HOW THE TALKIES WORK! SEE INSIDE

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

Hobbies

2D

February 28th, 1931.
No. 1845.
Published every Wednesday.

GIVEN INSIDE! Design Chart for this Splendid Stool!

OTHER SPECIALS!
Shocking Coil and Morse Tapper.
How to Braze.
Wireless.
Woodwork,
Model Making,
etc., etc.

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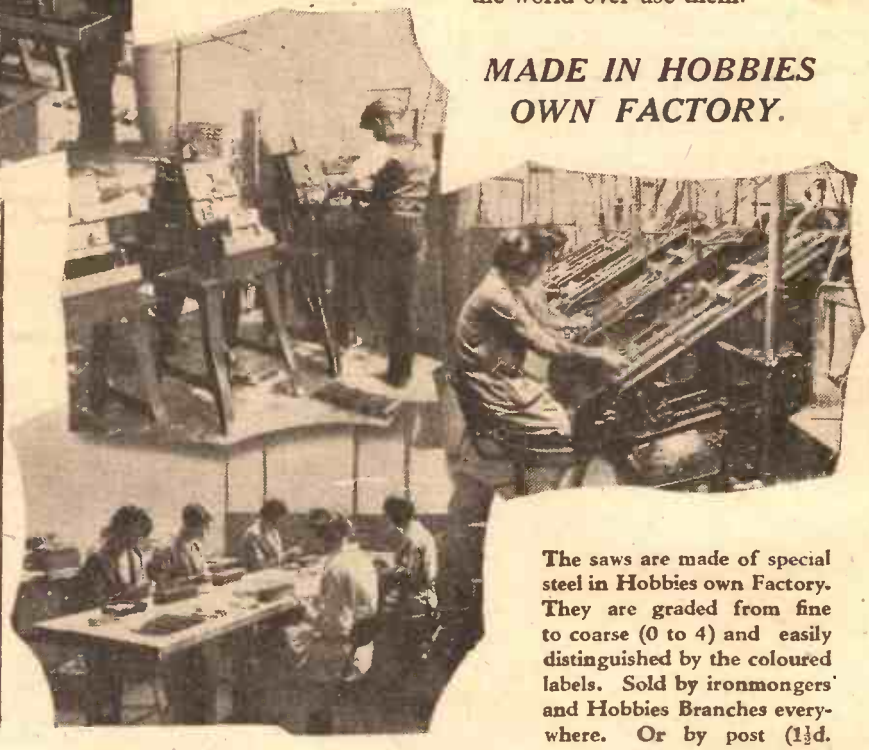

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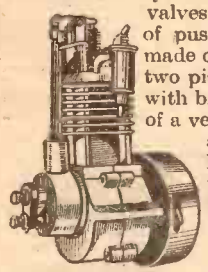
Hobbies

Vol. 71. No. 1845. Published Every Wednesday FEBRUARY 28th, 1931

THIS WEEK'S CLEVER IDEAS

Half-h.p. Overhead Valve Petrol Engine.

THIS neat and minute petrol engine runs extremely well, and is designed primarily for driving model aeroplanes, model boats, etc. It has a bore and stroke of 1¼in. each, giving a total cylinder capacity of 25c.c. The cast-iron cylinder has a detachable head, whilst the valves are mechanically operated by means of push-rods and rockers. The piston is made of aluminium alloy and is fitted with two piston rings and a gudgeon pin with brass ends. The carburettor is of a very simple type provided with an adjustable extra-air sleeve. Lubrication is by splash from the crankcase. The weight of the whole engine is about 4½lbs., and it is capable of turning a 16-in. airscrew for model aeroplanes, whilst it has already been used successfully in many model hydroplanes. It is marketed in complete form and also as a set of castings and blue-prints by Economic Electric, Ltd., 10, Fitzroy Square, London, W.1.



A ½-h.p. petrol motor for model aeroplanes and power boats.

Power Plant for Model Boat.

THE illustration at the foot of this page shows a very compact electric motor complete with reduction gear, ready for mounting in a boat. The propeller is geared down to half motor speed, and the shaft runs overhead in a water-tight tube. All the usual packing glands are dispensed with, thus greatly increasing the power. The propeller is 2in. in diameter and three-bladed. It is 9in. overall length, weighs 14oz. only, and runs from a 4-volt battery. The wooden base shown in the illustration is not included; it is merely intended to illustrate how the motor may be mounted. It is marketed by the firm whose address is mentioned above.

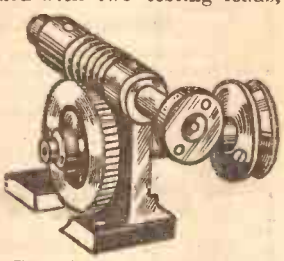
Testing Lamps.

THE testing lamp shown in the centre is compact and designed to be carried in the tool-bag or pocket. It will be found of great service to wireless constructors and electricians, for one is enabled by its use to see at a glance the condition of any cell. It is cheaper than a voltmeter although it does precisely the same work; it is provided with two testing leads, and is supplied with two screwed boxwood end caps for protection.

A testing lamp for wireless constructors.

Work Reduction Gear for Models.

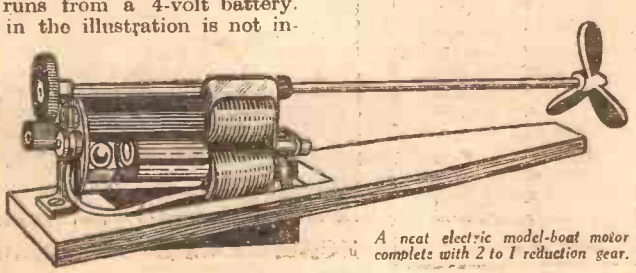
THE little reduction gear shown in the illustration enables a shaft to be driven at right-angles to the direction of drive. It is supplied with a brass wheel and a ¾-in. pulley for direct coupling with torpedo and locomotive motors, etc. The worm and worm-wheel are machine-cut. This gear is supplied by Messrs. A. W. Gamage, Ltd., Holborn, E.C.1.



This reduction gear enables a shaft to take its drive at right angles to the driving shaft of the motor.

Nestlé's Free Gift Scheme.

EVERY *twopenny* bar (in addition to the larger sizes) of Nestlé's chocolate, which make, readers will agree, is renowned for its flavour and careful packing, now contains a coupon, which the proprietors, Messrs. Nestlé's Gift Dept., Silverthorn Road, Battersea, London, S.W.8, will exchange for really acceptable novelties such as table tennis sets, match football, fountain-pens, etc., etc. Readers who would like a free list of gifts obtainable in this way should write to the address given for Nestlé's Presentation Book; and if mention is made of HOBBIES, five free coupons will also be sent.

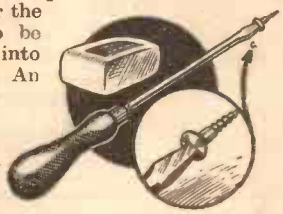


A neat electric model-boat motor complete with 2 to 1 reduction gear.

NOTES AND NOTIONS from our READERS

Inserting Screws into Awkward Places

QUITE a number of people have no doubt experienced the difficulty of inserting a screw into a position where the space is insufficient to allow for the screw to be guided into the hole. An easy way of getting over this difficulty is to fill the slot of the screw with soap, and when the screwdriver is inserted into the slot, the screw will adhere to the screw driver as shown in the sketch. It will now be quite a simple matter to guide the screw into the hole.—W. G. E. (Walmer).



Inserting screws into awkward places.

Making a Ground Glass Focusing Screen.

IF you find it difficult to obtain a ground glass focusing screen, a very good substitute can be made as follows: Place a mixture of knife powder and water between two pieces of glass (cut to the required size) and rub them together until a thoroughly ground surface has been taken by the glass. When finished it will give quite satisfactory results.—J. H. (Barkingside).

How a ground glass focusing screen is made.

A Home-Made Beading Tool.

EVERY handyman will find a use for this home-made beading tool. Obtain a piece of wood about 2in. square and ¾in. thick; then put a screw in the centre of the wood, leaving about 3/16in. of the screw showing above the surface. Run the screw along the edge of your work, as shown in the illustration, and quite an effective beading will be produced. This little tool will be found very convenient for concave and convex work.—H. E. J. (Holcombe).

A home-made beading tool.

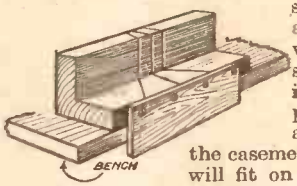
THAT DODGE OF *YOURS!*

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

Securing Casement Windows When Open.

DURING windy weather, casement windows, if partly opened, are sometimes blown off their catch, causing much damage to the glass. Here is a simple method for making them secure against the wind. Unscrew the small stop on the windowsill, then screw down the small spigot with a set of dies and fit a wing-nut to suit, and when screwed into position again the casement stay will fit on in the required hole. Then screw down the wing-nut and the window is rigid.—J. B. (Kenilworth).

Securing casement window when open.



How to prevent a mitre block slipping when cutting moulding.

How to Prevent a Mitre Block Slipping When Cutting Moulding.

IT is sometimes very awkward to cut moulding in a mitre block or box, but the following useful hint makes it quite easy. At one side of the mitre block is screwed a piece of wood which must project about 1in. from the bottom of the block. This stops the mitre block moving over the bench or table as illustrated in the sketch.—G. L. (Wallsend).

Testing the freshness of eggs.

Testing the Freshness of Eggs.

TO test the freshness of eggs, dissolve two ounces of common salt in one pint of water. Fresh eggs will sink in this solution, and stale eggs will float.—J. B. (Liverpool).

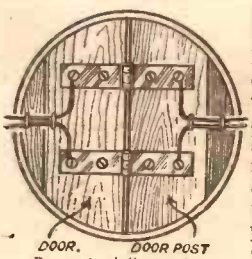
Repairing a Bicycle Free-wheel.

WHEN on a cycling tour and your free-wheel will not catch, due to the springs under the pawls not working, the following may be of assistance. Remove the rear wheel from the cycle, unscrew the cap of the free-wheel (a nail will serve as a punch for doing this) and you will see that the spring is not keeping the pawl pressed up to the ratchet. Now insert a small piece of rubber under the pawl, sufficient to press it up into the teeth of the ratchet, as shown in the sketch.—O'B. (Kilkenny).

Repairing a bicycle free-wheel.

Preventing Bell Wires from Breaking.

BELL wires frequently break. To overcome this, obtain a 2in. brass hinge, saw it in half and screw the two parts to the door and post where the wires pass. Then cut the wires and fix them by screws.—H. J. F. (Swindon).



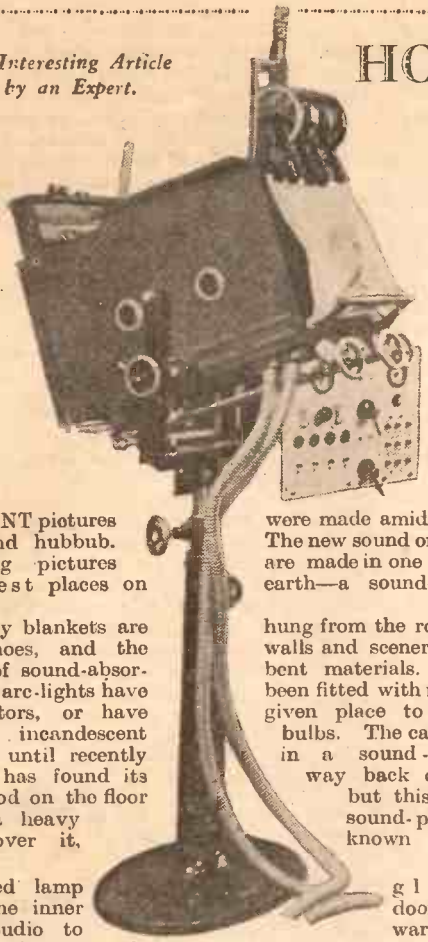
Preventing bell wires from breaking.

An Interesting Article by an Expert.

HOW TALKING PICTURES WORK

The Various Systems Simply Explained

By Leslie Wood



SILENT pictures were made amidst din and hubbub. The new sound or talking pictures are made in one of the quietest places on earth—a sound-proof studio.

Heavy blankets are hung from the roof to kill echoes, and the walls and scenery are made of sound-absorbent materials. The hissing arc-lights have been fitted with ripple eliminators, or have given place to gas-filled incandescent bulbs. The camera, housed until recently in a sound-proof booth, has found its way back on to its tripod on the floor but this time with a heavy sound-proof cover over it, known as a blimp.

A red lamp glows over the inner doors of the studio to warn the unwary that microphones are about to pick up.

The Mixer.

