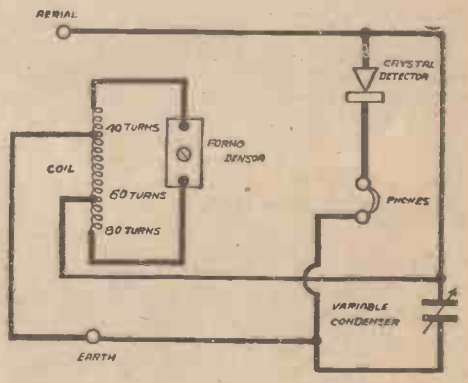


Fig. 8.—A cork pushed into the boiler to act as a safety valve.

A SIMPLE CRYSTAL CIRCUIT

By J. H. Mortimer



THE only parts required to make the simple crystal set shown in the circuit diagram on the right are a .0003 or .0005 mfd. variable condenser, a tapped coil, a crystal detector, and .0003—.000025 Formo-Densor. A good outdoor earth is needed to obtain the best results. When tuning-in, the small knob of the Formo-Densor must be screwed up or down until its most efficient position has been found, for it is intended to act somewhat as a tuning condenser. The wiring is apparent from the diagram. The set gives very good results on the earphones, receiving the local station quite strongly and other stations more moderately up to a radius of 20 miles.

In spite of the fact that the crystal set is not now so popular as it was in the early days of wireless it has many advantages to offer, particularly when a two- or three-valve amplifier is added. Used alone, one is enabled to listen in and enjoy the programme without upsetting the recreations of others who may be in the room, and, whilst it is unlikely that it will ever return to popular favour, it can never be entirely superseded by the valve set among those who cannot afford them. It is the simple device which brings wireless within the reach of all.

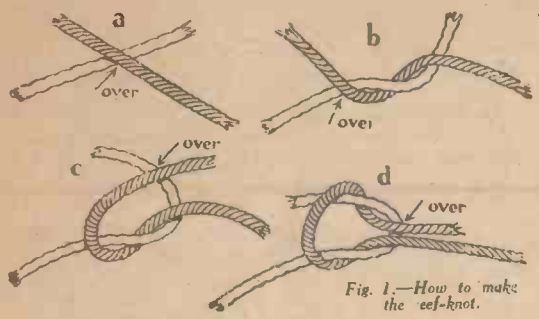


Fig. 1.—How to make the reef-knot.

THE ART OF MAKING KNOTS

By "Home Mechanic"

A KNOWLEDGE of how to tie some of the simpler knots is a great advantage to anybody; yet it is remarkable how few people have it. There are two essential points about a good knot: (1) it must not slip or come undone, and (2) it must be fairly easy to untie. Most people who won't bother to learn to tie things properly make knots which untie themselves when they are not wanted to, or which defy all efforts when their maker wishes to undo them. Here are two pointed questions for you: How often do your bootlaces come undone, and can you always unfasten them at once when you want to do so? I wonder.

The Reef-Knot.

To join up two pieces of string or cord of about the same thickness the most usual knot is the reef, which is shown in Fig. 1. The important point to remember is that the end which starts going over the other always goes on doing so until the knot is finished: (1a) shows the first step; the right (shaded) end is laid over the left. The second stage is the single knot (1b) made by taking a turn with the shaded end round the other. You will see that the right or shaded end is still on top. In the third stage (1c) the same end is passed over the other, and in the fourth it takes a turn round and once again goes over. This knot, when pulled tight, will not slip, provided that the two ends of rope or string are almost of the same thickness. It is just the knot you want for bootlaces, because it is very easy to undo. When you make a bow on your shoelaces, or tie an evening tie, the same instructions hold good, for the bow is only a form of reef-knot.

The "Granny."

Those who can't make a decent bow, or whose knots are always slipping, will find that they are making the "granny," shown in Fig. 2; if you compare it with the reef-knot, you will see that the mistake is made at the third stage. Compare (1c) and (2c) by passing the right-hand end under instead of over the left. Avoid the granny as you would the plague; it is the worst knot in the world—and the commonest. It slips on any provocation, or, if it does happen to hold, it jams.

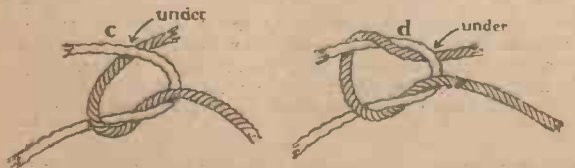


Fig. 2.—The "granny"—a knot to be avoided.

A Thumb Knot.

Fig. 3 shows a very good method of joining up two slippery ends. A thumb knot (3c) is made in one end, the other end is passed through it and formed into a thumb knot round the first end. The two "thumbs" are then pulled tight and run together. This is one of the best ways of joining up lengths of gut for making fishing casts. You can make it doubly secure by taking an extra turn round each "thumb," as shown in Fig. 3d.

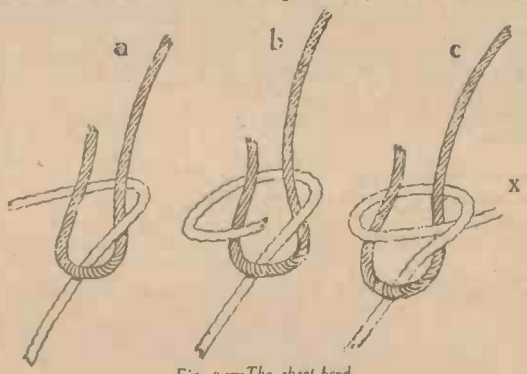


Fig. 4.—The sheet-bend.

The Sheet-bend.

If your two ends are of different sizes, the best knot to use is the sheet-bend, shown in Fig. 4. This is a very easy knot to tie once you have got the idea, and it is a very useful one. The loop may be open, as shown in Fig 5. The sheet-bend with a closed loop is generally used by fishermen for fixing the cast, or hook, to the line. If you are afraid of the knot slipping, a stop should be put on to the end X (Fig. 4c). This may take the form of either the ordinary "thumb" or the figure of eight (Fig. 6), both of which are very easy. For thick or slippery rope the latter is the better, as the "thumb" is apt to slip off over the end. Another good stop is the "double thumb," shown in Fig. 3d.

The Double Sheet-bend.

If you do not think the sheet-bend sufficiently secure, tie the double sheet-bend (Fig. 7), which is made quite simply by making a second turn round the loop with the free end. This knot cannot slip, and is very useful for attaching eyed flies to gut. Both the sheet-bend and

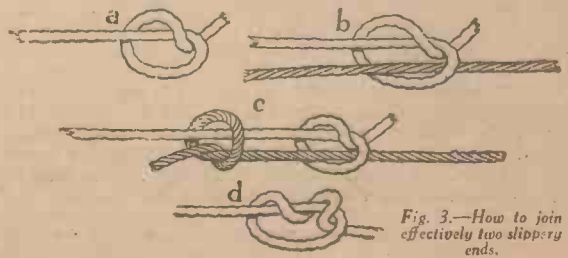


Fig. 3.—How to join effectively two slippery ends.

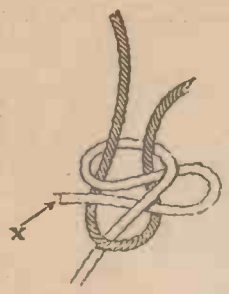


Fig. 8.—A "quick release" sheet bend.

the double sheet-bend have the advantage that if made on slippery rope or gut they may bind and become difficult to undo. A "quick release" form of sheet-bend is shown in Fig. 8. You will see that the free end, instead of being passed through singly, as in Fig. 4c, is doubled on itself and passed through in the form of a "bight." When the knot is pulled tight it cannot slip, but should it be desired to undo it, a pull on the end marked X will bring both ends free at once. This knot comes in handy for a great many purposes—for securing a rope, for instance, which may have to be released at any moment, it is the very thing. It can be tied in the dark with a little practice.

Fig. 7.—The double sheet bend.

Making Loops.

There are several ways of making loops. Fig. 5 shows the most usual, which does quite well if tied on thin string, and if the strain is on the loop itself and on one of the ends marked a and b. If, however, the strain came on both of these ends, the loop would probably slip and straighten out. If you want an absolutely non-slipping loop on the end of a rope, use the bowline, shown in Fig. 9. This knot takes a little learning, but you will soon get hold of it if you try. In the next article we will discuss some rather more advanced knots and their uses.

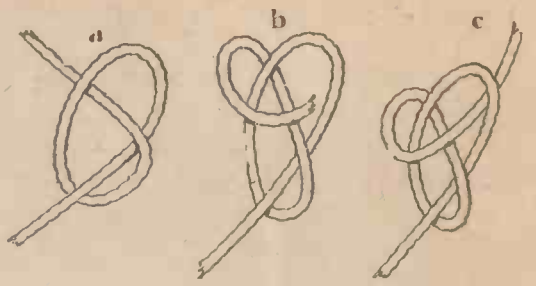


Fig. 6.—The figure of eight knot.

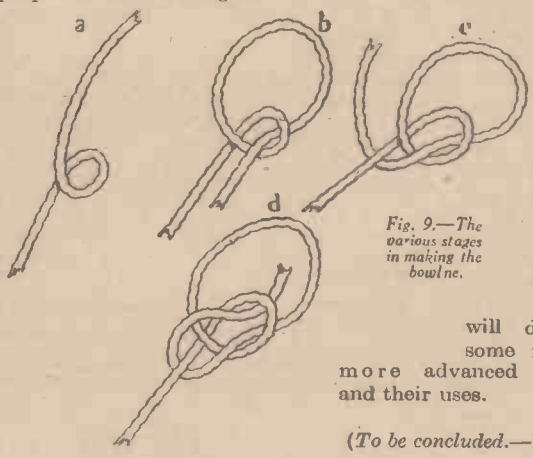


Fig. 9.—The various stages in making the bowline.

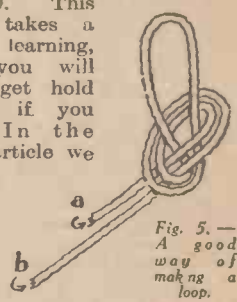


Fig. 5.—A good way of making a loop.

(To be concluded.—ED.)

MAKING SLIDES FOR TOY LANTERNS

SLIDES for toy magic lanterns can be made very easily and cheaply from ordinary transfers, such as can be obtained in sheets bearing quite a large number of small pictures for a penny.

First obtain a supply of glass slips of the size to suit your lantern; you can cut them up yourself with a wheel cutter, or a glazier would probably cut up a supply very cheaply. Rub the sharp edges from the glass—to avoid cutting your fingers—with an old file or by rubbing the edge of one glass against another. Clean and polish the glass carefully, then coat one side with gold-size, spread over as thinly as possible; the best way to do this is to put a drop or two of the gold-size (which must be clean and fresh) on the glass and spread it by rubbing with a clean finger. This is better than using a rag, which might leave bits of fluff.