A man equipped with headphones climbs into a little switch-room built high up against one of the end walls. From its many windows he has a clear view of the scene of action. Microphones have already been adjusted just out of range of the cameras. The Mixer, as the man with the headphones is called, tests each mike in turn via his phones, tuning them much as a radio fan tunes his set. When the producer signifies his willingness to start, the Mixer asks the cameraman if they have got their A.C., for both cameras and sound-recording apparatus are run on synchronous motors fed by alternating current. On each camera there is a trigger which punches a hole in the film; this hole indicates to the developing-room staff where each scene begins. The cameras are tested, the films punched, and the Mixer orders "Turn 'em over"—the signal for the cameras to start grinding. Two or three cameras are used simultaneously, each photographing the scene from different angles.

The actors start their dialogue; the Mixer, high up in his cabin, keeping conversant with the progress of the scene via his headphones. By controlling the monitors, the Mixer fades in or fades out his sound as occasion demands, bringing in effects, such as music from an unseen orchestra (actually playing outside the range of the cameras), just as B.B.C. engineers "mix" in the sound effects in a broadcast drama.

Two Systems of Recording Sound.

The sound may be recorded by one of two systems, known respectively as sound on disc and sound on film. In the former, gramophone records are made as the scenes are shot, and, afterwards, in the cinemas, are played in step or synchronisation with the film. There are two or three sub-varieties of this system, the most famous being Vitaphone.

The records measure 16in. across and weigh 2½lbs. They are single sided and are ¾in. in thickness, and rotate at 33⅓ revolutions a minute instead of 78. The sounds picked up by the microphones in the studio are converted into electrical impulses, in the same manner as your voice when you speak over a telephone. Valves pick up these impulses or audio-frequencies en route and strengthen them. In their boosted-up form they reach an electric gramophone pick-up fitted with a cutting point instead of a needle. This cutting point is vibrated by the frequencies and traces them, in the form of a spiral, wavy groove on a wax disc with a highly polished surface. When recording is complete, the wax is covered with a fine metallic powder, and then placed in a metal plating bath, from which it emerges with a "crust" of metal on its surface. This crust is, in turn, duplicated, metal plates or dies being made from it, and these are used to press the wax records on hydraulic presses. Unlike your home gramophone records, the talkie record starts playing from the centre, and the tone-arm travels across to the outer edge.

Cinemas are supplied with duplicate records in case of breakage.

A piece of talkie film shown considerably enlarged.

How Gramophone Records are Made to Synchronise with a Film.

It is a very difficult matter to get a gramophone record to synchronise with a film, but it has been made practically fool-proof by the following method: the first groove or track on the record is marked by a tiny white arrow engraved in the wax. The cinema operator puts the steel needle of his electric pick-up on this. The film bears, just before its title, a cross or the word "Start." The film is fed through the projector until the start point comes to rest opposite the lens. The operator then throws over a master-switch controlling the motor which drives the turntable and projector, and both film and record start in step. As they are driven by the same motor, both film and record always keep in time with one another. The vibrations picked up by the electric pick-up resting on the record are converted once more into impulses, are fed through valves which increase their power, and are conducted by wires to the back of the cinema screen, where, in the loud speakers hanging from the roof of the stage, they are converted into vibrations which, beating against the air, become once more the sound waves or speech which the actors spoke in front of the microphones in the studio.

Such films call for skilful editing, for though it is easy to join two film scenes together with the aid of cement, one cannot cut and rejoin records. Each scene, therefore, is made on a separate record, and, when the film is made up in its correct sequence, the whole of the records, in their right order, of course, are played in time with their appropriate film scenes, the whole of the sound being re-recorded on one master record.

Western Electric System.

Of the sound on film or photographed sound systems there are several kinds—Movietone, Photophone, etc. —but the famous Western Electric system is characteristic of them all in its main essentials. In place of the gramophone disc, the sound, in the form of a wavy photographed line extending down the whole margin of the film, or a number of tiny bars of light and dark grey, according to the intensity and pitch of the sounds they are to reproduce, are printed on the film between the sprocket perforations and the photographed picture. The area of the picture is thus reduced by the space occupied by the sound track from an oblong to a square, necessitating the closing in of a black border on the cinema screens when such films are shown.

Sound Translated into a Photographic Image.

How sound is translated into a photographic image and then re-translated back into sound in the cinemas is a miracle of ingenuity. The voices of the actors are picked up by microphones, and are boosted up en route by valves, as in the disc system; but here the similarity ends. Focused on the margin of the film is a ribbon-filament projection lamp. Between it and the film, however, is a novel form of control for cutting down and increasing the intensity of the light. This control is a loop of duralumin tape suspended at right angles to a magnetic field and wired with the recording amplifiers. As the sound frequencies travel down the cables, they energise in varying degrees the loop of tape, causing it to open and close. This opening and closing of the loop in sympathy with the sound frequencies controls the amount of light shed, through a tiny aperture, on the margin of the film, and, when the film is developed, it appears as minute bands stretching across the margin, each bar differing in its density according to the strength of the sound which it represents. In order to translate these bars of light and shade back into sound in the theatres, a constant ray of light is shed on the margin of the film in the projector; this ray filters through the band in ever-changing intensity according to the density of the bars. This fluctuating ray acts on a photo-electric cell, which is not unlike a radio valve, which, in turn, increases and decreases its energy in accordance with the strength of the ray. This fluctuation of energy in the photo-electric cell sets up, in turn, frequencies in its connecting wire. The frequencies are amplified by valves and, finally, given back to the audience in the cinema over the loud speakers in the form of sound vibrations, faithful reproductions of the vibrations of the actors' voices picked up by the mikes in the studio.

The Sound Record.

Actually, when the film is being shot, the sound record is photographed on a separate film, and is grafted on to the picture film in printing.

Variations of this sound on film system employ the intensity of a photo-electric cell or the fluctuations of a tiny mirror in place of the loop of duralumin tape.

The most surprising thing about the sound on film system is that the photographed pictures are not printed opposite the sounds which represent them on the film. Actually, the sound is printed about fourteen inches farther ahead on the film than the picture to which it corresponds. This is accounted for by the fact that the sound apparatus is some distance below the lens on the projector, and it follows that, when a picture is behind a lens, its accompanying sound record, if it is to be given to the audience at the same time, must be in the sound apparatus at the same instant. And the distance from the lens to the apparatus is about fourteen inches.

A SHOCKING COIL AND MORSE TAPPER (*continued from page 703*).

other contact is a piece of brass fixed in a similar manner. The ⅜in. screw eyes are the best to use for these terminals. The tapper key should be well made and finished off, as it forms a valuable addition to the amateur electrician's supply of instruments.

Connect the coil in series, with a pocket-lamp refill or two dry cells, and the Morse tapper. Depress the key and adjust the contacts crew until the armature vibrates with a gentle hum. The coil should now be giving a smart shock and should be tested by—well, it's rather obvious; but when using the coil, see that it does not get pulled off the table, if the handles are given a sharp jerk, which they often get when someone lets go in a hurry. No doubt readers will be able to adapt various pieces of junk to suit the requirements of this piece of apparatus.

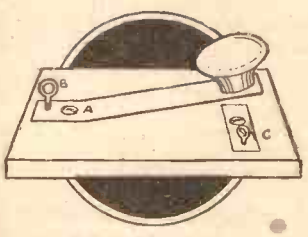
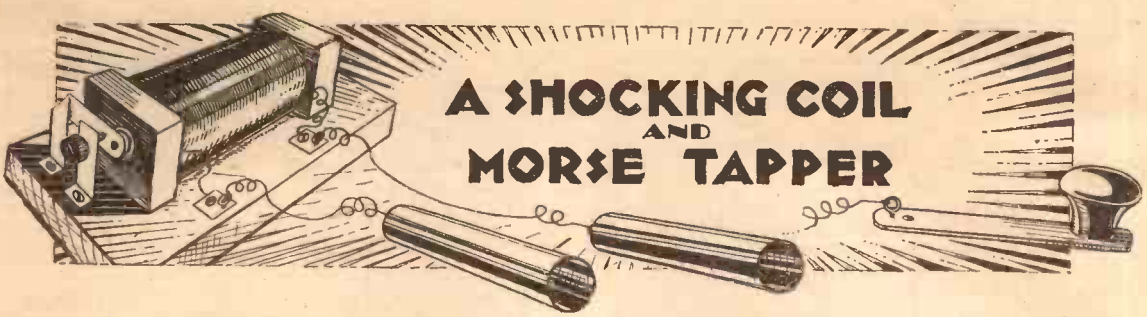


Fig. 4.—The tapper key.



A SHOCKING COIL AND MORSE TAPPER

BEFORE commencing the construction of an induction coil a word on the theory will not be out of place. When a coil of wire is moved in a magnetic field a voltage is induced in it. In this shocking coil the wire is fixed, but the magnetic field moves and causes the same effect. The magnetic field is caused by the current through the primary, and when this is switched on or off the field grows and collapses, inducing a large voltage in the secondary.

The Coil.

This is the most important part, and consequently it should be made first. Obtain a length of soft iron rod ⅝in. in diameter, and to ensure that it is "dead soft" leave it in the fire overnight. Cut a piece of this rod 4½in. long, remove the scale which will have formed through the action of the fire, and file the ends smooth. Cut two supports for the coil, drill them with ⅝in. holes, and fix them on to the rod so that one end projects about ¼in. Wind a layer of insulating tape on to the core, and then wind on three layers of No. 26 D.C.C. wire, leaving a few inches over at each end for connections. About 5 or 6yds. of wire are required. Wind a layer of insulating tape over the primary, next wind a strip of dry grease-paper over this, and then gum the end down. The core is now ready to receive the wiring for the secondary, which consists of thirty yards of No. 30 D.C.C. wire. In winding the coil care should be taken to put the wire on evenly and to press the turns close together. If the wire is wound on unevenly, the shock will not be so great as when the turns are packed tight. Cut a base for the coil 8½in. by 4in. by ½in. from any convenient wood, chamfer the edges, and stain it and the coil supports a dark brown. When dry the coil may be fixed in place by means of wood screws through the base (see Fig. 1).

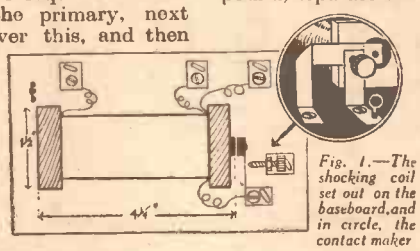


Fig. 1.—The shocking coil set out on the baseboard, and in circle, the contact maker

The Contact Maker.

Cut a piece of brass as shown in Fig. 1, solder on the end an iron nut or washer about ½in. in diameter and ⅛in. thick, and file the face of it smooth and bright. Drill the other end of the brass strip to take two ⅝in. round-headed screws, bend it to shape and fix it to the base. The washer should now be in line with the core and about ¼in. from it. Obtain a nut and bolt for the contact screw. Drill a hole slightly larger than the diameter of the bolt in the contact screw support, and solder the nut over this so that the bolt will easily screw through. Solder a short length of silver or iron wire on to the end of the contact screw, when the whole should be fixed on the base, so that the end of the contact screw is just touching the armature when the former is screwed about ½in. through its support. If the operation of soldering the contact wire to the bolt proves too difficult, the end of the bolt should be filed to a blunt point.

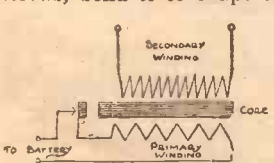


Fig. 3.—The wiring circuit for the shocking coil.

Terminals.

Four terminals will be required, but they may be easily made by using screw eyes. Cut a piece of tin 2in. by ⅝in. for the base of the terminal, bend it double, and drill two holes for a screw eye and a round-headed screw. The construction and use of the terminal is clearly shown by the sketch. Connect the various parts together, and the coil proper is complete. Two handles, to hold, are necessary before a good shock can be given, and are made as shown in Fig. 2. Obtain a discharged pocket-lamp battery with the zincs in fairly good condition. Remove the paper and sealing compound, separate the cells, remove the interiors and wash the containers to remove any chemicals that may be left adhering to the sides. Cut a circle of wood ⅝in. in diameter to fit tightly in the open end of the container, drill it with a small hole, through which pass one strand of a yard of flex. Knot the flex so that it will not pull through the hole, solder the end to the zinc, push the wood in place and secure with ¼in. brass nails. Two handles like this are required, and are connected to the secondary terminals by means of the flex. It is worth while taking a little trouble over the construction of the handles, as they receive quite rough usage.

The Tapper Key.

A tapper key (see Fig. 4) is most useful to connect in circuit with the coil, as it enables one to give a shock without having to mess about with loose wires. Cut a base 4in. by 3in. by ½in., chamfer the edges and stain a dark brown. Cut the arm for the key from a springy brass or mild steel, and drill it as shown. The knob is a piece of hard wood, and is fixed to the arm by means of a round-headed screw. The arm is now fixed on the base by means of a wood screw through the hole A and a screw eye through B. The

(*Continued at foot of page* 702.)

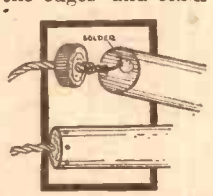
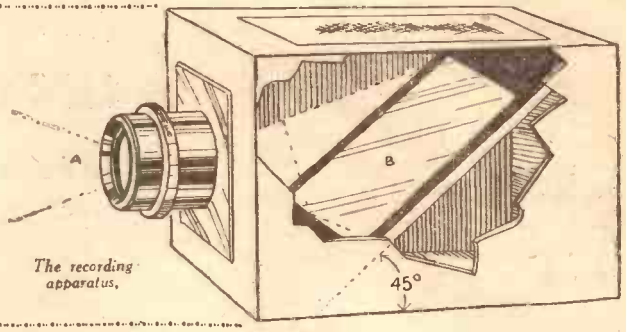


Fig. 2.—How the handles for the shocking coil are made.

SHADOWETTES

By R. Gow

A Simple and Fascinating Pastime.



The recording apparatus.

THE silhouette pictures of our great-grandparents are now highly prized, even more than photographs. The art of making them is a very old and difficult one. The silhouettist snipped out the side-view portrait from black paper with a pair of scissors, and unless you are particularly gifted with your fingers, you are not likely to be able to produce good results. The "shadowette" system described here will enable you to make perfect silhouettes, and even to make a great deal of money for your next bazaar. The principle is a very simple one, and most hobbyists will find all the requirements lying about their workshop.

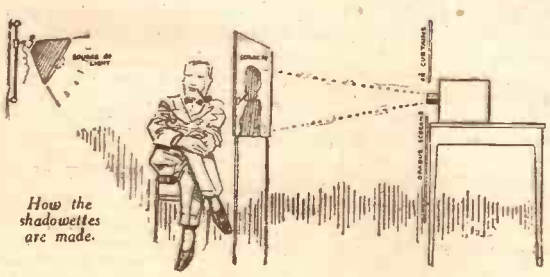
How Shadowettes are Made.

The "victim" sits in a chair so that his shadow may be thrown upon a ground-glass or paper screen. He must be so arranged that he sits as close to the screen as possible, in order to obtain a sharp edge to the shadow. He will not have to sit still very long, because a shadowette outline can be made in ten seconds, and a very small movement on his part will not matter. It will be found that a sharp shadow will be thrown by a strong light when the light is at a great distance; but as this is not usually practicable, a "magic-lantern" or spotlight may be used. A good source of illumination is a 100-watt electric lamp, with a small filament, at a distance of ten feet from the "sitter." A condenser lens will concentrate the light. Or, on the other hand, an electric cycle or motor-car lamp, with a parabolic reflector, will project a suitable beam.


A finished shadowette.

The Recording Apparatus.

And now for the "recording" apparatus. You will require a camera lens of from 4 to 7in. in focal length, a plane mirror about 4in. square, a piece of glass about 6in. square, and when you have made several experiments with these objects, a box of the right size. We cannot lay down any exact dimensions for this box, because a great deal depends upon the focal length of your lens. This may easily be found by focusing some distant object, such as a window in the room, upon a sheet of paper. The distance from the centre of the lens to the paper is the approximate focal length.


How the shadowettes are made.

The Lens.

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

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

The Finished Silhouette.

When the subject is sitting in the required position before the screen, the operator quickly but carefully traces the outline of his features on the tracing paper with a sharp pencil. With practice a few seconds will suffice. The pencil outline is then inked over and filled in with a brush and indian ink. The silhouette picture may be mounted on card or in a white paper folder. If you are working at a bazaar, then time means money, and it is better to organise the work so that one operator makes the pencil outline, another goes over it in ink, and a third fills it in.

AMATEUR CARPENTRY

Make this Splendid Stool from the Gift Design Sheet.

This is the stool any fellow can make with a few fret-work and carpentry tools. It is cut in oak, full-size patterns being given on the gift design sheet. Wood and legs are also supplied.

THE reader who is an owner of a carpentry and fretwork set is given the opportunity this week of proving his ability in the use of these tools by turning out a practical article as a welcome addition to any home, and particularly acceptable as a gift to a lady. The stool we illustrate herewith is quite simple to make, and is built in oak so that it can be easily stained when completed. There is no work in it which is beyond the ability of any reader who is used to the handling of carpentry tools. The completed article should be equal to any that one could purchase at a shop, and yet can be made at half the price from the material supplied by Hobbies Ltd., and by means of utilising the patterns given on the gift design sheet with this issue.

A Carpentry Framework.

As all these patterns are printed the full size, a good deal of work is saved in marking them out on to the wood, for it is quite straightforward to paste the parts down to the boards to proceed straight away with the actual cutting and fitting. The framework is composed of parts mortised and tenoned together, but this is work which every young carpenter is now taught, so that there is nothing he need worry about in going ahead.

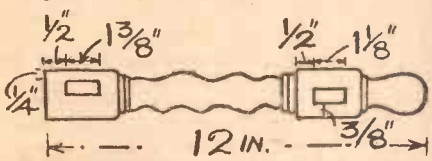


Fig. 1.—Dimensions which have to be marked on the legs to cut out the mortise joints for the cross rails.

Beyond the actual carpentry there is a little work to do in the overlays on the sides—although these may be omitted if so desired. The stool is quite a plain and straightforward piece of work, consisting of a framework of four legs and rails to which is fitted a shaped top. The legs are obtainable ready turned, so that they need only marking out and cutting for the mortises. The other wood is supplied by Hobbies planed, and in the thicknesses and sizes to take each pattern. This saves a good deal of work in measuring up the material required, and particulars of the parcel itself are given below. The completed stool stands 12¾in. high and has a top 15¼in. by 11¼in.

Broken Patterns.

The patterns on the design sheet are all straightforward, but they should be studied in conjunction with the picture of the finished stool before work is actually commenced. Where there are long straight edges in the design, this edge can be pasted down close to the edge of the wood—thus saving a complete length of cutting. In the case of the pattern of the side rails, of the top frame, this has had to be broken in order to accommodate it on the sheet, but by cutting across where shown and extending the two ends to an overall distance of 15¼in., and then linking up the complete side by pencil marks, the complete pattern is easily obtained. There is, of course, no actual need to paste the pattern down if one marks out carefully the extreme length 15¼in.. uses a 45 degree set square both ends, and then marks down again a rail that is 2⅜in. wide. The end rails can be marked out in the same way, but they are only 11¼in. long. In this case, however, a complete pattern is shown, and can be pasted down if preferred.

Fig. 2.—The ends of the tenons must be chamfered off so they meet and bed together in the mortise in the leg.

The First Operation.

The work on the legs should be the first undertaken. Lay the legs together and see that they are exactly 12in. long, then mark off across all four at once the mortise joints shown at Fig. 1. It is essential to use a square in doing this, to ensure them all being the same length. To ensure the rails fitting correctly mark the mortises at the top of the legs ¼in. inwards from what will be the outside face of the leg. The mortises at the bottom of the leg on the other hand are ⅛in. inwards from the outside face—that is, ⅜in. from the inside face as shown on the design sheet. All the mortises are, of course, ¼in. across, but before marking them this exact width, test them out with the actual pieces of wood which are to form the rails. If these rail parts are planed down slightly under the ½in. it will be necessary to decrease the width of the mortise accordingly, because

The MATERIALS

A complete parcel of oak is supplied for making the stool for 7/6 or 8/6 post free. It includes the turned legs planed oak boards the size required, and the two fancy rosettes.

Obtainable from Hobbies Ltd., Dereham, Norfolk, or at their branches, or Canadian Depot—844 Yonge Street, Toronto, Ontario

it is on the accuracy of these joints that the rigidity of the whole stool depends. The mortises for the top rails are 1¼in. deep. Those for the rails at the bottom are only ⅞in. deep. These mortises are, of course, cut by making three or four holes in each with a ⅜in. bit, and then cleaning them up to the size required with a chisel. The work must, of course, be held in the bench vice, and the mortises cleaned and smoothed to make a good joint. Remember that the mortise in the lower piece of the leg is only required on one face, because instead of four rails there are only two cross rails here.

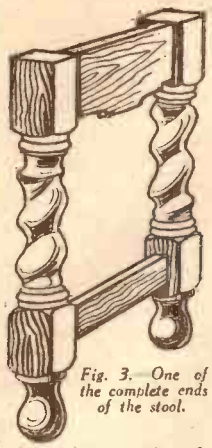


Fig. 3. One of the complete ends of the stool.

Having completed the legs, get out the four top rails to the shape shown, and test out the accuracy of the shouldered tenon which passes into the mortise just cut in the leg. The mortises in the top of the leg will have run together inside, and in order to make the rails fit close, the end of each tenon must be chamfered to an angle of 45 degrees to allow them to seat properly when fixed in. This chamfering can be done with a plane or file, and the angle is shown in detail at Fig. 2. Test all the rails in their proper place; and having got them correct, number them off so that they can be replaced later when being glued together. Two short strips coming between the ends are also cut and fitted in temporarily, and then the rail connecting these is fitted in between the mortise and tenon joint A. Test this connecting rail up so that when it is in place the legs themselves fit on the framework at the top. These rails must not be glued in place, but the whole thing dismantled and all the parts finally cleaned up. Be careful not to sandpaper the tenons once they have been tested. Now we can complete each end of the stool by fitting in the short top rail and the similar short rail at the bottom, to get the framework as shown at Fig. 3.

These parts can be stood aside whilst we proceed with the cutting out of the top, so that when that work is completed the glue in the ends will have set. Lay these ends flat, by the way, in order that they should not twist. The top is composed of a hollow frame of four flat rails, above which is a single overlay piece of wood to make the necessary thickness. The illustration at Fig. 4 is a view underneath showing this construction clearly. The four rails forming the frame fit together at the corners by a saw-cut at an angle of 45 degrees. This can be undertaken with a tenon saw, and the part which is cut off is used to fit into the inside corner as a gluing block (see Fig. 4).

Fig. 5.—This is the overlay pattern on each side rail. Notice the ornamental carving supplied for the middle.

The outside edges of all these rails have to be rounded nicely to the shape shown by the section at each one—work which is done first with a plane and file, and finished off smooth with a medium grade of sandpaper. The framework is glued together, and is then laid flat to see that it does not twist.

Now we can go back to the completed framework of the ends. The long side rails are fitted in at the top, and the connecting rail between the other two at the bottom. See that these all fit true, using a square freely in order to make sure that the corners are at right angles, and that the whole framework of the stool is accurate. It is essential, too, that the top edge of the rails is flush with the top end of the legs. Put glue in all mortises and pull all joints up tight. A piece of strong thick string can be tied round the top end of the legs—padded at corners to prevent cutting—to hold the framework until the glue has set.

The framework of the top can now be added to the top edge of the legs and upper rails, so that it projects an inch over the outside of the latter all round. Glue it and strengthen with screws driven down into the rails and legs, being careful to sink the flat-headed screws so that they are below the actual surface of the wood. These screws will be covered by the actual top, which is a piece of ¼in. wood 13¼in. long, 9¼in. wide glued centrally to the top frame. A large piece of wood like this naturally has a tendency to curl, so that it must be glued down very firmly and can then be screwed from the underside of the ½in. thick frame if need be. At any rate, the piece must be weighted down on to the top frame whilst the glue is setting. Blocking pieces beneath will serve to keep the part in place.

The rails are decorated with small ornamental overlays, and these are equally easily cut from ¼in. wood to the patterns given. As only one pattern is provided of each, nail two pieces of wood together and cut out with a fretsaw at one operation. Clean up the overlays with sandpaper and glue them on the rails midway between the legs. The overlays on the side have a square opening in which is glued one of the fancy square rosettes.

How to make this TABLE BOOKSTAND.

The fellow who does much reading or studying needs a bookstand for his den or desk. Readers of "Hobbies" need not buy one, because with next week's issue we are telling you how to make one, and giving full patterns from which the parts are to be cut. This chart alone is worth 4d., so be sure to get your next week's issue, and obtain it free.

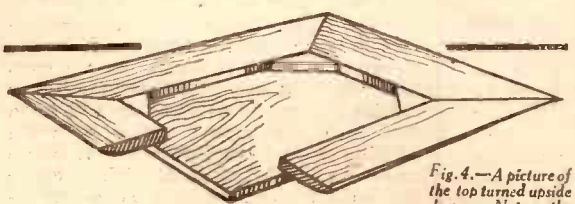
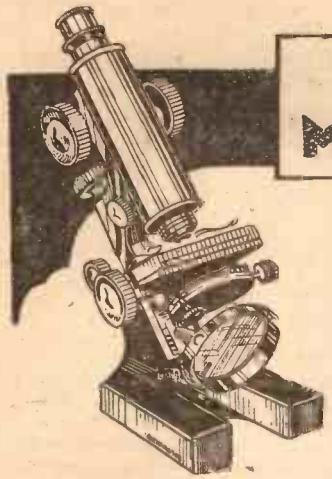


Fig. 4.—A picture of the top turned upside down. Note the angle blocks to strengthen the corners of the frame.