Fixing the Transfers.

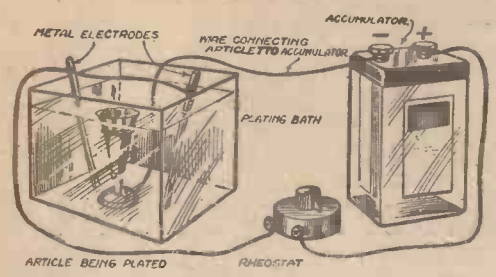
Leave the glass in a warm place till the coating becomes tacky, which should happen in a few minutes; while the glass is drying, cut out a few transfers and float them carefully, picture side upwards, on some water in a saucer, and be careful that the picture side does not get wet. The transfer will probably curl up when laid on the water, but don't touch it; it will unroll itself in a very short time and lay flat on the surface. After a few minutes lift the transfer carefully from the water, lay it face upwards on a piece of blotting paper for a moment, then press it face downwards on to the tacky glass. Put on several transfers until the glass is covered, moisten the back of the paper again if it has begun to dry, and then peel the paper off. The pictures should then remain on the glass ready for use in the lantern.

Binding the edges of the glass will add to the finished appearance.

Writing Announcements on the Slide.

If you want to write announcements you can do this by smoking some of the plain glass slips in the flame of a candle and writing on them with a fine point. The slightest touch will rub the black off, so if you want to keep these slides they should be bound round the edges with a second glass to protect the black surface, the two glasses being kept slightly apart with slips of paper along the edges.

Photographic slides can be made on plain glass from your own negatives by using Kodak Transferotype Bromide Paper. This is printed and developed exactly as an ordinary bromide print, but there is a coating of soluble gelatine under the sensitive surface which allows the paper to be stripped off, leaving the picture on the glass or any other desired material. Full detailed instructions are given by the makers for using this paper.



The method of electro plating articles.

ELECTRO-PLATING AT HOME

By H. Welton

AN interesting and profitable hobby is to be found in plating metal work. Oddments that the amateur has made increase in value and appearance on receiving a coating of nickel or silver, while objects about the house—door handles, cutlery, vases, etc., whose original plating has become worn, may be readily restored to their original, attractive finish. When proficiency in the art has been attained, the plating of articles for neighbours and friends may be accomplished at remunerative rates, and hence the hobby may be turned to good account. By following the instructions, gratifying results will be obtained.

There are three operations in the process of plating:

Cleaning the Article. (This also includes, when applicable, the removal of existing traces of an old coating.)

Plating.

By chemical means.
By electro-chemical means.

Polishing.

These will be dealt with in order.

CLEANING.

This is the most important stage in the whole process. The presence of grease, dirt, or paint will hinder the deposition of metal, and will result in an uneven and messy coating, hence the following must be carefully carried out.

Scrub the article, using soap and water; then immerse in a caustic soda solution (1lb. to the gallon), finally removing and rinsing under the tap. It is most important that the object must not now be touched with the fingers, as these, however clean, would leave a film of grease, resulting in ultimate disappointment. It is a good plan to attach a wire to the article before commencing the cleaning process, as this facilitates subsequent manipulation. If traces of an old coating are present, these must be removed before cleaning by immersion in a solution of 4 volumes of sulphuric acid, 1 volume of water, to which has been added, when cold, 1 volume of nitric acid. After this treatment the work is rinsed, scrubbed, immersed in alkali and washed as previously described, when it is ready to receive the plating.

PLATING.

By Chemical Means.

This method does not yield the lasting thick coating obtained by the electro-chemical method to be described later, but nevertheless provides a means of quickly obtaining a brilliant finish, which, if the article is not subjected to a great deal of handling, will prove very lasting.

With Copper.

Prepare a solution: Copper sulphate, 1oz.; water, 4oz. The article, which must be of iron or steel, is immersed in this solution until a good deposit of copper has been secured, after which it is washed and polished gently.

With Silver.

The following is ideal for small brass or copper work. Dissolve a small quantity of silver nitrate in distilled water, and make also a similar solution of potassium cyanide (Caution—Poison). Add the latter solution slowly, and stir the former, until the white, curdy precipitate at first formed, just dissolves. Into this solution shake a handful of whitening. Apply this thickened liquid on a soft rag, rubbing well into the surface of the article, upon which a fine coating of silver is deposited. Finally, rinse and dry, polishing lightly with a soft cloth.

With Nickel.

With a moist cloth rub on the surface of the article to be plated a little of the following powder: Nickel ammonium sulphate, 2 drachms; magnesium powder, 6 grains; powdered chalk, 1 drachm; talc, 15 grains, then wash and dry. This process, which gives a fair coating of nickel, is really electrolytic, although no battery is used. The magnesium powder acts as an electrode, causing a current to be produced in the presence of moisture.

By Electro-chemical Means.

This process gives better results than the previously described immersion and application methods, since the thickness of the deposit is entirely under the control of the operator.

The following apparatus is required: A large glass jar, of such size that it will comfortably hold the article to be plated, a four- or six-volt accumulator, and a rheostat.

We have the choice of plating in three metals: copper, nickel, and silver, and, as copper is the cheapest, it will pay the amateur to copperplate a few articles as a preliminary to more elaborate work. In the case of certain metals, iron and steel, for instance, in order to apply a plating of nickel, it is necessary to first plate with copper, as the nickel cannot be directly coated on to these metals.

The Lay-out of the Apparatus.

This is the same in any type of plating and is as follows. The glass bowl or jar contains the chemical solution (suitable formulæ are given later), and also the article to be plated. On either side of the latter are placed two strips of the particular metal of which a coating is desired. A wire connects these strips to the rheostat, the other terminal of which is joined

to the positive side of the accumulator. The rheostat is thus in series with the plus plates of the battery and the plating metal. The article to be plated is connected direct to the negative pole of the cell. The general arrangement is shown in sketch.

To copperplate carbon, and most of the commoner metals (with the exception of iron and steel), a solution of copper sulphate in dilute sulphuric acid, constitutes the plating bath. The strength of this solution is unimportant. Immerse the article in the bath, together with two strips of clean metallic copper, the wiring arrangements having been completed. Now, by means of the rheostat, adjust the amount of current flowing in the circuit, until a fine stream of bubbles is emanating from the article which is being plated. This adjustment is critical and important, as excessive passage of current, denoted by vigorous bubbling, causes a fluffy, non-adherent deposit. Plating may be now continued until a sufficiently thick coating has been obtained, after which the work is removed from the bath, washed, dried and polished.

Plating with Copper.

For plating objects of iron and steel with copper, an alkaline bath is used. A suitable formula is: Rochelle salt, 5oz.; water, 20oz. Copper sulphate, 1oz.; water, 20oz.

Mix the two solutions and add caustic soda solution until the precipitate dissolves, leaving a fine dark blue solution.

While on the subject of copperplating a word on the production of electrotypes would not be out of place. The amateur may easily reproduce medals, coins, etc., in copper, by making a wax impression, well dusting it with graphite, attaching a wire so that contact is established with the dusted portion, immersing the whole in the plating bath, and applying a thick coating of metal. A substantial reproduction having been obtained the wax is melted off and the metal shell reinforced, if necessary, by filling it, from behind, with hard wax.

With Nickel.

The following is a suitable plating bath: Nickel sulphate, 1oz.; water, 1 pint.

When dissolved, add half an ounce of ammonium chloride.

Two pieces of sheet nickel constitute the positive electrode. Proceed as described with copper.

With Silver.

The following plating bath must be used with great caution, as it is extremely poisonous, and, when in use, may emit some vapour of prussic acid: Potassium cyanide, 200 grains; water, 1 pint.

Dissolve in this solution 80 grains of silver chloride.

Use two stout pieces of silver foil as electrodes, and proceed as above.

POLISHING.

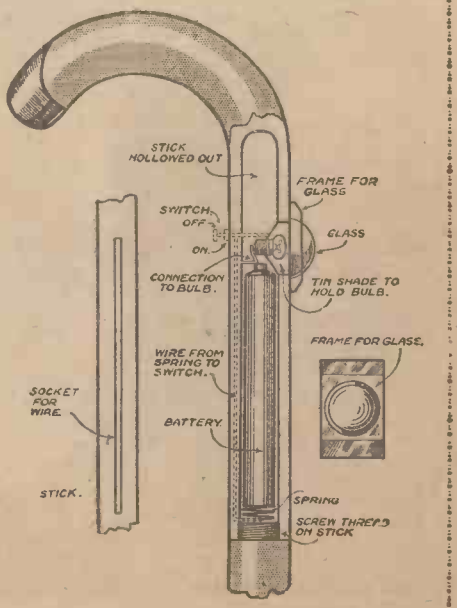
Plating having now been completed, it remains to polish the work. The quickest and easiest method of accomplishing this is by means of a soft buffing spindle, but as such an aid is not always available to the amateur, polishing paste and "elbow grease" are, in this case, resorted to.

Using a soft duster, the work may be burnished with a silver polishing paste, and light friction. Whitening applied on a damp duster serves quite well, as does also jeweller's rouge used in a similar manner. A good polishing pad may be made by soaking a duster in a mixture of petrol and whitening with a little oleic acid. On evaporation, the petrol leaves the duster ready for use.

When polishing articles plated by chemical means, in this process, it must be remembered that the coating of metal on the article is of thin character, and must not be expected to withstand heavy friction. Hence, on this account, polish very lightly.

A FLASH-LIGHT WALKING-STICK

THE illustration shows in part-section a walking-stick which has been adapted to carry a small battery and flash-lamp bulb. It may be switched on and off by means of the small switch whilst in normal use, and will be found extremely useful to those who reside in unlighted streets. It will be seen that the stick has a screw-thread cut in its straight portion. The upper part is hollowed out to receive a pencil battery. A small frame for the bulb and glass is fitted to the front of the stick, and the connections are made as shown. A small spring is placed beneath the bottom of the battery to force it into contact with the electrical connection. No doubt many readers will be able to find from odd electrical apparatus the pieces necessary to adapt the stick in the manner here detailed, but in case they cannot it is worth mentioning that small sockets complete with reflectors and lenses suitable for the purpose are obtainable from most electricians. The idea may also be adapted for other items of personal use, such as attaché cases, handbags, and so on. The diagram clearly shows all of the connections.



"HOBBIES" CINEMA

By

"Home Mechanic"

Fig. 1.—The finished model of the cinema projector.