AMATEUR MICROSCOPY

MAKING THE MICROSCOPE

TO many people the word "microscope" suggests a rather dull hobby. Those who have had the slightest experience of even the simplest apparatus will agree that it is easily one of the most interesting pastimes that could be followed. It has many advantages, not the least being that it is an "all-season" hobby; it can be quite inexpensive, and a large number of the items required for its use can be collected and mounted by the worker. Nor is it necessary to purchase an expensive apparatus. Of course, if funds are ample, then perhaps a beginning may be made with the most simple apparatus, and, having obtained practical knowledge of its working, expenditure may be entertained for something far more costly than the one dealt with here.

Before describing the making of the simplest form of microscope possible, it may be well to outline very briefly some of the uses to which the completed apparatus may be put.

The Usefulness of the Microscope.

There is the useful study of botany, the even more interesting examination of small insect life in all its forms, and here there is a vast field of choice. The microscope can be employed in examining the contents of a pond, objects brought from the seashore, from rock pools there, and more particularly the observations of life which is too minute in many instances to be observed by the naked eye.

It is rather remarkable to realise that some of the commoner salts in general use will provide magnificent specimens for the microscope, whilst, again, such items as fungi and the disintegration of vegetable life will reveal some remarkable workings of Nature.

Coming now to the making of the simple microscope. There is one very great advantage in doing so, because if it should turn out, after all, that the allurement of microscopy does not prove as great as one might have expected, very little trouble or expense has been taken in the provision of this apparatus.

Materials Required.

The first step is to buy a pocket folding glass (see Fig. 1). This may be carried regularly in the pocket in order to examine specimens before bringing them home. The next stage is to build a stand upon which the folding magnifying glass can be fixed. A piece of well-planed timber, usually obtainable for nothing or a copper or two, will serve admirably for the base of the stand. Those who prefer neat-looking articles will select a piece of wood which can be stained and polished. Mahogany is probably the best of all, teak is a good second, but oak or pitch-pine will serve equally well. This base should be about 1½in. thick, and if it is a foot square, so much the better.

Fig. 1.—A pocket folding glass

The next item required is one of the old-fashioned sliding penholders or pencils. Years ago these could be bought in any stationer's shop for a few coppers, but it is only too true that these have been largely supplanted by the fountain-pen and the ever-sharp pencil. If it is impossible to obtain such an article, the builder of the microscope will probably be able to fashion something for himself. The main idea is that the pencil-holder should be stood upright upon the wooden base, and then a hole is pierced in the cover of the folding magnifying glass, allowing the glass to be fixed upon the sliding portion of the pencil—the idea being that the glass may be moved up and down for focusing purposes. It is essential that the sliding pencil-holder must be firmly secured into the base.

A gramophone needle makes an excellent point for fixing in the handle of the folding magnifying glass, and, as a rule, it is not difficult to fix the blunt end of the gramophone needle into the top of the penholder or pencil case.

The handle of the magnifying glass is usually made of vulcanite, and it is, therefore, not difficult to drill it.

The Base for Displaying the Objects.

The next step is to provide a second base upon which the objects for examination may be placed (see Fig. 2). This base is secured to the main barrel of the sliding pencil-case or penholder, and it does not move; instead, the magnifying glass is brought down by the simple expedient of pushing the extending portion of the pencil-case into its barrel. This second base may be made from a piece of vulcanite similar to that supplied for wireless sets. Indeed, most fellows will have such material ready at hand. Glass or three-ply wood will serve almost as well, but vulcanite as a rule gives a better finish.

Stiff cardboard can be employed as a last resource in case none of these other materials is readily available.

A little care is required to fit the base to the barrel of the penholder or pencil-case. The best plan is to drill a hole through the sheet of material not very far from one of its edges. It is then pushed down the barrel and fixed into position by some adhesive material, or by any method which readily suggests itself. As regards size, this sheet should be at least 4in. by 3in. It may be larger, but in any case it should not be larger than the base.

This comprises the whole of the simplest microscope which can be built in the home. It is only necessary to stress that the magnifying glass fixed upon the gramophone needle should be so arranged that it may be taken off when not in use, and there is no better method of storing it than in the waistcoat pocket, where it is available for other uses at home or out in the country.

(*Continued at foot of page* 710.)

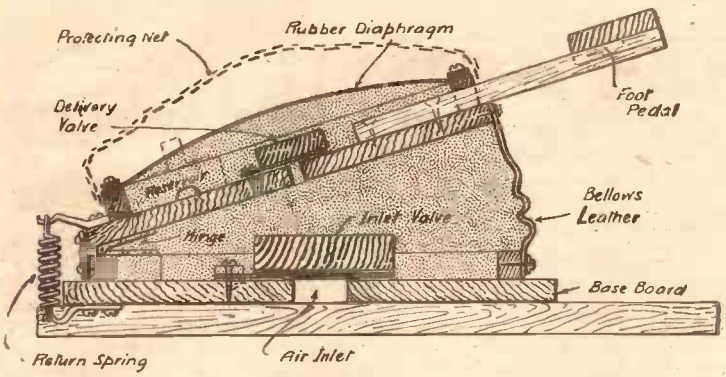


Fig. 2.—Showing the construction of the foot-bellows.

HOW TO BRAZE

By Henry Greenly

An instructive article on a useful art.

BRAZING is a form of hard-soldering in which the solder, or "brazing spelter" as it is called, is a species of brass, i.e., an alloy of copper, zinc and tin of varying consistency according to the strength required and the temperature at which it is desired to flow. The zinc content naturally lowers the melting point, but at the same time it considerably reduces the tenacity of the solder. These items are perhaps only important when the strength value of the engineering job being brazed has to be maintained in its highest degree. For ordinary amateur work it is necessary to have an easy running solder to prevent a possible less skilful handling of the work resulting in burnt joints.

Its Application.

Brazing is, therefore, applicable to those non-ferrous metals to which a brazing spelter will adhere—such as copper and its better quality alloys, nickel and the alloys of nickel and copper which pass under such names as German silver and nickel silver. Both of these alloys have no silver in them. The process can also be adopted to joint all kinds of iron and steel parts together, where there is no coating of tin or zinc on them. Brazing iron and steel is, perhaps, not so universal as it was because of the development of the welding process, but for the hobbyist it will be found extremely useful for many years to come. The flux used in the process is borax, as in silver soldering.

Fig. 1.—The gas blow-pipe.

Common Brasses.

Common brasses, alloys of copper, tin and zinc—especially where the latter metal bears any considerable proportion—are quite unsuitable for brazing. Even parts made in a good quality metal, in which there may be little or no zinc and a copper content amounting to 75 per cent. or more, will require a certain amount of skill and experience to unite satisfactorily by this process. The temperature at which brazing spelter will flow is so near to the melting point of the work being operated on that there is always the danger of fusing the latter. The reader is, therefore, recommended to use only silver solder for brass and gunmetal objects, and, unless he can thoroughly manage the blowpipe and hearth, to do the same for work of pure copper.

Brazing Suitable for Iron and Steel.

Reducing the foregoing recommendations to a simple form, it may be said that, although it is quite possible to braze some brasses, gunmetals, nickels and copper, it is advisable to reserve the process to iron and steel work. Silver soldering is both safe and easy, and quite as sound from a constructional point of view, when it is remembered that silver is fairly strong in itself and has a great affinity for copper and nickel. The only real objection to silver soldering is the whiteness of the joint and the cost of the solder itself. For the small jobs the amateur is likely to tackle, these are minor drawbacks. Further, silver is particularly cheap at the moment.

Galvanized iron and tinned-plate must be united by soft soldering only, because of the very low melting point of the outer coatings to the iron or steel used in these materials.

The Apparatus.

The tools necessary for brazing are not many, but must be good as far as they go. A gas blowpipe of a calibre suited to the size and weight of the largest job that will have to be worked on, is the first requirement. Failing a supply of gas, recourse must be made to the paraffin blow-lamp, although this tool is not so easy to manage, and therefore its use should be avoided if possible.

The blowpipe can be made, but to obtain a good job another blowpipe is really necessary to hard solder the air pipe into the gas nozzle. It is, therefore, more satisfactory to spend a few shillings on a ready-made blowpipe, and to make other parts of the equipment. Fig. 1 illustrates one type of controlled gas blowpipe. They are made in all sizes from ⅜in. to 1½in., measured by the nozzle diameter, with or without control cocks. The picture shows a blowpipe with a valve. For the hobbies workshop, the smallest size will do well if the jobs to be done are small. If not, choose the ½in. or ⅝in. size. It will be noticed that the nozzle end is reinforced against damage.

The Brazing-Hearth.

The hearth is a simple container or tray of sheet iron, fixed on legs or from the wall on brackets. In

(*Continued on page 710.*)

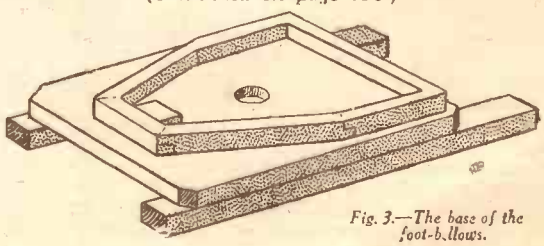


Fig. 3.—The base of the foot-bellows.

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HOW TO BRAZE (*continued from page 708*).

any case, the back of the hearth should be made 8in. to 10in. high, to form a guard for the blowing flame, and, also, to assist in piling up the lumps of broken firebrick with which the hearth is filled.

The Foot-bellows.

A common foot-bellows, with an elastic chamber on the air delivery to steady the blast, is all that is necessary to provide for the air-pressure feed to the blowpipe. A simple method is to fit a football bladder to a Tee-piece on the air delivery. Another arrangement—a sheet of rubber over the top board of the bellows, protected by a net—serves the same purpose.

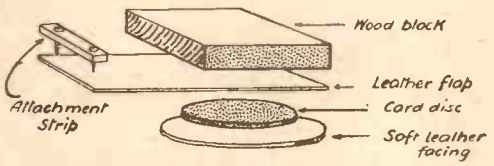


Fig. 4.—Details of the inlet valve.

Making a Foot-bellows.

The illustration, Fig. 2, shows a bellows made from odd pieces of wood and leather. The baseboard consists of a square of ¾in. wood with two battens (Fig. 3). On the baseboard some strips of ¾in. x ¾in. wood of good, close-grained quality are firmly screwed down to the upper side of the baseboard. The profile formed by the strips should be marked off the main top board. These strips form a basis for tacking the flexible leather sides of the bellows to the baseboard.

The Inlet Valve.

Before the leather mentioned above is fixed, the inlet flap-valve should be made and fixed (see Fig. 4). This is entirely inside when finished, and consists of a flexible leather flap tacked down over a 2in. hole in the centre of the baseboard, on the back of the flap being affixed a heavy piece of wood. Sometimes this wood is reinforced with a piece of metal on the back to ensure that it lies down tight over the inlet hole.

(*To be concluded next week.—Ed.*)

HOW TO MAKE A BOOMERANG

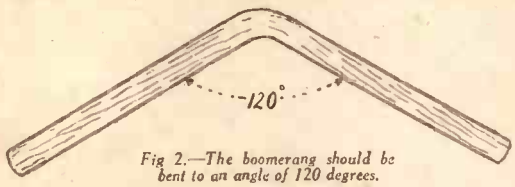


Fig 2.—The boomerang should be bent to an angle of 120 degrees.

A BOOMERANG is quite easy to construct, and a great deal of instructive amusement may be had from a study of its behaviour under varying conditions.

You require a piece of hard wood such as oak or teak, about 2ft. 6in. in length, and 1½in. wide. The thickness should be ½in.

One side should be left flat and the other rounded, as shown in Fig. 1—the greatest thickness of this curved part to be 4/10in.—and by steaming the wood, carefully bend to an angle of 120 deg. (see Fig. 2).

If it is preferred, two pieces could be mortised together to form this angle and the rounding of one side done afterwards.

Launch the boomerang into the air, holding one tip in the hand with the curved face upwards giving it a spinning motion.

An open space is necessary, also a calm day to conduct initial experiments. If there is a slight wind the boomerang should be launched into the wind.

If the foregoing instructions are carried out, the boomerang should travel from 75 to 100 yards before beginning to return.

With practice, proficiency both in accuracy and length of throw, can be obtained.

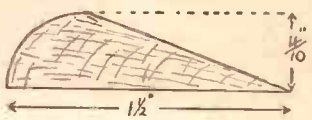


Fig. 1.—One side of the wood should be rounded, and the other tapered off as shown.

AMATEUR MICROSCOPY (*continued from page 707*).

How to Use the Microscope.

To use this very simple microscope, it is suggested that a series of slides should be made up. These may be purchased from any opticians or quite easily old negative plates may be utilised by cleaning off the film. Lantern slides which have been discarded are also suitable. It is far better to place any object upon a slide of this description than to put it directly upon the focusing table. It is apparent that many of the objects which will be brought to the microscope will be of a nature which will discolour or soil the focusing table, whereas if a slide is used, the base is always clean and and ready for use. Again, it is often necessary to fix the objects to be examined with some adhesive substance. It is a good plan to fix such objects to the glass and make a collection of objects which will be available for examination by yourself or by friends. The handy fellow will make his own boxes and will label them up so that as he puts the slide away he will know exactly where to put his hand upon it when required for examination.

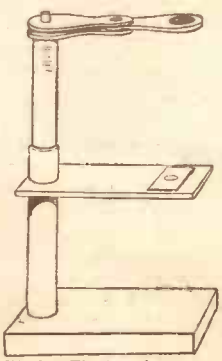


Fig. 2.—The base for displaying the objects.

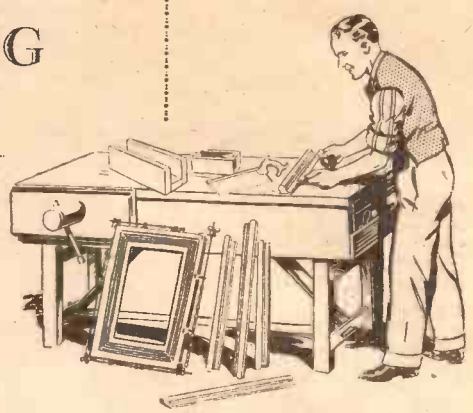
Slide Containers.

Cigar boxes make excellent slide containers, and with little ingenuity trays may be made from 3-ply wood which will allow fairly big cigar boxes to accommodate quite a large number of slides.

The microscope here described can be made for a few coppers, the only real expense being the magnifying glass. In very many cases this will be already in the possession of the fellow who has a leaning towards such a hobby as microscopy. In any case, the magnifying glass can be bought for a few shillings, and there are some which have three glasses which are excellent for the pocket and can be employed for the microscope too.

The apparatus suggested will require a few accessories, some of which may be made.

PICTURE FRAMING for the Amateur



PICTURES lend character to any home, but it is often a trouble to get a frame ready-made to fit the pictures we should like to hang. Coloured prints and illustrations are always obtainable cheaply, and it provides fresh scope for the handyman to make suitable frames for them. At first thought it may sound a difficult proposition, but anyone who undertakes carpentry can equally easily undertake picture framing. The work is not hard, the tools required are few, and the cost is within the reach of any pocket. Moreover, the work can be undertaken on the kitchen table without any elaborate preparations being made. One cannot, of course, expect to be an expert with the first frame—like everything else, experience is needed to make the craftsman. Care is as necessary in picture framing as in any other art, and a few extra minutes spent in measuring or testing may save hours of further labour or worry. There is no reason at all why the amateur should not make frames equal to those of the professional. He certainly has every opportunity now with the tools, moulding and accessories obtainable quite cheaply. Besides that, the work has been more simplified by the present popularity of narrow moulding in frames. A few years ago frames were made in moulding up to 3in. wide, whereas now it is about one-third that width.

A Hobby any Handyman can enjoy

As so many readers are keen to make their own picture frames, we have asked an expert to tell them all about it. This is the first part of the instructions. The tools described are obtainable from Hobbies Ltd., and free illustrated lists are obtainable telling you all about them.

The tools required are those which every carpenter is often using, so no special extra expense is involved. The moulding is cut on a mitre block, which can be bought from 9d. upwards. Or for larger moulding, one may prefer the mitre box, in which the work is laid. Elaborate corner-cutting tools and cramps make the work easier and cost from 9s. 6d. upwards. Then the worker must have an ordinary carpenter's tenon saw for cutting. A shooting board for planing the angles smooth is used by the professional, but this can be dispensed with by the amateur, because of the cost and the awkwardness of using it with success. Besides these tools, we only need glue, brads or panel pins, and, of course the moulding itself.

The moulding used varies considerably both in shape and size. One has only to look round a room to see something of the variety. There are really two main kinds which affect the amateur—the plain wood moulding, and that which is covered with composition and coloured. The plain wood is most suitable as it can be cut and stained as required. The "compo" moulding is apt to chip or become scratched unless carefully used. Of the variety of shapes the worker should select the plainest.

Kinds of Moulding.

Some are shown at Fig. 2, which are quite simple to mark and cut. Don't commence on any moulding where the back projects as at Fig. 3, because this "spoon-back" is much more awkward to cut and handle and fix. The material is usually supplied in oak or mahogany, so it can be stained down to any shade when completed. It is sold in almost any length at so much per foot. If possible, know how much you require before you start, in order to buy as economically as possible. Remember in this connection to allow the width of the moulding additional to the dimensions of the picture. Add to the measurement of each side double the width of the frame to provide the end cuts. Then add a little more to the complete length to allow for waste. If the picture is 12in. by 8in. and the moulding 1½in. wide, two pieces 15in. and two pieces 11in. long will be required. Thus a complete length not less than 5ft. should be obtained. When buying look along the length to ensure that there is

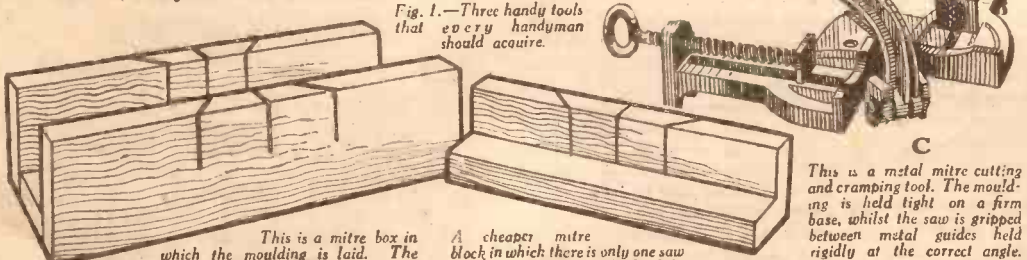


Fig. 1.—Three handy tools that every handyman should acquire.

B *This is a mitre box in which the moulding is laid. The tenon saw passes through the guides in both sides to ensure an accurate cut.*

A cheaper mitre block in which there is only one saw guide for each angle. Right, left, and centre cuts are provided for, as shown. **A**

C *This is a metal mitre cutting and cramping tool. The moulding is held tight on a firm base, whilst the saw is gripped between metal guides held rigidly at the correct angle. You cannot go wrong in using this tool.*

no warp or twist in the length. A frame can never be made from moulding which is not straight.

Now, it is most important that the lengths be cut correctly to make a perfect frame. The actual measurement must be the same in corresponding parts, and the cutting angle (or mitre) must be accurate. It is surprising how even a shade wrong in the length will throw the whole frame out. It may sound a simple matter to take a little piece off the end of one length, but in practice this never does the trick. The pieces have to be cut accurately in the first instance, and then the frame will fit easily and accurately. This cutting is where the mitre tools come in. The open block (A, Fig. 1) is only 9ins. long, but quite useful for small moulding. The box shown at B (Fig. 1) is much more serviceable, and is the professional worker's tool. The moulding is laid inside and held there tightly with the left hand. The blade of the tenon saw is slipped down the slots across the sides, and is made to cut through the moulding inside the box. Make sure the wood is on the floor of the box, and that there is no side play whilst the saw is cutting. Keep the saw upright, and do not attempt to take too long a stroke. Short rapid cuts will do the work more satisfactorily and not push the moulding out of place. The illustration at Fig. 4 shows the saw cutting through the moulding. Each length of moulding must, of course, have a right- and left-hand cut to make the corners, so that having cut one end, measurements must be made to cut the other. This measuring must be done carefully, and depends largely on the picture to be used. There is the "picture size" and the "sight size," and a glance at Fig. 5 will show the difference. The projecting portion of the moulding (the rebate) will obviously cover up a certain portion of the picture all round, and this must be allowed for if the whole of the picture is to be seen. The "picture size" is that which rests inside the frame—the "sight size" is the dimension between the rebate on the moulding when the frame is complete. To measure up the moulding, cut one end on the mitre block as has been described, and mark the actual length of the picture along the edge of the rebate (see Fig. 6). Turn the mark of the picture length just over on to the top of the moulding, and then put the length into the mitre box so the mark comes against the proper saw guide. Hold the moulding securely and saw through as before. Thus one length is provided, and this is actually used to mark off the piece to form the opposite side of the picture. Then cut off the other two parts, forming the other two sides in the same way to complete the four parts for the frame.

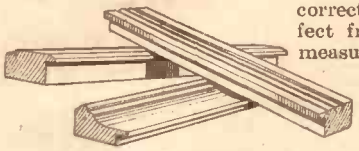


Fig. 2.—(Left). Suitable shapes of moulding for the amateur. The back edge is square in each case.

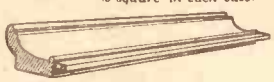


Fig. 3.—(Right). A "spoonback" moulding which is awkward to saw and to hold, until one has become fairly expert at the work.

The ends of the parts should be left as they are cut, and must not be sandpapered. If a shooting board is used, the ends are planed, but the amateur can get quite a good joint without, whilst the roughened end made by the saw provides a grip for the glue when the parts are put together.

The third illustration of Fig. 1 (C) is of Hobbies special cutting and cramping tool, which not only serves for cutting the moulding to correct angles, but holds two lengths during the gluing process. This cramp is made of metal. There are strong saw guides which grip the blade, and a screw clamp to hold the moulding. The operation is exactly the same as in the mitre box, but here the worker cannot go wrong, because both saw and work are held rigid at the correct angle, and the saw cut must be right.

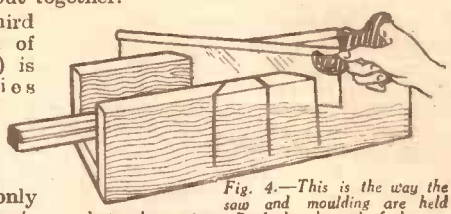


Fig. 4.—This is the way the saw and moulding are held during the cutting. Don't let the end of the saw blade slide out of the guide.

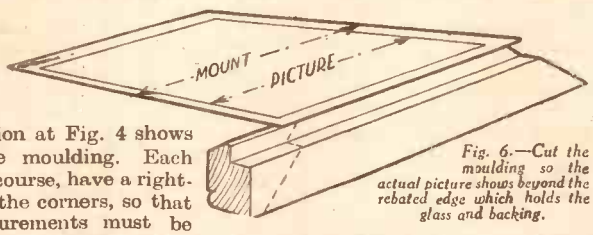


Fig. 6.—Cut the moulding so the actual picture shows beyond the rebated edge which holds the glass and backing.

This tool is screwed down to the bench so both hands are free to hold the moulding and the saw. Moreover, a proper length gauge is supplied (at small extra cost) which fits over the cutting plate and ensures any number of pieces of moulding being cut the same length.

When all the lengths have been cut, lay them in pairs together—the two long and the two short—to make sure they are exactly the same length. This may seem a small point, but it is really very important. The slightest difference in length will throw the whole frame out. Take great care in measuring and sawing, therefore, to see that your pencil measurements are accurate, that your moulding is held quite firmly in the mitre tool, and that your saw is sharp and cuts straight through. The saw-cut must be exactly upright, or this again will throw the moulding out. It is a good plan to practise work on narrow moulding to become used to handling the tools and work.

When you have become fairly expert at this simple sort of moulding, you can then try something more difficult.

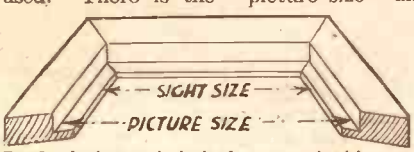


Fig. 5.—Looking at the back of an uncompleted frame to show the difference between the picture size and the size which will be seen between the moulding rebate.