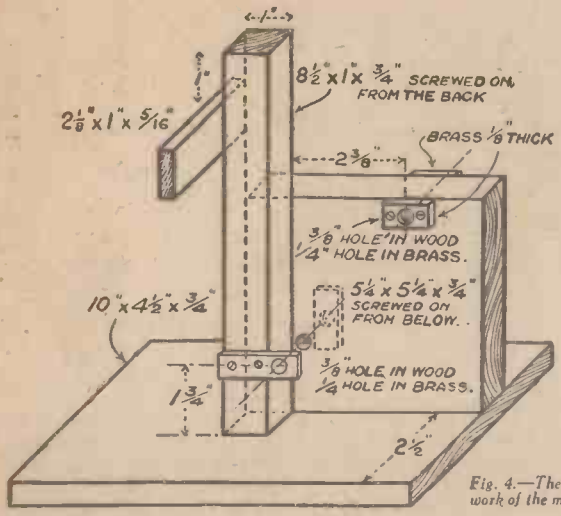


Fig. 4.—The framework of the machine.

THIS projector has been specially designed for HOBBIES, so that it can be made without a lathe and without the use of toothed wheels; also the mechanism has been specially worked out so that the accurate positioning of the film does not depend upon the accuracy of machined parts. Any intelligent boy can therefore undertake the construction of this projector if he is handy with a drill, file, and soldering iron, and is blessed with a moderate degree of patience.

The machine takes Pathé Baby films, as these are reasonable in price, there is a good selection to choose from, and also they are non-inflammable.

It is advisable to study the photographic illustrations to get a clear idea of the working of the instrument before commencing construction. Fig. 1 is a comprehensive photograph, showing the general arrangement.

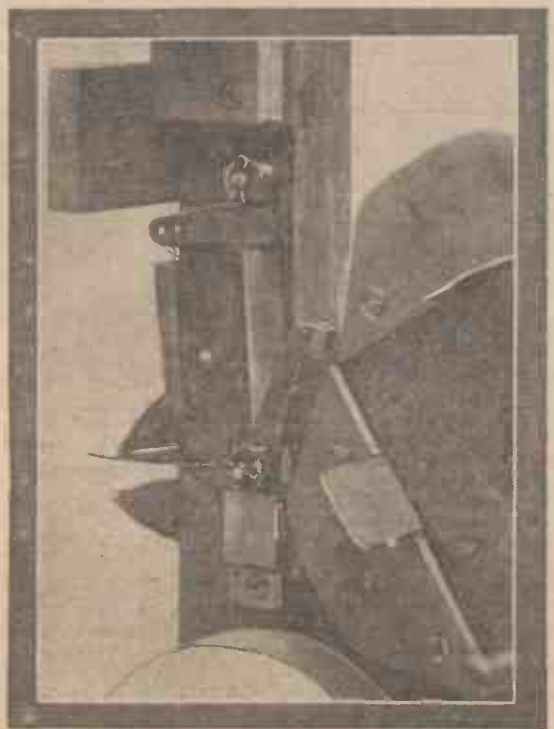


Fig. 3.—The mechanism which gives the necessary intermittent motion to the film.

How To Operate.

The metal case containing the film (every film is supplied in such a case) can be seen at the top of the picture resting in a wooden cradle and held in position by a rubber band. The film passes along a brass guide through the "gate" (i.e., the hole through which the light shines), and out on to the take-up reel, which is conspicuous at the bottom of the picture. On the right of the picture is a wooden disc—turned by a handle—which carries four brass cams screwed on to its face. These cams operate the mechanism which moves the film; each cam causes a picture to move out of the gate and a new picture to enter. Now the pictures have to be changed at the rate of twelve a second, so it will be seen that it is necessary to turn the handle at three revolutions per second to operate the machine properly. This is quite a convenient speed. While the picture is moving across the gate the light is cut off by one of four flat pieces of metal which project from the face of the cam-wheel and act as shutters. These shutters uncover the lens immediately the picture comes to rest in the gate, and allow the image to be projected on to the sheet for its allotted period of a little less than one-twelfth of a second, when the next change becomes due.

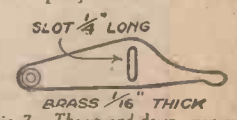


Fig. 7.—The up-and-down movement of the little tongue is limited by two stops, as shown.

The Mechanism for Giving Intermittent Motion to the Film.

The mechanism which gives the necessary intermittent motion to the film is shown in Fig. 3, which is a "close-up" view with the lens and gate removed to show the details more clearly.

Two "followers" will be seen in the path of the cam which is assumed to be

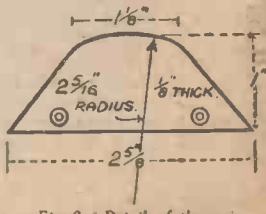


Fig. 8.—Details of the cam.

HOME PROJECTOR

This fine working model cinema projector can be built in a few hours at very little cost.

moving in an upward direction. The lower follower, pivoted near the top of the illustration, is just coming into engagement with the cam which moves it about 1/10in. towards the left; on this follower is pivoted a "bell-crank" lever, which is, of course, also moved bodily to the left, causing the tongue of metal on the extreme left to be pushed through one of the perforations of the film (not shown on photo). The cam as it moves upwards then comes into contact with the second follower—which has a movement of about ¼in.—and pushing this to the left, moves the film downward through the medium of the bell-crank lever. The movement of the tongue is limited by two adjustable stops, and when the cam has passed, the tongue is withdrawn from the film, and the moving parts brought back to position ready for the next cam by spiral springs in tension.

Details of the Construction of the Machine.

In describing the construction of the machine only essential dimensions will be given, as it is intended that the parts should be made and assembled in the order given, each part being fitted to those made previously.

Commence by making the framework shown in Fig. 4. This does not require much description, but all the pieces of wood should be planed and fitted truly square or complications might arise during erection. Fig. 1 shows the baseboard cut away to clear the take-up reel, but this will not be necessary if the dimensions on Fig. 4 are followed.

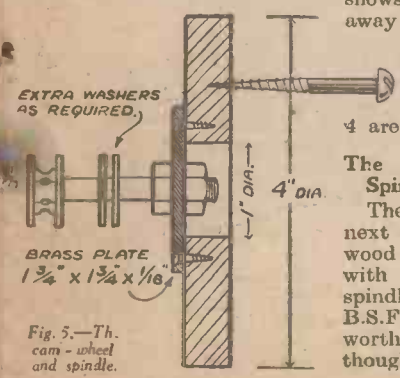


Fig. 5.—The cam-wheel and spindle.

The Cam-Wheel and Spindle.

These should be made next (see Fig. 5). The wood disc can be cut out with a fretsaw; the spindle is a 1¾in. x ¼in. B.S.F. bolt. A Whitworth bolt would do, though the finer thread is preferable. A washer is soldered on each side of the head to form a small grooved pulley for the take-up drive. Mount the wheel and spindle in its bearings, and fix a long screw into the face of the disc as a temporary handle. If the wood disc does not run true, the brass back plate can be taken off and refixed, and the face of the disc can be trued up by packing the wood away from the back plate as required. The face of the disc should stand out about 1/16in. beyond the tall upright of the frame.

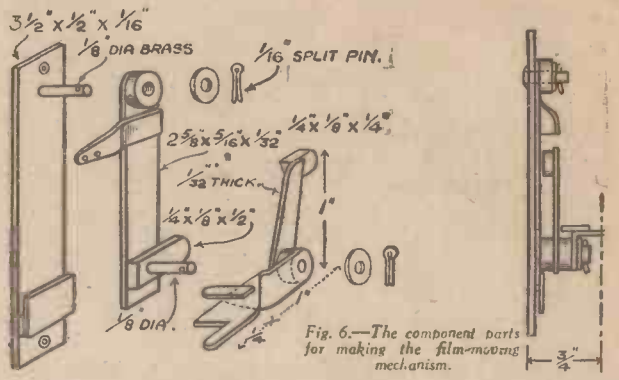


Fig. 6.—The component parts for making the film-moving mechanism.

The Film-Moving Mechanism.

This is shown complete in Fig. 2. All the separated parts are shown in Fig. 6, together with a side view of the complete assembly. The dimension marked ⅜in. from the centre of the tongue to the back of the base plate is important, and should be adhered to. The protruding end of the tongue should be well rounded off to facilitate its entry into the film perforations. The tongue itself should be considerably narrower than the perforations, but its thickness should be as great as possible consistent with free movement into and out of the film. The angle between the tongue and the point of contact with the cam on the other arm should be 120 degrees, measured about the pivot of course. This piece of mechanism is all built up from pieces of brass soldered together, and is quite an interesting part to make. It should, of

Fig. 2.—The two stops fixed into position.

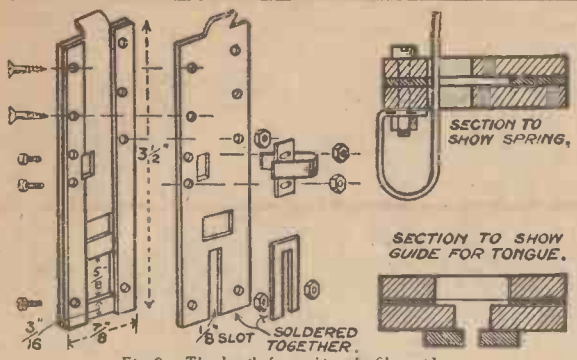


Fig. 9.—The details for making the film-guide.

course, work quite freely, and must be entirely without any tendency to sticking When complete, it should be screwed on to the tall member of the frame with the edge flush with the wood, as in Fig. 3, the vertical position being such as to bring the two cam followers equally above and below the horizontal centre line of the cam-wheel. After fixing this part, screw a small flat piece of thin brass on the other face of the upright member to act as a stop for the member carrying the lower cam follower; the end of this stop can just be seen in Fig. 3. It engages the lower end of the vertical pivoted member, where it works in the guide and prevents the member from coming out of the end of the guide.

The Two Stops.

The up and down movement of the little tongue is limited by two stops, as shown in Fig. 7. These are simply flat pieces of brass, about 18 gauge, and are fixed as shown in Fig. 2. The slotted holes allow for adjustment, the screws through the slots being round-headed and fitted with washers. The two stops should be fixed in a position to allow the tongue a movement of about ⅝in. above and below the horizontal (about ¼in. in all), when the screws are in the centres of their slots. The exact adjustment must be left till later.

The two spiral springs may now be fitted; the longer one operating the bell-crank should be of a "light and lively" type having a pull of between one and two ounces when fitted. The other spring must be definitely stiffer and stronger, so as to ensure the tongue being withdrawn from the film before its upward movement begins.