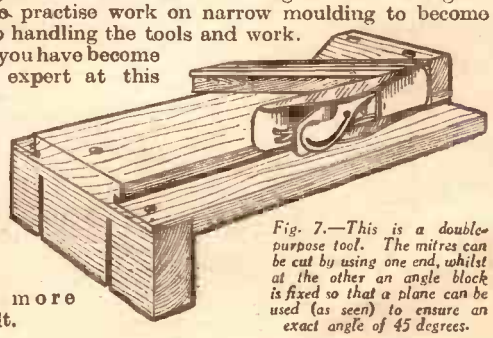
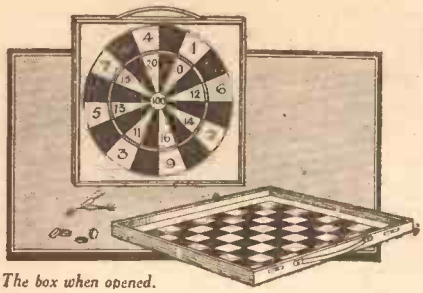


Fig. 7.—This is a double-purpose tool. The mitres can be cut by using one end, whilst at the other an angle block is fixed so that a plane can be used (as seen) to ensure an exact angle of 45 degrees.

NEXT WEEK

The second portion of this article will appear next week and tell you how to put the frames together and finish them off. Written specially for the young handyman by a fellow who knows all about it.



The box when opened.

PORTABLE DRAUGHTS OR CHESS AND DART BOARD

By E. Kerb

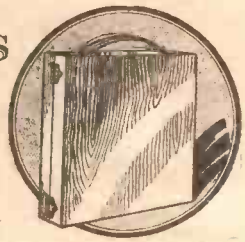


Fig. 3.—The box when closed.

VERY often you are asked out for the evening and requested to take a game with you. Here is a novelty: portable draughts, or chess, and a dart board, to carry draughts, darts, etc. This when closed is an ordinary polished case, with draughts and darts inside, and when opened you have two separate games, which would be very welcome at any gathering, young or old; it is shown above.

Any handyman can make them quite cheaply and easily by following the diagrams carefully.

The Draughts Board.

We will commence with the draughts board. First the baseboard: this must be light-coloured wood—light oak is very suitable; cut it 14in. by 14in., ¼in. thick; get it absolutely square, and mark out as follows: draw a square 12in. by 12in., leaving 1in. border all round, divide this into 1½in. squares, as shown in Fig. 1; the dotted lines indicate position of the stripwood edging; fill in each alternate square with black poster colour, which may be obtained from any stationer's store quite cheaply.

The Dart Board.

Use poster colour, not Indian ink, as this is liable to run in the grain. When absolutely dry, give a coat of clear varnish. Now fix the edging; cut two pieces of ¾in. by ¼in. stripwood, 14in. long, and two pieces 13½in. long; screw this firmly to the baseboard. Leave this for the time being and carry on with the dart board. Again, a baseboard 14in. by 14in., ¼in. thick; draw lines diagonally across, as shown dotted in Fig. 2; this will give the centre; now the centre lines "A." From the centre draw a circle with a radius of 6in., and inside this another circle with a radius of 3½in., with a very small circle in the centre. Having divided the 12in. circle into eight parts, with the diagonal lines and centre lines, divide each part again, making sixteen equal divisions. Fill in the divisions with various colours; black, red, and yellow with a green inner circle would look very attractive. Poster colour is the most suitable. When perfectly dry, paint on the figures in white, numbers optional. Now fix the edging as described for the draughts board; finish the outside of the boards with a coat of dark stain, then polish. When dry, fix two catches on each of the two sides, and a strip of leather, screwed on to each board at the top, to form the handles, as shown. Fig. 3 shows the case closed, and the position of the catches.

List of Wood Required.

Baseboards.—Two pieces, 14in. by 14in., ¼in. thick.

Edging.—Four pieces, ¾in. by ¼in. stripwood, 14in. long.

Edging.—Four pieces, ¾in. by ¼in. stripwood, 13½in. long.

Adaptations.

Although the suggestions contained in this article specifically relate to a combined draughts, chess and dart board it will readily be perceived that the idea lends itself to a variety of other adaptations. For example, the case could be made to contain draughts, dominoes and a ring board; by making suitable divisions it could accommodate a pack of playing cards and some simple conjuring tricks, a cribbage board, etc., etc. It could, in fact, be converted into a compendium of games similar to those sold in the shops. It provides a means of keeping various games tidily—a great advantage!

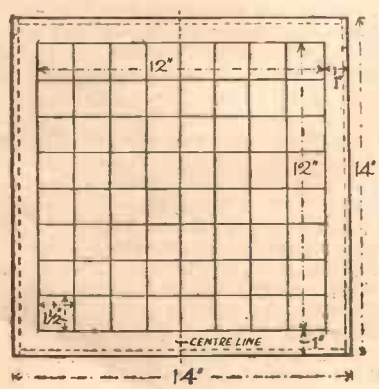


Fig. 1.—The draughts board should be divided up into squares as shown.

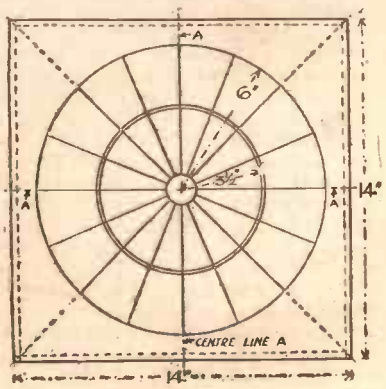
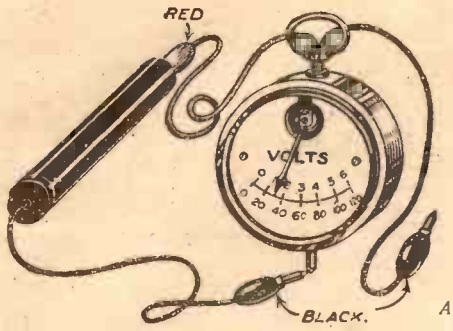


Fig. 2.—The construction of the dart board.



A voltmeter.

WIRELESS NOTES AND COMMENTS

By W. J. Delaney

A USEFUL CURRENT-MEASURING INSTRUMENT.

TO run a wireless set really efficiently and economically you must have a voltmeter and a milliampmeter. There are several instruments on the market which combine these two meters in one, and the money spent on one of these instruments will be amply repaid in longer valve life, better quality, and in quite a number of cases, longer life for the accumulator. A number of people—more especially those with two volt valves—run their accumulators until they can hardly hear signals before they visit the charging station. If you read the label on your accumulator you will find that it must not be discharged below a certain value. Some accumulators give this in volts, and some in what is known as the specific gravity. A two-volt cell should not be used after the voltage has fallen to 1.5 volts on full load (some accumulators even require recharging when the voltage falls to 1.85 volts). The term "on full load" means that the voltmeter should be placed across the accumulator terminals while the valves are alight, not when the accumulator is disconnected from the set. If the accumulator is completely discharged each time, and then not given a slow re-charge, the plates will quickly fall to pieces. If, for any reason (such for instance as going to bed and forgetting to switch off) the accumulator is completely discharged, the charging station should be informed, and they will put it on a slow charge which will help to preserve it, but making a practice of running it right out will soon spell ruin for it.


A safety fuse holder.

Grid Bias Battery.

With the voltmeter keep an eye on the grid bias battery. This little battery is often neglected, providing signals are not too badly distorted. The function of this battery, however, is to limit the current of the L.F. valves, and if this is not done the life of the valve is considerably shortened. In addition, the H.T. battery will run out sooner. Most of the valves sold nowadays have the full working data either printed on the box, or on a slip enclosed with the valve. You should study this and find the current taken at the particular voltage you wish to employ. Then, insert the milliampmeter between the anode of the valve and the H.T. tapping and see if the current is correct. If not, adjust the bias until it is. If the needle of the milliampmeter in this position jumps upwards and downwards it shows that the valve is being overloaded, and the remedy is to reduce signal strength, or increase the H.T. (of course, not going above the maximum stated by the valve makers).

If the needle kicks downwards only, then too much grid bias is being employed, and if it kicks upwards, not enough grid bias is being used.

A Safety Fuse.

No set, especially if you make a practice of experimenting or dusting inside the set with a metal-ferruled brush, should be without a Safety Fuse. A Holder complete with Fuse costs only 1s. 3d., and may save pounds in valve replacements. It is quite a simple matter to fit a fuse to your existing set, no technical knowledge or skill of any kind being needed. If you examine the connections to the terminals in your set, you will find that the H.T. battery negative terminal is joined to one of the L.T. battery terminals (usually the negative one). To fix the fuse, cut this wire in the centre, screw the fuse holder to the base-board as near the cut wire as possible, then connect the cut ends to the terminals on the fuse-holder. If your particular set has one common terminal to which leads from both H.T. and L.T. battery are connected, it will be necessary to mount the fuse on the terminal strip near that terminal, and to connect the L.T. lead to the original terminal, and the H.T.— lead to the remaining terminal on the fuse-holder. The fuse illustrated is made by a well-known firm, the holder costing 9d. and the fuse 6d.

Plug-in Coils.

If your set employs the two-pin type of plug-in coil, it is worth while remembering that signal strength and selectivity are best when a station is tuned in at the lower end of the scale. This means, that if you have to have all the vanes of the tuning condenser interleaved to receive, say the Midland Regional, by plugging in the next size of coil, that station will be received with the vanes "all out," and in all probability with no interference from the London Stations. The "Centre-tapped" and the "X" types of coil are much more selective than the ordinary type and are to be preferred for the aerial circuit of simple sets. When changing coils of the plug-in variety, don't pull them out by the top of the winding. Always hold the ebonite base whether pulling out or replacing them, and they will preserve both their shape and their working characteristics. Some types of winding suffer seriously when pulled out of shape, and it therefore pays to be careful when handling these coils. Thus, by careful handling when plugging in or out, the best results will be obtained from them.

AN AUTOMATIC GRAMOPHONE STOP AND HOW TO MAKE IT

By J. H. Reed

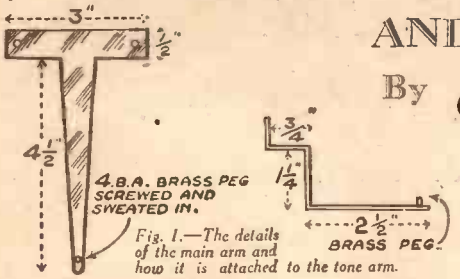
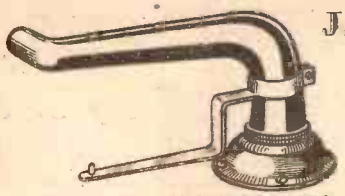
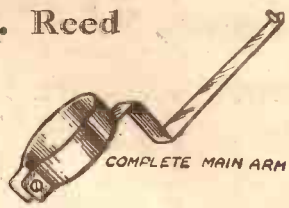


Fig. 1.—The details of the main arm and how it is attached to the tone arm.



HOW MAIN ARM IS CLAMPED TO TONE ARM



COMPLETE MAIN ARM

THERE are few gramophone enthusiasts who possess instruments fitted with an automatic stop, which will function on any make or size of record. With such a device fitted to an instrument there is no longer the vexed question as to who shall leave the fireside or dancing partner to stop the motor.

The mechanical stop to be described, is the result of considerable experimenting by the writer, and gives perfect satisfaction. The dimensions are indicated, and should need little modification to suit any type of machine. The device operates on a twelve-inch turntable, and hence for a ten-inch may be conveniently made slightly smaller.

The material used throughout was brass, not by choice, but because it happened to be handy. A much better material would be mild steel, as this would be more durable. Brass, nevertheless, appears to be quite satisfactory, and may be used if more convenient than steel.

Fig. 5.—The base plate.

Construction.

Reference to the sketches will show that there are five main parts, the main operating arm (Fig. 1), the link (Fig. 2), the catch (Fig. 3), the brake arm (Fig. 4), and the baseplate (Fig. 5).

In addition to the above, two weak springs, and a few odd screws are needed.

The Main Operating Arm.

This cut out of $\frac{1}{16}$in. sheet metal. If the gramophone tone arm is of large diameter, it may be necessary to make the arms of the "T" a little longer, since, as will be seen, these arms are clamped round the tone arm, after the style of an electrician's earthing clip. Holes are drilled as shown in the sketch, two at the extremities of the arms to accommodate a $\frac{3}{16}$in. clamping bolt, and a third hole is drilled and tapped 4 B.A. at the lower extremity of the third arm. A $\frac{1}{4}$in. length of 4 B.A. rod is screwed into this hole, and sweated in with solder. The fitting is then bent to the shape shown in Fig. 1.

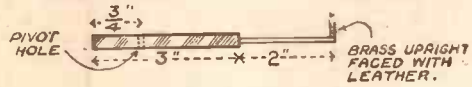


Fig. 4.—The brake arm.

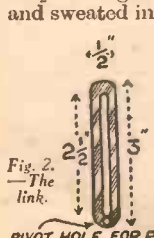


Fig. 2.—The link.

The Link.

This is also cut out of $\frac{1}{16}$in. metal. The most convenient way of cutting the slot is to scribe it out and cut it with a fretsaw. Another method is to drill out the slot within the outline, and finish off with a small file. A pivot hole is drilled as in sketch.

The Catch.

Cut this out of $\frac{1}{8}$in. metal and true it up to shape with a file. The upper end is drilled and tapped 4 B.A. and a piece of tapped rod sweated into the hole in the same manner as the main operating arm was treated. The lower end of the catch is drilled in two places. One hole is of sufficient size to pivot smoothly on 4 B.A. rod, while the other is very small, serving as a point of attachment for a spring. This is illustrated in the sketch of the completed stop.

The Brake Arm.

The square centre rod from a wireless variable condenser was used for a brake arm. It consists of a 3in. length of $\frac{1}{4}$in. square metal, with a 2in. extension of 2 B.A. rod. The square portion is drilled $\frac{1}{4}$in. from its extremity so as to pivot on a 4 B.A. rod in the same manner as the catch. To the threaded extremity of the arm, a brass upright is soldered. This upright is faced with leather, and bears on the outer rim of the turntable when the catch is released, thus stopping the motor.

The Baseplate.

This is a piece of sheet metal 2½in. by 3in. by $\frac{1}{16}$in. As the working parts lie on this baseplate, the surface must be filed and emeried until quite smooth. This is very essential since undue friction will prevent successful operation and may also cause wear on the record. Countersunk holes are drilled at the four corners of the plate, in order to screw the latter to the gramophone. Two other holes are drilled in the plate, both of which are to accommodate 4 B.A. pegs, screwed and sweated into position as already described in the cases of the main arm and catch.

All is now ready for assembly.

Assembly.

Reference to Fig. 6, which shows the finished device, will make the task of assembly quite straightforward. Bend the two arms of the "T" on the main operator around the lowest portion of the gramophone tone arm, and clamp them in this position by the aid of a $\frac{3}{16}$in. nut and bolt. The operating arm will now be found to swivel with the tone arm, its ex-

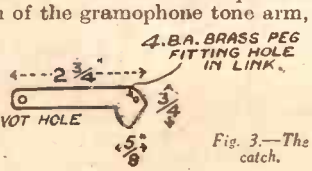


Fig. 3.—The catch.

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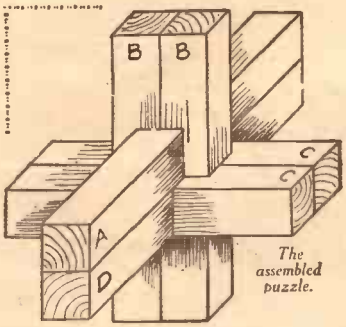


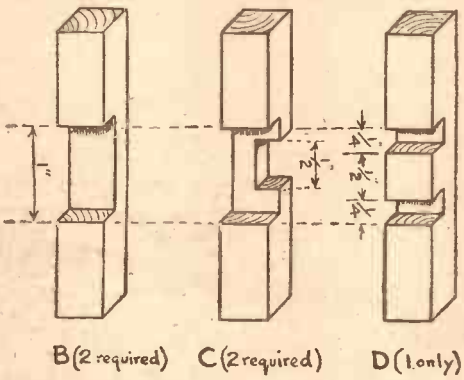
The assembled puzzle.

A SIX-ARM CROSS PUZZLE

By S. J. Garratt

THIS puzzle, although really an old one, becomes new again with every fresh generation of boys that arises. When you hand the puzzle to a friend he will probably find it very easy to pull to pieces, but it is a much more difficult matter to discover for one's self how to put it together again.

To construct the puzzle you require six pieces of wood, say 3in. long and ½in. square. The wood should be bought already cut to size by machinery if possible, but if you cut it yourself make sure that it is truly square in section. Put one of the pieces aside, as it requires no further work; call this piece "A." Then cut a groove across two of them as shown at B in the illustration; the dimensions given are for wood ½in. square; of course, if you use any other size wood the dimensions must be altered to suit. The C pieces are made exactly as B to start with and an extra groove cut afterwards. D has two grooves as shown; in every case the grooves are to be ¼in. deep.



How the arms of the cross are cut before assembling.

Assembling the Puzzle.

To assemble the puzzle take first the two B pieces and place them together, with the slots facing each other so as to form a hole. Lay D centrally in this hole with the two grooves upwards. Then fit a C on each side of the two B's, as shown in the complete illustration; the exact position of the two C's will be quite obvious when you come to their turn. A square hole will then be left between the two B's; push the plain piece (which we have already referred to as A) through this square hole. This will lock the whole six pieces together and complete the assembly of the puzzle.

AN AUTOMATIC GRAMOPHONE STOP (*continued from page* 717).

tremity sweeping in a circle underneath the turntable. The latter is now removed temporarily from the instrument while the other working parts are fitted. The 4 B.A. peg in the arm just fitted, runs in the slot in the link, and the hole drilled in the end of the latter is an easy fit on the peg in the top of the catch. Secure the link on these two pegs by means of 4 B.A. nuts, which are *not* screwed up tightly—the action must be free and unrestricted by any tension from these nuts, which, when in position, to obviate any possibility of them working loose, are soldered to the screwed rod. The baseplate is placed roughly in position; the catch and brake arm are placed on their respective pivots, and like the link, secured with nuts.

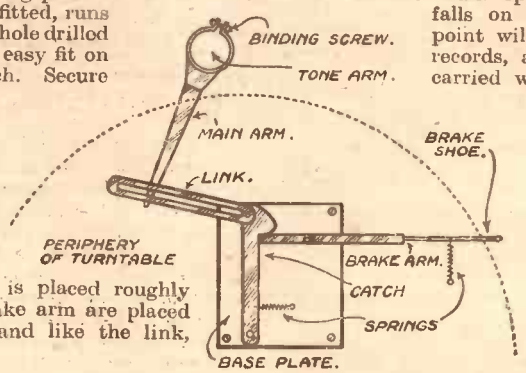


Fig. 6.—The finished automatic stop.

Adjustments.

Now adjust the position of the baseplate so that when the catch and brake arm engage, that is, the "off" position, the leather brake shoe clears the rim of the turntable by a small margin. Having satisfactorily obtained this position, screw down the baseplate. Now obtain two small weak springs, and fix them as shown in Fig. 6. Replace the turntable, place on it a record, and, using the clamping screw, adjust the relative angle between the gramophone tone arm and the main operating arm so that the brake falls on as the record finishes. This point will be found to answer for most records, as the needle track is usually carried well into the centre of the disc.

Releasing the Mechanism.

To release the brake mechanism, and to simultaneously reset it, swing the tone arm to the extreme right before putting the sound-box on the record. This movement causes the catch to be pushed forward, thus lifting the brake arm, and holding it until the full extent of the link has been traversed by the tone arm attachment, when the catch is pulled back slightly, and the brake falls on to the turntable.

If the above directions are carefully followed no difficulty should be experienced in obtaining a successful result, and the time spent in making this automatic stop will be found well worth while.

Mark all envelopes containing queries with the word "Photography" in the top left-hand corner.

BEGINNERS sometimes wonder why they get such poor results when taking coloured objects. Quite often, too, older workers, who ought to know better, will not trouble to take the steps necessary to make a good job of an original in which certain colours, notably red, green and yellow, are strongly represented. This is not as it should be, since the "reason why" is quite easy to understand, and the remedy not at all difficult to apply.

Light and Colour-Sensitiveness.

Most of you have learnt at school that light is made up of rays of different colours, ranging from blue-violet at one end of the "spectrum" to deep red at the other. If you do not know what the spectrum is, look carefully at the next rainbow you see, and you will see a lovely picture of it drawn by Nature. Nearest to the red is yellow, then comes green, and, finally, blue or violet. Now the ordinary photographic plate is sensitive chiefly to white light and to the rays at the blue end of the spectrum. It is so sensitive to blue that a light-blue object—sky, for instance—photographs as if it were white. But it is only sensitive in a limited degree to yellow and green, and hardly at all to red. That is why we mostly use a red light in the dark-room when developing an ordinary photographic plate, and why red, green and yellow so often come out black, or nearly black, in a photograph. But all these colours, as we see them, can be very bright, and to make them appear as black is almost as bad as telling a lie.

Fig. 1.—This photograph was taken with an ordinary plate.

Fig. 2.—This was taken with a panchromatic plate and Gamma filter.

Sensitising Dyes.

There is really no need for these photographic falsehoods. Certain wonderful dyes—some of their names in full would make your heads ache—have been discovered which, when added to the silver-emulsion with which ordinary plates are coated, have the property of making it sensitive to other colours besides white and those at the blue end of the spectrum. Some of these dyes make the plates sensitive to yellow and green, but little more sensitive to red than ordinary plates. Plates sensitised with them are called "ortho-chromatic," or ortho for short, and we shall have a separate article about them later on. To-day we are dealing specially with plates which a certain dye admixture has rendered more or less sensitive to *all* the colours, and which are consequently known as "pan-chromatic," from two Greek words, *pan* (all) and *chromata* (colours).

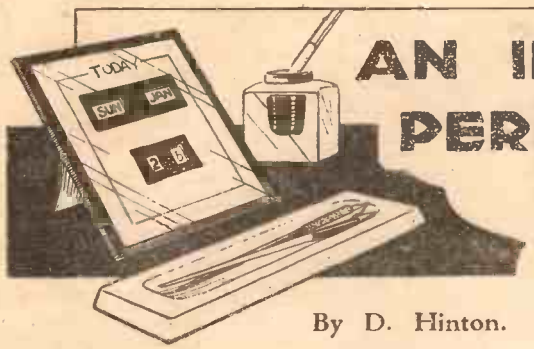
Light Filters.

To get the best results out of these plates—since they are not *equally* sensitive to all the colours—it is necessary to use a "light filter" on the lens. This usually takes the form of a piece of gelatine film specially dyed according to the effect it is desired to produce. Those who want to get a correct rendering of all the colours generally use a pan-chromatic plate with a pale greenish filter known as the Ilford Gamma. Mounted filters in holders for fitting on to the lens are rather costly, but the stained gelatine film is quite cheap, and can be obtained from any photographic dealers. You can buy a 1½in. square or circle of "Gamma" film with which you can get astonishing results on either Ilford or Imperial panchromatic plates or films. If your lens is a doublet, all you need do is to unscrew the front glass and, having cut a disc of the Gamma film to the right size, drop in the latter so that it rests against the iris stop, and then replace the front glass. The film should be placed between two pieces while cutting the disc, as it is most important that it should not be messed about with the fingers. By the way, if your camera takes only roll film or film-packs, remember that you can now get either of these sensitised with the same panchromatic emulsion as is used for coating plates. They cost rather more than the regular kind, but, when once you have tried them for special work, you will not grudge the small extra expense.

Precautions.

As panchromatic plates and film are sensitive to red,

(*Continued at foot of page* 720.)



AN INEXPENSIVE PERPETUAL CALENDAR

By D. Hinton.

THE Perpetual Calendar shown herewith may ea ily be made from some cardboard and a piece of glass. Bristol board is the best card to use, but any good quality white cardboard will do.

First, cut a 5in. square from the cardboard, and on it mark, in pencil, the positions of the four openings as given in Fig. 1. They should then be cut out with a sharp penknife, slightly bevelling the edges.

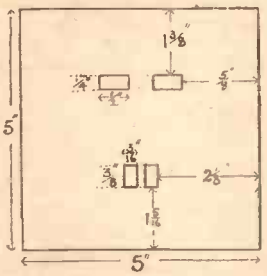


Fig. 1.—The square p ece of cardboard with the position of the openings.

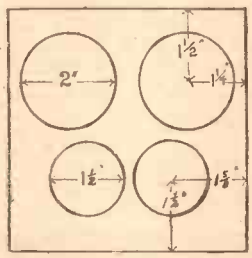


Fig. 2.—A second card should be made, with circles cut out as shown.

Next cut a second card, the same size as the first, and on this draw the four circles as shown in Fig. 2. Cut these out neatly, keeping the discs thus obtained, as they will be required. Glue this second card to the back of the first.

Trim up the edges of the four discs so that they will go back into their places with room to rotate. Then from a piece of dowel rod cut four pieces ½in. long, and glue one to the *back* of each disc, exactly in the centre (see Fig. 3).

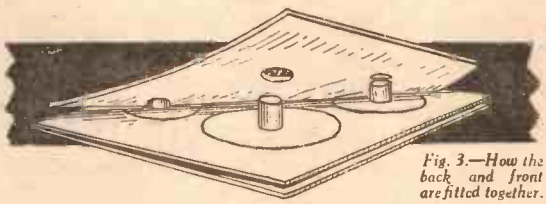


Fig. 3.—How the back and front are fitted together.