Now make four cams as shown in Fig. 8. Fix one of these on to the face of the cam-wheel as in Fig. 3, so that the cam projects $\frac{3}{16}$in. Turn the cam-wheel slowly and see that the lower follower is moved about 1/10in. by the cam; if the movement exceeds this amount appreciably, it should be reduced by filing down the follower a little, if less than 1/10in., shift the cam out to give the required movement. Next turn the wheel until the upper follower is fully lifted, and, leaving the wheel in this position, adjust the lower stop (Fig. 7) until it presses quite firmly against the under side of its lever, but leave the adjustment of the upper stop till later. The other three cams may then be screwed in place, taking care that they all give the correct movement to the lower follower.

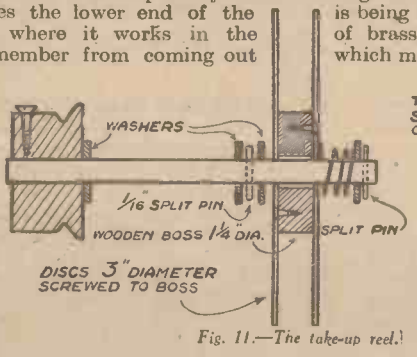


Fig. 11.—The take-up reel.

If everything has been done properly the tongue should move up and down too rapidly to be seen when the wheel is turned smartly by its temporary handle.

The Film Guides.

Before starting to make the film guide shown in Fig. 9, the reader is strongly advised to buy a film and make sure that the parts fit the film as he proceeds. Thirty foot films can be obtained new for 2s. 6d., or second-hand (from dealers who specialise in film exchanges), for less. A second-hand one should do for the purpose of fitting up, as it will probably become scratched or torn before the instrument is finished. The construction of this part should be quite clear from Fig. 9. The copper foil should be slightly thicker than the film and the width between the two strips of foil should be very little greater than the width of the film, only just enough to allow the film to slide freely. The little bolts, 10 B.A. by ¼in., can be obtained from a model engineer's supply store. The little spring shown larger in the sectional view is to keep the film over to one side of the guide and to steady the film by introducing a little friction; the blade that rubs on the film should be rounded off to prevent scraping, and slotted holes for the bolts allow the spring to be moved to increase or reduce the pressure on the film. The blade of the spring should project far enough to be pushed aside by your finger when the film is being threaded down the guide. The slotted piece of brass at the bottom is a guide for the tongue, which moves the film; it should fit the tongue closely, but not too tightly, and should be carefully centred before being soldered on.

The "Gate."

The hole forming the gate should be left uncut for the present. Screw the film guide on to its wooden support (see Fig. 2) in such a position that the tongue works freely in its slot within the limits of the large hole opposite. Then adjust the top stop (Fig. 7) so that the tongue has exactly the required movement to bring it directly opposite to a perforation in the film. It should withdraw from one hole when at the bottom stop and come directly opposite the next hole when at the top. The position for the gate should then be marked out, so that when the tongue is in a perforation at the top of its movement there is one picture between the tongue and the bottom of the gate.

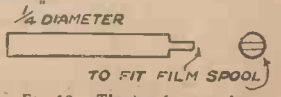


Fig. 12.—The key for rewinding the film.

The Lens.

This should now be fitted. An ordinary magnifying glass of about 1½in. focus will give a fairly good result,

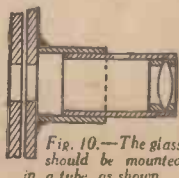


Fig. 10.—The glass should be mounted in a tube, as shown.

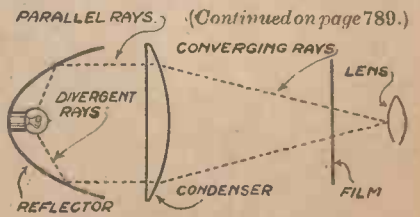


Fig. 13.—The arrangement of the condenser.

(Continued on page 789.)

THE AIRPLANE BOMBING GAME

A novel and exciting game any handyman can make in his spare time, and with a few fretwork tools.

HERE is a game which provides endless fun and excitement, and a glance at the picture of it will convince the reader that the model is well worth making. The lower part of the model is in the form of a wheel provided with holes which are numbered, and above which is erected an airplane so constructed as to allow a small marble to drop on to the wheel into one of the holes as the wheel revolves. There is nothing difficult about making the model, as will be realized in reading the following instructions.

The base (Fig. 1) is made from a piece of wood 12in. by 10in. by 1in. thick. After nicely squaring the edges, mark 5in. from one end and 5in. from one side to give the position for the bearing of the wheel spindle. The bearing is formed by scooping out a countersunk hole a little less than ¼in. diameter at the top. In the other end of the base, cut a mortise ⅝in. deep and 3in. wide to take the main back support.

The support for the wheel spindle (Fig. 2) is made from ⅜in. three-ply 3in. by 8in. Mark a centre line along its length and cut a tenon on one end ⅝in. deep and 2in. wide. At the other end on the centre line 1in. inwards, strike the curve of 1in. radius and draw the tapered sides. On the same centre mark a circle ½in. diameter and cut this out to form the top bearing of the wheel spindle. The support bracket is also shown (Fig. 2), and is cut from wood ¼in. thick.

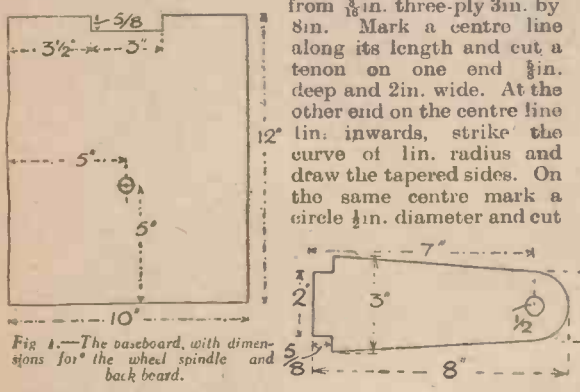


Fig. 1.—The baseboard, with dimensions for the wheel spindle and back board.

The wheel spindle (Fig. 2) is made from strong wood ⅜in. square. One end is made ½in. diameter and ⅝in. long, and the other end is made the same diameter, but only ¼in. long and with the end formed to a point which will swivel nicely in the bearing in the base. Readers who own a lathe may readily turn the ends of the spindle, but with a little care they may be formed with a sharp knife and finished off with sandpaper.

The wheel is the next part to make, as detailed in Fig. 3. A piece of wood 1in. thick is required, and this is cut as a circle 9in. in diameter. Then strike a circle with compasses 7in. diameter on the blank, and divide this into twelve equal parts—readily done by means of the ordinary 60 degrees and 30 degrees set-square. At each point thus found on the circle, make a hole ¼in. deep with a ¾in. centre-bit. Mark a ¾in. square in the centre of the wheel and cut this out to a good fit on the square portion of the wheel spindle. The square is readily cut by first drilling through and then squaring the sides and corners with a chisel. An edge is required round the wheel, and this is formed with a strip of tin or leather in the manner indicated in the lower drawing of Fig. 3. Cut a piece of material 28½in. long by ¾in. wide, and carefully fix this round the edge of the wheel with small tacks so that the top projects ¼in. above the wheel face. When you come to the joint, cut the length to a close fit. The wheel and spindle may now be fixed together with a little glue, taking care to get the end of the square shank flush with the underface of the wheel.

The back upright support (see Fig. 4) is made from a piece of wood ⅝in. thick cut 12in. long by 3in. wide. A mortise is cut in the support 2in. wide by ⅜in. in position 1¾in. from the end as indicated. This mortise should be cut to a good fit to the tenon on the wheel support. At a distance of 1in. from the other end cut a second mortise, 1¾in. by ¼in., to take a bracket for supporting the plane.

The parts of the plane are illustrated at Fig. 5. First cut a piece of ¼in. wood 10⅞in. by 9in., and mark a centre line through the 10⅞in. length. Mark off the outline of the plane from the measurements in Fig. 5, and then cut to shape with a fret-saw. At the tail end of the plane cut a mortise 1¼in. by ¼in. on the centre line ½in. inwards from the edge. Measuring 9⅞in. from the tail-end edge on the centre-line, make a hole large enough to allow a small marble to pass through with ease.

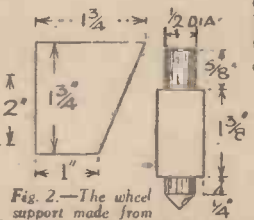


Fig. 2.—The wheel support made from two parts, and the spindle which fits into the wheel.

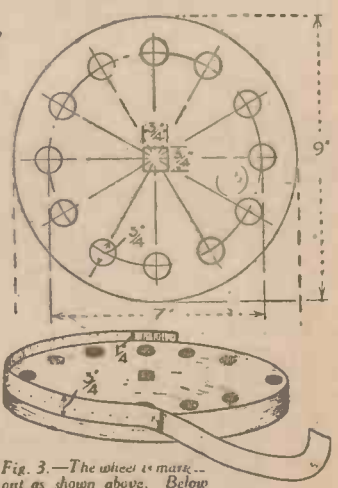


Fig. 3.—The wheel is marked out as shown above. Below is the way a strip edge is put round it.

A PLANT-HOLDER

This handsome jardiniere is made in beech and stands 9in. high, with a 9in. square base. It can be made by using the patterns on this week's gift design sheet.

WHY have plants standing about the house in ugly brown earthenware pots when you can make up handsome and useful containers for them like the one illustrated here? It can be built from any common fretwood, and workers are helped out of the difficulty of planning their own by being provided with designs which can be pasted down on to the wood ready for cutting out. These designs are printed full size on the sheet which is given with this issue, and a parcel of wood supplied by Hobbies contains all the necessary boards to which the patterns can be fixed. These are in beech—an exceptionally suitable material for this class of work. A jardiniere wants to look strong and to be strong at the same time, so some of the ordinary light woods are not in keeping with the requirements. Beech in the ordinary way is very hard and tough, but the boards supplied by Hobbies are specially prepared to make them suitable for cutting with the fretsaw, and any worker of ordinary ability can undertake all the patterns necessary. This is undoubtedly the easiest way out, for not only does the parcel contain the boards, but also the three different kinds of moulding and the fancy wood ornaments, all of which are used to build and decorate the work. One lot of moulding is required to form the base and feet, whilst another is used as the framework round the top to save the trouble of building up and shaping three or four pieces of material. Then again, the corners are ornamented with a special new moulding which every woodworker should know about, as it saves no end of trouble in the building of all kinds of frames and boxes generally. This is a corner moulding formed at a right angle so that when the box is butted together in the ordinary way the edges of the wood are covered by this ornamental material being glued on. At Fig. 1 can be seen the manner in which it is used to cover the corner joints. The moulding for the base is the shaped moulding shown at Fig. 2.

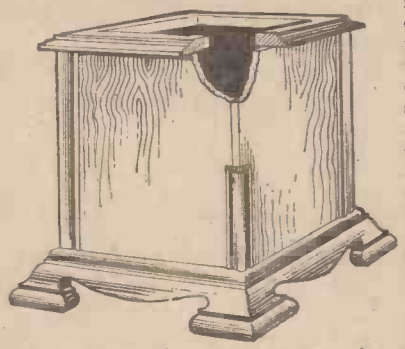


Fig. 1.—Showing the general construction and a detail of the way the corner joint is covered by moulding.

Fig. 2.—The shaped moulding supplied for the base.

The moulding at the top of the box (illustrated at Fig. 3) is a flat moulding generally used in much larger cabinet work. Now it comes in useful to form a framework on the top of the box, but in order that it shall not appear too heavy, $\frac{5}{8}$in. is cut off the back edge, and a little arc of wood is then cut further inwards. Thus the moulding is left $1\frac{1}{4}$in. wide instead of $1\frac{7}{8}$in.

How it is Made.

The general construction of the jardiniere is simple, and most of the work is in $\frac{1}{4}$in. wood. The sides are composed of four pieces butted together at the corners. Two each of the patterns shown are needed, and the two narrow ones fit between the two wide ones as indicated by the dotted lines on the design part of the base. The centre circle is cut from the base, and the drill hole for the saw should be made on the actual cutting line, because the piece of wood which comes out is used for a platform upon which to stand the flower pot later. This platform is merely the circular piece of wood glued and screwed to two strips which act as supports, and are put together as shown in Fig. 4. The box framework itself is glued down to the base and screwed from the underside through the screw holes previously made. The corner moulding is then added over the corner of the box frame to cover the edges as already mentioned.

The top framework is a rectangle of the No. 41 moulding made up of four pieces cut at an angle of 45 degrees at each end. The design for one is given on the sheet, and this can be used to mark out the others when it has been cut. This is the moulding, of course, from which the strip has to be taken as spoken of earlier. The parts for the strips which are cut away, too, also serve as blocking pieces to be put beneath in the corners to make the frame more rigid. A section of it is given at Fig. 5, and the design pattern indicates quite clearly the parts which are to be used for this purpose. It is essential, of course, to get this top framework rigid, especially as it cannot be screwed down. Glue should hold it in place along the top edge of the box framework, but these corner angle blocks will also provide a greater surface for additional strength. The

Fig. 3.—The flat moulding which forms the top framework.

shape of the moulding, of course, is on the upper edge.

The whole box framework of the jardiniere is now complete, but in order to raise it as a suitable stand, it is necessary to build it on to the moulded base-work which also forms the feet. This part is cut, as has been mentioned, from the No. 43 moulding. Four pieces of this moulding 9in. long will be required, and each end will have to be mitred by standing it in a mitre trough.

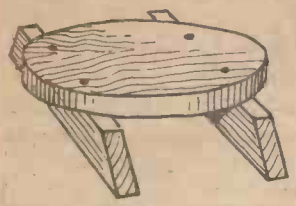


Fig. 4.—The platform inside the jardiniere to act as a stand for the plant pot.

When the pattern shown has been taken out with a fretsaw the two ends of the moulding are stood in a mitre box and sawn across at an angle of 45 degrees when the moulding is standing on its solid edge. (This cutting was referred to more fully in our issue of January 10th.) On this mitred length of moulding has to be added the pattern from which the shape is cut to form the feet outline. Mark up a centre line on the back of the moulding, and get the centre line on the pattern to coincide with it. The pattern is pasted down on the flat face of this moulding, and turned over round the edge as shown in Fig. 6, so that, when laid on the cutting table, it can be cut with the fretsaw to the line given in the ordinary way. Having thus obtained one shape, it is a simple matter to mark out the others by laying this one on the other pieces and going round it with a pencil.

Thus we have four parts which, when stood together, meet at the mitred corners and form a sort of hollow platform. Upon this platform the box framework previously prepared should stand evenly, and it is glued all round, with blocking pieces added beneath, as can be seen by the sectional drawing at Fig. 7. These blocking pieces, of course, cannot be square, but must be chamfered off with a plane in order to meet the sloping surface of the inside of the moulding. See that they are glued near the corners to help strengthen the angle of the base. They must not be so long as to show beyond the fretted shape of the base moulding itself.

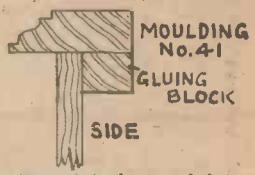


Fig. 5.—A side view of the top frame and sides, to illustrate the strengthening blocks in the angle.

The sides of the jardiniere are shown with an overlay and a decorative ornament on each, and these can be cut and added before the work is put together, or can be put on when the rest of the work is complete. The best way is probably to put them on each side before the box frame is put together, because this allows the two parts to be weighted down so that the overlay is firmly fixed. All the overlays are cut from $\frac{1}{16}$in. wood, so that they can easily be got out together by nailing two or three pieces of the thin material into one board and cutting out the pattern at one operation. The centre of each is a solid piece, and on to this is glued some wooden ornaments (No. 231) which forms a striking rosette on each side of the jardiniere.

As the wood is in beech, it should not be brilliantly polished, but can easily be stained down slightly with a dull polish, or treated with linseed oil just to darken the material down in its natural state and to bring out the mottled effect of the grain.

Fig. 6.—How to paste the pattern to the moulding base

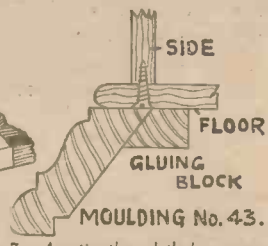


Fig. 7.—A section through the base, again showing the use of blocking pieces.

THE AIRPLANE BOMBING GAME—(*Continued from page* 779).

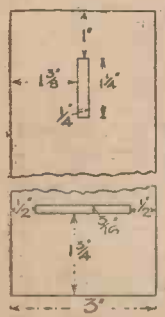


Fig. 4.—The back board which supports the airplane. Dimensions for the slots are clearly shown.

The bracket for holding the plane to the main support is also cut from wood $\frac{1}{4}$in. thick. Cut tenons as indicated, to fit in the mortises made in the main support, and in the main plane.

The other two pieces of the plane (to go beneath) are required cut to shape indicated, and are glued under the side edges of the main plane, one on either side of the hole for the marble at the front, the square ends coming flush with the end of the plane. Fix the whole plane in place on the back and then cut a piece of $\frac{1}{4}$in. by $\frac{1}{4}$in. stripwood 1$\frac{1}{2}$ins. long and two pieces 6in. long.

The model will look more real with a propeller, and this is cut from an odd piece of $\frac{1}{4}$in. wood 4in. long and $\frac{1}{2}$in. wide (see Fig. 6).

Fix the back support (Fig. 4) to the base with two or three small screws. Glue the bracket under the wheel support, to give extra strength. The article should be stained or nicely painted to one's own requirements.

The number which the marble rests in is the count for the turn. The game may be played 100 up, and to win a player must score the exact number.

Fig. 6.—The size and shape of the propeller.

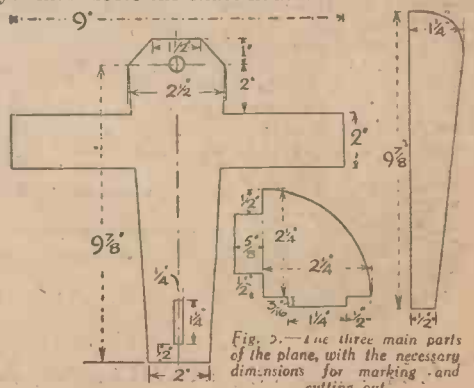


Fig. 7.—The three main parts of the plane, with the necessary dimensions for marking and cutting out.

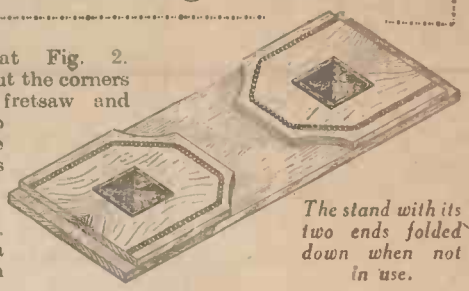
Another instance of the usefulness of the fretsaw. This handy stand is just the thing for your library and reference books.

A SIMPLE BOOKSTAND with Folding Ends

A HANDY form of book end rack is illustrated herewith, and a glance will show the advantages of the folding ends. When the stand is not in use it may conveniently be packed away, and the ends folded down on to the base, so taking up less room and with little fear of becoming broken.

Having got the wood clean and ready, cut the base 1ft. 4in. long by 6in. wide and ⅞in. thick. The ends are to be hinged to the base, so form four recesses ⅞in. inwards from each end and 1in. from either side of the base edge as indicated in Fig. 1.

Two ends ⅞in. thick are required from the same kind of wood 6in. square. Mark one end into ½in. squares and then draw the curved corners as shown at Fig. 2. Neatly cut the corners with a fretsaw and clean up the face and edges with sandpaper. Make a recess in the bottom edge of each end piece to take the hinges to be fixed in the base. In the centre of the outside of the book ends glue a 2in. raised square oak ornament (Hobbies No. 210), and then fix the strips of ⅜in. half-round beading (No. 52) ½in. inwards from the edges as can be seen in the pictures. The beading should be arranged so that a complete ball comes at the corners in order to obtain a good joint (see Fig. 3).



The stand with its two ends folded down when not in use.

Now try up the ends on to the base with the hinges in order to see if they will fold nicely over, making any little adjustment if necessary.

Particular care should be taken with the finish of the article, and a coat of spirit stain applied to match the kind of wood used will ensure this. The stain is supplied by Hobbies Ltd. in handy bottles made with a wide neck into which the brush may be dipped direct. Having applied the stain, the ends are finally fixed to the base by screwing on the small hinges with flat-headed brass screws.

Fig 1.—This diagram will show you how to mark out the base, and the position of the hinges.

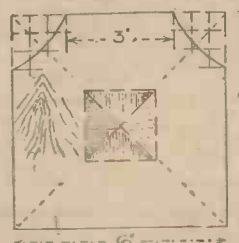
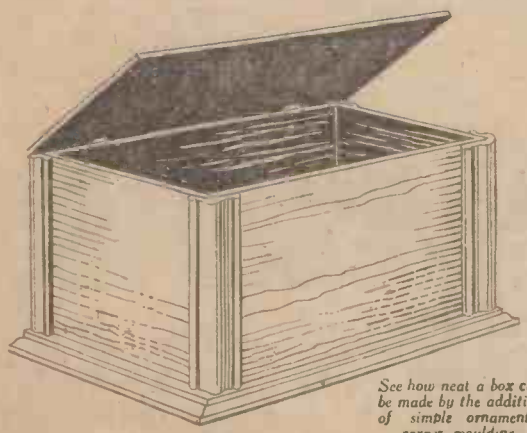


Fig. 2.—The shape and size of the ends. The position of the ornament is also given.

Fig. 3.—A "close-up" of the beading to show the join at the corners.



See how neat a box can be made by the addition of simple ornamental corner moulding.

An Easy Way of COVERING CORNERS

FOR cabinets and boxes of all descriptions HOBBIES new corner moulding is a boon, especially to the amateur woodworker who is not, let us say, quite so proficient in the art of joinery as he might be

For radio cabinets and boxes and cabinets of all descriptions, and for all purposes, this moulding offers an easy means of construction, and the use of it saves much time and money. The moulding is obtainable in three sizes, so it is suitable for all kinds of boxes. Moreover, it is finished smooth and semi-glossy so that no further cleaning is needed. As it is in light wood, too, it can be easily stained down to match any other work.

Fig. 2 (left).—A photograph of the moulding itself. It is obtainable in three sizes, with outside measurement of ⅝in., ⅞in., and 1in.

Fig. 1 (right).—A diagram showing how the moulding is used to cover an ordinary butt-joint. It is easily glued along two sides as shown.

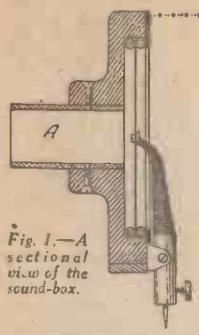


Fig. 1.—A sectional view of the sound-box.

AN EASILY-CONSTRUCTED GRAMOPHONE SOUND-BOX

By W. S. Rogers

A SERVICEABLE sound box may be made mainly of wood by the method described here.

The wood may be beech, birch or boxwood, and the grain should run parallel with the axis of the box.

First obtain a piece of stout brass tube (see A), externally ¾in. in diameter for a push-in tone arm socket, or internally that diameter for a push-on socket. Turn the cup-shaped body to the section shown in Fig. 1, making the central hole a tight fit over the tube.

The hollow face of the box may be 55 millimetres in diameter, hollowed to a depth of 5 millimetres.

Drive in the tube A, after smearing the hole with glue, and secure it with two screws as shown, their points having had the thread filed away so as to enter the holes in the tube.

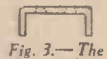


Fig. 3.—The plate that carries the two screws, on the conical points of which the needle socket pivots.

The Cover Plate.

This is cut from sheet brass, the centre part of which must be removed to such a diameter that its inside edge overlaps the internal edge of the sound-box hollow about ⅛in. (see Fig. 1). Drill eight holes in the plate for the screws that secure it to the box, as indicated in Fig. 2.

The Needle Socket and Stylus Bar.

The socket is cut from brass rod. A central hole is drilled to a depth of ¼in. from one end—sufficient to accommodate the ordinary steel needle. In the other end a saw-cut is made to receive the stylus bar. A transverse hole must be drilled to receive the cross member on which the socket pivots, and a small hole must be drilled and threaded to receive the clamping screw. Clamping screws may be purchased from dealers in gramophone sundries (see sectional view, Fig. 4).

The above details will be made clear by a study of Figs. 2 and 4.

Fig. 3 shows the plate that carries the two screws, on the conical points of which the needle socket pivots. A side view of this plate is shown in Fig. 1.

Assemble by sweating the cross member into its hole, and the stylus bar into its slot. The latter may be cut from hard sheet brass, and the perforated disc at its small end joined to it with silver solder. The hole must be threaded to receive the small screw that attaches the bar to the diaphragm. Conical cavities should be put into each end of the cross member to receive the points of the pivoting screws.

Fig 4.—Section view of the needl socket, showing the clamping screw.

The work on this part of the bar calls for neatness and accuracy, but offers no difficulties to those who can command the use of the necessary tools.

It will be noted that no springs are embodied in the mechanism.

The Plate.

The plate shown in Fig. 3 has two countersunk holes in its base. It must be screwed firmly to the box with long screws, as the latter will have to hold in end grain. Let the screws come through at the back, file down their points until they project about 1·32in., and rivet over, taking care not to split the wood. It is essential that this plate be rigidly attached to the sound box body. It should be noted that part of the cover plate is cut away (see Fig. 2) to allow of the other bedding on the wood.

Referring to Fig. 1, it will be seen that it overlaps the edge of the box slightly. A small block of wood, therefore, must be glued behind the overlap as indicated in this figure.

The Diaphragm.

This may consist of two thicknesses of mahogany veneer glued face to face with the grains crossed. When the glue is set the diaphragm may be cut to size and its thickness reduced by glasspapering an equal amount from each side until the thickness does not exceed a millimetre.

To assemble, obtain some rubber gasket from the gramophone dealer, cut off two lengths, each equal to the internal circumference of the box, push one in, lay the diaphragm on it, seeing that the edges of the latter clear the wood, add the second gasket and screw on the cover plate.

Put a fine hole through the centre of the diaphragm, pass the screw through it from the back into the head of the stylus bar and tighten up. Lastly, treat the junction with wax in the usual way.

A sound box made in this way should function as well as any of the highly-priced sound boxes on sale in the shops; in fact, if the diaphragm be made as directed above it would give results superior to many.

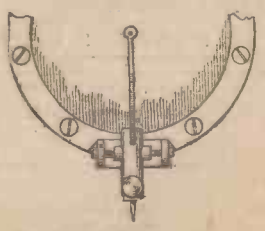


Fig. 2.—Showing how the cover plate is secured to the box.

NEXT WEEK!

MAKING A MODEL AEROPLANE DRIVEN BY COMPRESSED AIR

GROOVED LEGS

MAKE TABLE-MAKING SIMPLE

Isn't it much better to make a table yourself just the size you require rather than pay a big price for one larger than you want? Any amateur can do his own work now, and quite simply, too. These mahogany legs have ⅜in. grooves in them to hold side supports.

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28½ins. Long.
With ⅜in. Groove.
Mahogany Legs,
4/- per set.
Oak Legs,
3/6 per set.
36in. Mahogany,
4/6 per set.
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HEAD OFFICE & WORKS:
DEREHAM, NORFOLK.

AS in the case of the earlier flights, special stamps were issued, the number being restricted to 300. They consisted of the 36 cents of the Caribou issue surcharged as follows: "Trans-Atlantic Air Mail By B. M *Columbia* September 1930 Fifty Cents." This inscription, which is in seven lines, blots out the original stamp very effectually. It was set up in printer's type by hand in a group of four, so that only that number of stamps could be surcharged at a time. Each of the four shows some peculiarity which distinguishes it from the others, thus providing four "types." In the first stamp, for instance, there is a well-marked break in the "N" of "Trans"; birthmarks of a similar nature are found on the other three. A knowledge of these facts is of the utmost importance in the detection of forgeries, of which some have already appeared on the market.

Stamp issued for Hawker's historic Atlantic flight in May, 1919

New Issue of Newfoundland.

The new set, which consists of the three values 15c., 50c., and $1.00, are real works of art, and have been produced by the London firm of J. Dickinson and Co., who recently got the contract for printing the ordinary postage stamps of Newfoundland. The design of the lowest value contrasts the old and the new methods of carrying mail. A courier and dog-team is seen toiling over the snow-covered ground; overhead is an aeroplane which is provided with skids.

Vickers Vimy Leaving St. John's.

The 50 cents reproduces the same idea with a view of an old top-gallant sailing ship between the rocky slopes of the Narrows; floating above is the Vickers Vimy biplane of Sir John Alcock flying in the vicinity of the Cabot Tower on Signal Hill. Below the picture is the caption: "Vickers Vimy leaving St. John's with first Trans-Atlantic Air Mail passing over the First Carrier of Ocean Mail." The highest value epitomises all the early Atlantic flights. A map of Newfoundland is seen on the left, the coastline of Europe on the right. On the intervening space are traced the courses of seven Trans-Atlantic flights as follows: Alcock, St. John's to Ireland; Hawker, uncompleted flight; De Pinedo, Trepassy to Azores; Lindberg's solo flight; the U.S. Navy seaplanes, Trepassy to Azores; Kingsford Smith, Ireland to Harbour Grace; and Koehl, Ireland to Greenly Island.

The three stamps have appeared in connection with the inauguration of an air mail service which was scheduled to begin in January between Mount Pearl, Hampton, Western Arm (White Bay), Condu and St. Anthony. I have not yet heard whether the Gypsy Moth machine which was to have essayed the first trip actually covered the course, but as the programme is of a very ordinary character there is no reason to fear the service is not by now in operation, and that the pretty stamps are not already justifying their existence.

NEWFOUNDLAND AIR MAILS.

By P. L. Pemberton.

(Concluded from page 755, March 7th issue).

A Youthful Mathematical Genius.

Though most collectors are familiar with the appearance of the Abel commemorative stamps of Norway, ninety-nine per cent. of them have no idea who Abel was. If he had lived even to an average age his name would no doubt have become known throughout the world as one of the mathematical giants of all time. As it is, during a life which was limited to only twenty-seven years, he made brilliant researches into the theory of functions, elliptic and hyperelliptic, and was the originator of a new class which is named after him and now known as Abelians. He cleared up many mathematical obscurities of analysis, and initiated new angles in the study of functions which widened the whole field of higher mathematics. Born in 1802, Abel's remarkable career was closed by death on April 6th, 1829. The special set of four stamps, in the design shown in the accompanying illustration, was issued on the occasion of the centenary of his death. At present the stamps are not rare, but as the issue was not a very large one they should soon appreciate in value.

A Norway commemorative stamp showing a portrait of Abel, the mathematical genius.

A MODEL AEROPLANE DRIVEN BY COMPRESSED AIR will be described next week!

SOFT SOLDERING SIMPLY EXPLAINED

By H. Greenly

Fig. 3.—The stand for the soldering iron.

THE art of soldering is like learning to ride a bicycle. No amount of reading will enable you to attain the perfection of balance on two wheels that a couple of hours' lesson on the actual cycle, and a few tumbles, will provide. To become skilful with the soldering bit get together the necessary equipment and try jointing up scraps of tin-plate, brass, steel and copper wires in various formations. You will soon be able to judge the right heat for the iron, the importance of working with a well-tinned bit, and also that main essential, perfect cleanliness, in the work being operated upon.

Processes of Soft Soldering.

To be entirely successful in the process of soft soldering, there are many little devices, other than those that are to be purchased at a tool dealer's store, that can be made up by the amateur for his own use. In addition, there are numerous "dodges" known to the practical man which, if adapted to the job in hand, will not only speed up the work but tend to produce very much sounder, cleaner and more workmanlike joints.

Fig. 2.—How to make a simple angle joint.

Fig. 1.—A wire to be attached at right angles to another should be looped together as shown.

The Weight of the Soldering Bit.

The term soft soldering covers all those lower temperature metal-jointing processes in which the base of the solder is a mixture of tin and lead. These solders are all fusible by the stored heat in a "soldering iron." A soldering iron is really a copper bit, held on to an iron stalk, which terminates in a wooden handle. Copper is used because of its conductivity and capacity for holding heat, and the bit is placed in a fire or over a gas-ring until it is hot enough to melt solder. A certain weight of copper is necessary, and for all average work the writer prefers a 12oz. bit. For very light work a 6oz. copper head will do very well, but, at the same time, it is very annoying to find that the solder cannot be melted because the bit has got cold, just as you are engaged in an intricate piece of work.

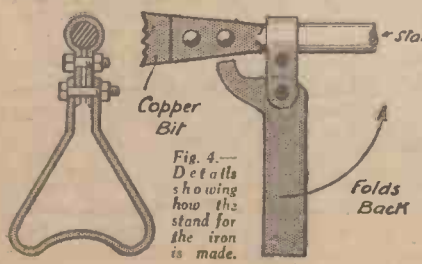


Fig. 4.—Details showing how the stand for the iron is made.

Fluxes.

The use of a flux is to stop the formation of an oxide on the surface of the metal and thus prevent the amalgamation of the solder and the metal. The solder adheres because the metal being soldered together forms a local alloy. This is why metals which have a natural affinity for the solder are joined together more strongly than otherwise.

Metals like aluminium are difficult to solder because their readiness to oxidize prevents the soldering alloy to be created. Special solders and fluxes are therefore sold to get over these difficulties, and it is also necessary in some cases to scrape the surface of the metal while it is being soldered. Welding aluminium is, however, a much more satisfactory process.

Fluid Flux.

Paste fluxes have their uses and can be recommended for some forms of electrical work so long as the job is cleaned of all flux after it is completed. For steel, tin-plate, brass and copper, strips and sheets of the fluid flux are to be preferred. By fluid fluxes are meant those which have as their base "killed spirits," viz., chloride of zinc, obtained by putting scraps of zinc into strong hydrochloric acid (spirits of salts). In making this flux always put in an excess of zinc to the mixture to make sure that no acid remains. While any hydrochloric acid is there it will continue to attack the zinc and become converted to the new compound chloride of zinc. If there is insufficient zinc, then free acid is present in the mixture.

The reaction should be performed in an open earthenware jar and also in the open air, as the fumes of hydrogen and acid which are given off are, to say the least of it, not very pleasant gases to breathe in.

When the bubbling has ceased pour on about three times as much water as there is fluid in the jar, picking out the larger lumps of remaining zinc. Then strain off through a piece of rag into another receptacle, and add a few crystals of sal-ammoniac. This is the common chemical used to replenish Leclanché electric batteries, and is easily obtainable. The mixture may be bottled (and, be it observed, properly labelled) for future use when diluted with a further equal quantity of water.

Place Flux in Strong Container.

A heavy, bulky pot—something like a small edition of the old-fashioned earthenware pickle jars or an old marmalade jar made of the same material—should at all times be used to hold a liquid flux. Something that will stand knocking about and which cannot be easily overturned is essential to success.

Using a Soldering Bit.

When the iron—as it is often called—is taken out of the fire or off the gas-ring, as the case may be, and presuming its working point is already properly tinned, it should be dipped into the pot of flux—quite a quick dip—and then poked into another jar of sal-ammoniac. An old experienced workman of mine used to prize a very large lump of sal-ammoniac which he laid on the bench and used in this way for "cleaning the iron."

The fumes accompanying soft soldering and the danger of splashing flux are both so deleterious to adjacent tools that it is always advisable to reserve a special bench in the workshop for soldering. If this is impossible, do the work as far away as possible from the better and finer workshop appliances.

Paste Fluxes.

All fluxes should be applied to the work by a piece of stick—a wooden meat skewer is quite a handy tool, and paste fluxes should be placed in heavy pots. Much petty annoyance in working is caused by not transferring a paste flux from the light tin in which it is purchased to a more massive container. If it is attempted to use the paste from the original tin, the stuff is so sticky that just at the critical moment, when it may be necessary to improve the flow of the solder by a touch of flux, you will find that the dibber stick picks up flux, tin and all. Therefore, keep the original tin as a store and transfer enough for use to either a heavy pot or one that is fixed down to the bench.

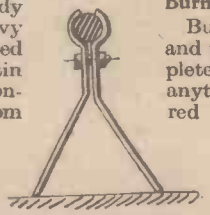


Fig 5.—How to make a permanent fixing for the foot of the stand.

Where it is advisable for the particular job in hand—say, wiring up a wireless set—to employ a paste flux, do not use it for dipping the end of the soldering bit into. Always provide the jar of fluid flux and the sal-ammoniac already referred to for cleaning the "iron" as it is removed from the fire.

Soldering Small Work.

For jointing or "sweating up" small objects which can be brought to the heat, soft soldering can be successfully done by a small Bunsen gas burner, methylated wick flame, or a blow-lamp.

A mechanical attachment of the two or more parts to be soldered is recommended in such cases, in addition to the soldering. A wire to be attached at right angles to another may be either looped round as shown in the sketch (Fig. 1), or if it is an angle-joint that is required, like that at the corner of a lamp-shade, the wires may be flattened and wrapped round each other, as in Fig. 2.

After hammering or working in any way which may similarly introduce foreign matter into the surface of the metal, the wires, or metal being worked on, must be cleaned and tinned. Even tinned iron wire gets "dirty" if hammered, and refuses to solder afterwards. To tin a wire or other small object, clean it with sand—or emery—paper, a scraper or a file, coat it with flux, preferably a fluid flux, heat up in the flame and reflux when it is hot with the stick of solder being used, dipped into the flux. If there is any solder on the job reflux with the wooden "dibber," guiding the solder where it is wanted. Rubbing the solder up and down the job will soon coat it so long as the right heat is preserved.

Burning a Joint.

But don't overheat it. This burns the solder and the tinning and prevents the job being completed. The work must never be brought to anything approaching red heat. Even the dullest red heat represents a temperature of over 800 degrees F., whereas the finest grade of soft solder melts at about 440 degrees.

A Stand for the Soldering Bit.

Where small work is being operated upon, the end of the "iron" may be used instead of the naked flame. To facilitate work of this nature a clip may be fitted on to the iron stalk of the soldering bit and to this clip a triangular foot, made of strip metal, is arranged as shown in Fig. 3. I have fitted one to my own iron. If it is thought that this foot is better if made to fold down, the clip should be provided with two holes, one to grip it to the stalk of the bit and the other, as shown by the sketch (Fig. 4), to carry the bolt holding the foot.

There is no real need to either remove or to fold foot. It may be a permanent fixing, as shown in Fig. 5, and will then be found most useful in ordinary soldering. It is often necessary to lay the "iron" down for a moment. The foot saves the bench from being burned by the hot copper bit.

(To be concluded next week.—Ed.)

"HOBBIES" HOME CINEMA PROJECTOR (*continued from page* 778).

though, of course, a better lens will give a sharper picture. The glass should be mounted in a tube as shown in Fig. 10, this tube being a sliding fit (for focusing purposes) in another tube which is soldered on to the film guide centrally over the gate.

The Shutters.

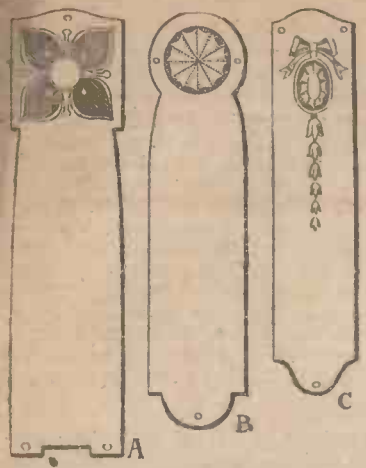
They are simply thin brass ½in. by 1½in. bent at right angles and clipped under the cams. Position them so that they come opposite the lens while the film is being moved, but leave the lens uncovered when the film is at a standstill. A permanent handle can then be fitted right behind one of the shutters (Fig. 1).

The take-up reel, Fig. 11, is simple, the centre is part of a cotton reel and the cheeks of aluminium; the hole in the outer cheek is to allow the film to be pushed into its clip by one's finger. The pulley is the remainder of the same cotton reel fixed by a radial wood screw, and a rubber band serves for a driving belt. The take-up reel is loose on the spindle and driven only by the pressure of the very light spiral spring, so that it can slip readily without putting appreciable tension on the film.

The Film Cradle.

The cradle for carrying the film can be made of three-ply wood, as shown in Figs. 1 and 2. No spindle is required as this is embodied in the metal case. For rewinding the film after a show a key like Fig. 12 should be made. It can be "twirled" between the fingers, this being a quicker method of rewinding than a tiny handle.

A lamp of the type illustrated in Fig. 1, but provided with a "bull's-eye" condenser will give a good picture about 12in. wide. A condenser is an absolute necessity and should be arranged to make the light converge right into the lens, as illustrated in Fig. 13. The more powerful the light the larger the picture. A motor-car headlight could be arranged to give a fine result.

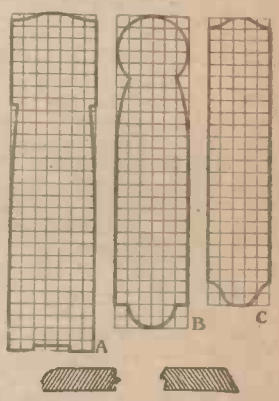


HOME-MADE FINGER PLATES

IT is surprising what a lot of difference a finger plate will make to a door, both in appearance and by the amount of dirt it saves, for nothing looks worse than a door marked by duty fingers. There are very few homes in which such plates would not be of use, and those shown here, although ornamental, are simple and inexpensive to make.

The plates are cut from ordinary $\frac{3}{16}$in. fretwood, ornamented with marquetry transfers, and polished. Practically any of the fretwoods—mahogany, sycamore, satin walnut, padouk, or oak—are suitable, and the plates may be made in any size or shape desired. Three designs are given, that at A being 14in. long by 3½in. wide; B. 13in. long by 3in. wide; and C, 12in. long by 2½in. wide. The outlines of the plates may be easily copied from the ruled patterns drawn to ½in. squares. A fretsaw is used for shaping, and the edges are either rounded or bevelled, as shown in the sections. If a rounded edge is preferred it is easily done with a file and finished with glass paper, while the bevelled edge may be cut with the saw, and using a tilting table.

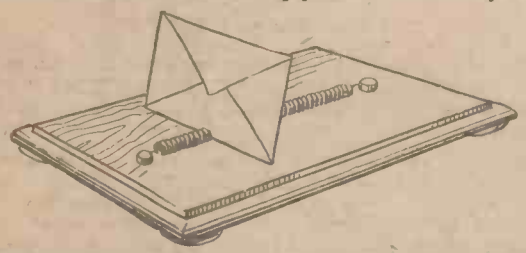
The plate A is ornamented with transfer No. 5182, size 3in.; B with No. 5147, size 2in.; and C with No. 5336, size 6in. by 1½in. The transfers are very easily applied. Any waste paper should be cut away, the film side is coated with transfer fixer and allowed to stand until tacky. In this condition it is applied to the wood, in the desired position, and pressed firmly. After some minutes have elapsed the paper should be damped until quite soft, when it may be peeled off, leaving the transfer on the wood. Some time should be allowed for the work to dry. It is then advisable to brush on a coat of polish, after which polishing may be completed. The plates should be fixed to the doors with small round-headed brass screws. Fretwood suitable for polishing, and in all thicknesses, with the handsome transfers, can be obtained from Hobbies Ltd. Full particulars supplied free on application.



Above, the patterns are shown drawn over ½in. squares, making them easy to draw on to the wood. Below, a section shows how the edges can be rounded or chamfered.

A Spring Letter Holder

A SIMPLE letter holder is made from two pieces of fretwood, four turned feet and a strip of spring. Put together as shown in the illustration, they form a useful article in any home or office. A suitable spring is the one used on the back of a Hobbies fret-machine—and obtainable separately (ask for Spring No. 1627) for 3d. The size of the base is about 6in. by 4in., with a larger piece beneath measuring 7 by 5. The bottom piece is ½in. or ¾in. thick, and the top piece thinner. They are



glued firmly together, and the edge rounded off as shown in the picture. The spring is stretched slightly to allow envelopes to be stood in, and the ends are fitted over hooks or rings to the base. Four little round toes are glued under each corner of the base, and the whole thing is given a coat of clear varnish. Almost any fretwood is suitable, and a number of stands like this made from waste wood will easily sell amongst friends or at a bazaar.

The World's Largest Motor Vessel

THERE is a great deal of interest in shipping circles now to see how the great motor vessel *Britannic* runs. The giant is the latest of the White Star fleet, and is the largest motor driven boat in the world. She displaces 27,000 tons, is 680 feet long, and is the last word in luxury in the furnishing and appointments. Just the boat to take a trip across to "little old N'York" on, what? Well, this latest wonders forms a feature of our gift design sheet next week. As you can see from the illustration, this useful piece of fretwork—a pipe rack—has an overlay picture of the new *Britannic* standing out in bold contrast from the background. The pipe rack consists of two shelves, so the bowl of the pipe rests downwards. All quite easy to cut and make—particularly as all the parts required are shown on the sheet full size and the wood is supplied planed and cut in boards the size of each pattern.

Let Your Editor Help You. Address your letters and queries to The Editor, "Hobbies," Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2. All letters and queries must bear the full name and address of the sender.

Our Title Page and Index.

MANY readers have written to me inquiring as to whether we shall issue a title page and index at the end of this volume so that they can have their copies bound up in a form in which they can readily refer to them. The answer is in the affirmative. Our volume ends with No. 1,849—two more issues to go! Binding cases, title page and a fully cross-referenced index will be issued for a nominal sum. I hope to be able to make an announcement regarding this next week.

A Serial Story?

APROPOS my recent note asking readers to let me have their suggestions, quite a number have suggested that I should include a serial story in HOBBIES. What do *you* think? Before I undertook to embark on a change of policy of this sort it would be necessary for me to satisfy myself that it would please the majority of my readers. Another point on which I should like to take the reader's advice is regarding the nature of such a story if I decided as a result of a general demand to proceed with the idea.

If You Were Editor!

THE letters I receive containing constructive criticisms are extremely helpful. To encourage readers to continue to send me letters of criticism—*constructive* criticism—I will award a watch to the sender of what I consider to be the best letter sent in each week. The watches we award, by the way, are not toys, but soundly constructed silver-cased, fifteen-jewel lever watches—they are watches that you would be proud to own.

Coming Articles.

READERS who have written suggesting titles for future articles will be glad to know that I have already commissioned and put in hand for early publication articles on the following subjects: "Making a Scooter," "A Rock Fountain for the Garden," "A Tape Machine," "A Portable Wireless Set," "A Record-breaking Model Aeroplane," "Overhauling the Bicycle," and "A Leyden Jar."

Our Home Cinematograph.

DON'T you agree that the Home Cinematograph described in this issue is really a fine piece of work for the handyman? It works quite as satisfactorily as any home projector on the market, and it certainly is not expensive or difficult to make. The original machine which forms the subject of this article is in my office, and those who go to the small amount of trouble necessary to build it will not be disappointed with the results obtained from it! This article is only one of many similar "specials" which I have up my sleeve. You will receive early intimation of them on this page!

NEXT WEEK

FREE Design Sheet for a FINE PIPE RACK

MODEL AEROPLANE TOPICS

A FINE SCOOTER

OVERHAULING THE CYCLE

A PERPETUAL FOUNTAIN FOR THE GARDEN, Etc., Etc.

REPLIES AND QUERIES.

Curing Rabbit Skins.

A. J. H. (Nottingham) wishes to cure a rabbit skin. The skin must be fresh flayed and cleaned of all fat and particles of flesh by scraping it with a blunt knife whilst stretched, fur inwards, upon a rounded surface, such as a baluster rail. Then steep it in a solution made by mixing thoroughly together when dry 4 parts alum and 1 part common salt, and then adding as much warm water as will dissolve the mixture. The quantity depends on the size of the skin. To ascertain when it has soaked long enough, squeeze the liquid from it. Then double it, with the skin side outwards, so as to make a crease, and when the line shows white the soaking can be stopped. The soaking usually takes about forty-eight hours. Make a paste of flour and water, and, having rinsed the skin, dip it for a minute in the warm gruel. Then wash it clean with cold water, and dry it. When about half dry, stretch again on a board, and rub with pumice. Small skins, when freshly flayed, can be cured by being soaked for a few days in a solution of tan. This can be made by boiling oak bark or oak galls in rain or distilled water, or by dissolving tannin in soft water. Fill a pot with oak bark, and boil it in twice as much water for three hours. Use the solution cold, and take out and rub the skin as often as possible during the process.

Finger Print Powder.

Finger print powder, M. A. S. (Teignmouth), consists of plumbago (or graphite) in a finely pulverized form; sprinkled over a finger print the latter is readily apparent, or it may be used on the finger itself for the purpose of taking a finger print direct. Detectives, however, nearly always take photomicrographs of the actual finger print without intensifying it in any way, for with the latter method there is always the risk that a valuable finger print might be obscured.

Mottling Metal.

The finish to which you refer, S. A. H. (Hammersmith), and which is seen on many engineers' tools, is produced as follows:—After cleaning and polishing the tool it is boiled in a solution made from 8oz. of copper sulphate and 2oz. of sal-ammoniac dissolved in 1 gal. of water. When a brownish colour appears, transfer the tool to a cold solution made from 4oz. of salts of soda dissolved in 1 gal. of water, floating on the surface of which is some oil. On replacing the work in the first solution a green colour appears, but owing to the oil, which spreads over the surface of the work, the action of the two solutions are not even, thus imparting the mottled effect.

Waterproofing Tents.

To waterproof the tent, B. N. H. (Blackpool), pass the material through a warm soap bath (1lb. to the gallon), and then through a solution of alum (1lb. to the gallon). It should first be passed into the soap solution and allowed to remain for about half an hour, so that the soap will penetrate; it should then be removed, wrung out, and passed into the alum solution. After removal from the latter the cloth should again be wrung out, passed once or twice through clean water, and then put through a mangle. The object is to get the cloth saturated with soap solution, so that the alumina soap is deposited in the fibres. It should be dried in the open air. When finished the tent will not appear to be much altered, but it will be a little stiffer and quite waterproof.

Removing Fur from a Kettle.

W. C. (Barling) wishes to know how to remove the fur from a kettle. This can seldom be done satisfactorily, but it may be chipped out with a chisel or dissolved with dilute hydrochloric acid. If the latter remedy is adopted, the kettle should afterwards be boiled out to remove all traces of the acid. An old-fashioned method of preventing the deposition of fur inside the kettle is to place a marble inside, the deposit will adhere to that and not to the kettle.

Polishing Scratched Mirror.

Polishing mirrors, M. H. (Norwich), is a tedious operation, especially if the work has to be done by hand. It would be necessary to begin with crocus damped with water and rubbed on with a cloth. This should be continued until the fine scratches are removed, then rouge may be applied in a similar way, followed by whiting and water, and the final polishing should be done with dry putty powder and a very soft old handkerchief. The polishing will take some time and considerable friction. There will be satisfaction in watching it become brighter from day to day.

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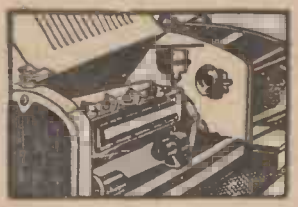

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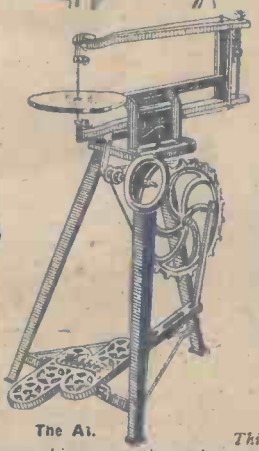

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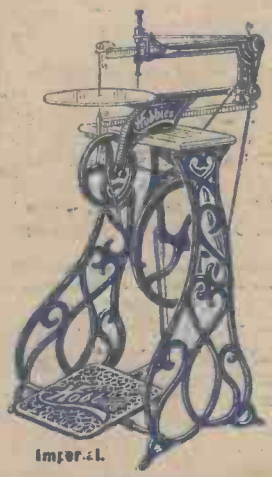

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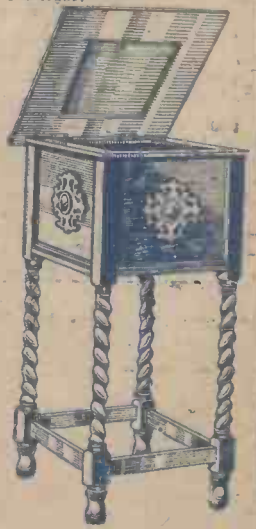

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