Now place the calendar face downwards. Replace the four discs in their respective places with the pieces of rod upwards. Cut a back, also 5in. square, from a piece of stout cardboard, and in it cut four holes to allow the pieces of rod to pass through. The positions of these holes will correspond with the centres of the circles as given in Fig. 2.

Glue the back down firmly, taking care that none of the glue goes on the discs, which should rotate upon turning the wooden knobs.

The Lettering.

Now proceed with the lettering. On the portion of the disc visible in the upper left-hand opening in the front of the calendar, print the letters, SUN. Let the ink dry, then rotate the disc just enough to make the printing sink out of view, and then print in the letters, MON. When this dries rotate the disc again and print the next day of the week, and so on, using the abbreviated forms—TUE., WED., etc. Proceed in like manner with the top right-hand disc, putting in the abbreviated names of the months—JAN., FEB., etc.

On the lower right-hand disc print, in the same way, the figures, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0. On the lower left-hand disc you require only three figures—1, 2 and 3. These give the tens, twenties, and thirties of the month.

The front of the calendar may be decorated by any suitable means, such as pen-and-ink, water colours, or by pasting on scraps. A 5in. square of glass is now placed over the front and the whole bound with passe-partout binding. Glue a cardboard strut to the back, and the calendar is complete.

PHOTOGRAPHY (*continued from page* 719).

the ordinary dark-room lamp fogs them badly, and it is safest to handle them in complete darkness, development being done by time. A very deep green safelight may be used if caution is observed, but the light is so dim that it is hardly worth while. The writer personally *desensitises* his panchromatic plates, but that is "another story" which will have to be told in a separate article.

The Illustrations.

Here is a pretty good example of the difference between correct and incorrect rendering of a coloured object by photography. The original is a china figure resting on a piece of cinnamon-coloured fabric against a grey background. The little maid's hair is yellow, her sash is green, her skirt is red, and her shoes brown.

Defects.

There is also quite a lot of red on her fat cheeks. See what a mess the ordinary plate makes of these colours in Fig 1. Hair, cheeks, sash, skirt and shoes are all too dark, and so is the cinnamon-coloured fabric. Now turn to Fig. 2, which was taken on an Imperial Panchromatic B plate, with an Ilford Gamma filter on the lens, and note the differences. The blocks may not show them up very clearly, but in the photographs they are very striking indeed. In Fig. 2 everything is "just so," and there is a complete absence of the harsh semi-blacks which are so disfiguring in the other picture. Yet the extra trouble it gave was small compared with the advantage gained. Isn't it worth your while, when you have a coloured original to deal with, to go and do likewise ?

A TOY TREASURE COT

AND HOW IT IS MADE

By

T. E. John

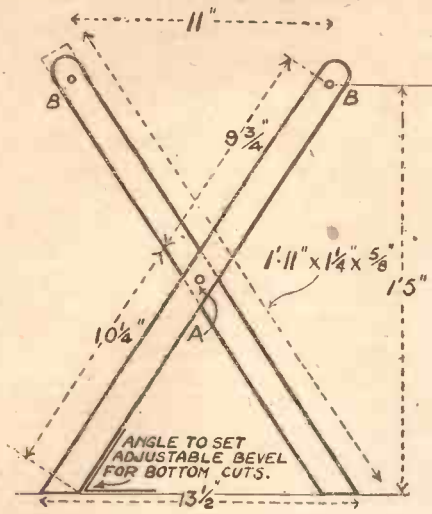
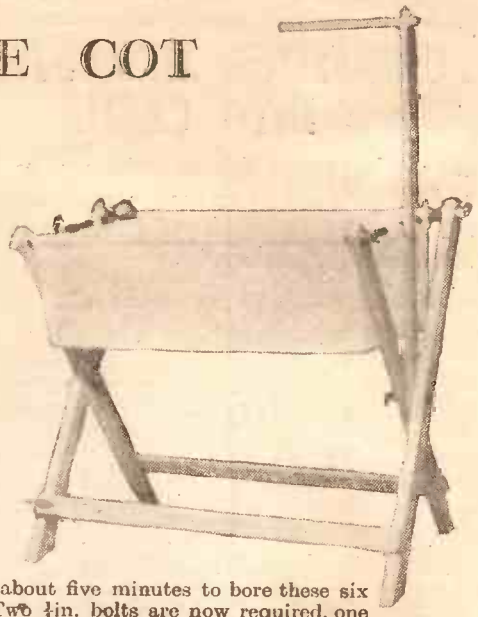


Fig. 1.—(Right) The finished treasure cot.

Fig. 2.—(Left) An end elevation of the cot.



MADE to this design, it can be executed for a total outlay of about four shillings—such a cot would cost four or five times as much in a shop.

To commence, it is better to draw a full-size elevation of one end of the cot; this is shown in Fig. 2. Next, the wood can be prepared. Four pieces of wood (Canary or Satin Walnut will do) are cut out and planed up to the required size, this being 1ft. 11in. by 1½in. by ⅝in. An adjustable bevel can now be set to the correct angle, and the feet cut off and planed in the vice. If carefully cut with a tenon-saw, planing will not be necessary. The upper ends may be pared to a circular shape and finished off by filing and glass-papering. Measuring very carefully, the centres of the holes may be marked as shown by small circles. It is the work of about five minutes to bore these six holes. Two ¼in. bolts are now required, one for the head of the cot and the other for the foot.

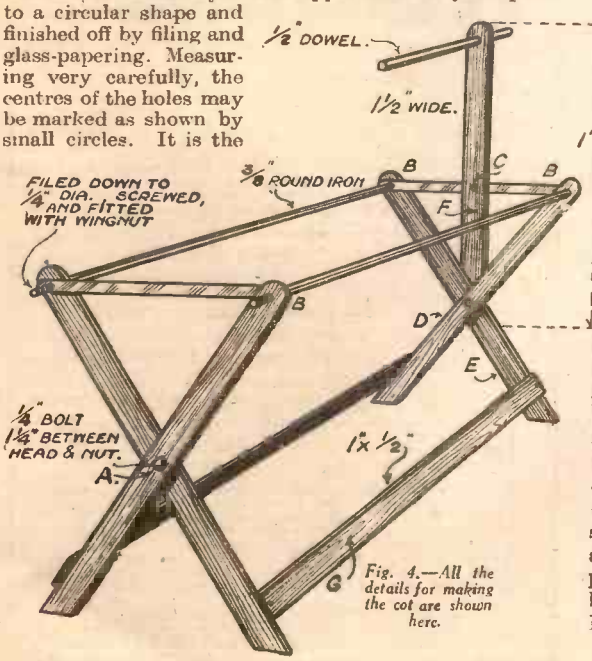


Fig. 4.—All the details for making the cot are shown here.

The Metal Work.

Procure two pieces of ⅜in. round iron about 22in. in length; this is sold at 2d. per lb. A two-foot length of ½in by ⅛in. iron will also be needed. If a slight mark is made around these round pieces (1in. from each end) with the hack-saw, it will not take long to file down to a ¼in. diam. Those who possess a lathe can run it down in a very short time. Now set the pieces vertically in a vice, and screw down the inch pieces; suitable ¼in. wing nuts can be bought very cheaply.

A glance at Fig. 3 will soon put any difficulties right. The flat iron can be cut into two 12in. strips, and two holes (the centres being 11in. apart) should be drilled. For convenience when folding the cot, one of these holes should be filed into a slot shape (see Fig. 3).

Before assembling, a small hole should be drilled and countersunk in the centre of the strip, to be used at the head. By this means the upright piece F can be kept perfectly rigid. This latter piece should be about 1½in. by ½in.; a ¼in. hole should be bored, and then the piece can be bolted between the pieces D and E (Fig. 4).

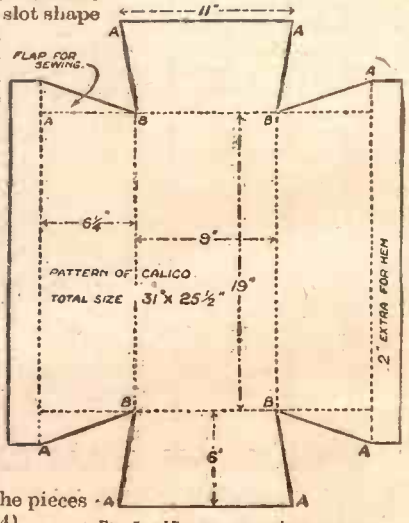


Fig. 5.—How to cut out the canvas carrier.

(Continued on page 724.)

INSPIRED by the ideals and successes of the revolutionists in N. America and France, some bold spirits among the Spanish colonists in South America, in the opening years of the last century, began to whisper the words "liberty, equality and fraternity," and were shouting them by 1810. The *bonnet rouge*, or cap of liberty, was openly flaunted in the faces of the representatives of the Spanish throne, whose inquisitorial rule had lasted for nearly three centuries. The torch, once alight, was borne throughout the southern continent from end to end, and Spain, distracted at home by the Napoleonic wars and her own dynastic troubles, found, by 1825, that the Spanish Main was a thing of the past and her whole vast American empire had vanished.


San Martin, the saviour of the Argentine Republic.

Defeat of the Spanish Troops.

Of the men who had the greatest share in establishing the independence of the several South American republics, Bolivar was the greatest figure, and has earned the title of "The Liberator." A native of Venezuela, he had himself been present in Paris during the closing scenes of the French Revolution. He returned home about the time that his compatriot, Miranda, issued his premature declaration of independence at Caracas (1811). Assuming the command of the revolutionist troops, Bolivar made war against the loyalists with very little success for ten years, spending his own private fortune—no mean one—in the furtherance of the cause. A great victory at Carabobo in 1821 virtually ended the war, but it was not until 1824 that the Spanish troops were finally driven out. Bolivar's sphere of action was in the North—Venezuela, Ecuador, Colombia and Upper Peru (now Bolivia). What Bolivar did for these regions San Martin had, by that time, accomplished for the South, freeing Peru, Argentine and Chile. The Portuguese monarchy had also been expelled from Brazil, and thus the whole of the South American continent, with the exception of Guiana, which was, and still is, divided between the British, French and Dutch, became independent.

TWO GREAT PATRIOTS

By P. L. Pemberton.

(*Concluded from page 694, Feb. 21st issue.*)

President of Colombia.

Simon Bolivar was not only a great military leader but also a great character. He was chosen president of Colombia, which then comprised Venezuela, New Granada and Ecuador, and later, when the state of Bolivar was carved out of Peru, he was named as its Protector in perpetuity. Imbued with the highest principles, and absolutely incorruptible, Bolivar proved to be an inspired administrator; unfortunately these unusual qualities were not to the taste of a people whose whole experience had led them to expect the head of a state to be amenable to the claims of favourites and monetary persuasion, and, as a result of the intrigues of those who were disaffected by his unyielding principles, he laid down his authority in 1830, and died in the same year.

A Very Rare Variety of a Very Common Stamp.

Most collectors like to hear of rare and valuable varieties which may, with luck, be found among common stamps. I have just heard of such a possibility in connection with the current Chinese provisional stamp, 1 cent, surcharged on 3 cents, green. This stamp was first issued about twelve months ago, and as it has been used in great quantities it is already exceedingly common. The surcharge is in red, and is expressed in English as well as in Chinese, the latter being denoted by two characters to the left and two to the right of the English. The stamp to which it is applied is the current 3 cents, which shows a Chinese junk sailing on the placid waters of a river; in the distance a railway train is seen crossing a bridge. If the stamp is carefully examined, it will be seen that there are seven pearls at the top of the design and one in both top corners, all of which are unshaded; there was, however, an earlier form of this design in which the said pearls are shaded, but this has been obsolete for several years. Now an extraordinary thing has happened: some diligent collector in Far Cathay has found one or two of the 1 cent surcharged on this old type with the shaded pearls. Evidently one or two sheets of the obsolete stamps survived and have received the surcharge. Up to now very few specimens, all of which are used, have come to light, and it is almost sure to prove a very rare item.


The Chinese stamp of a very rare variety which is described in the text.

A TOY TREASURE COT AND HOW IT IS MADE (*continued from page* 721).

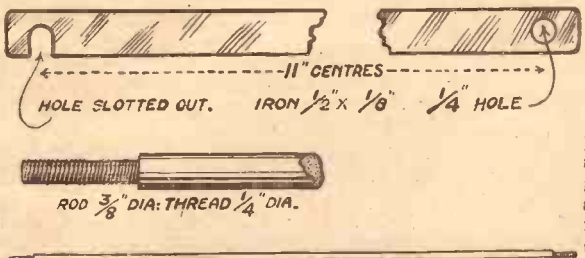


Fig. 3.—The details of the metal work.

A Trial Fitting.

Slip the round rods through the holes marked B (being careful to use washers beneath the nuts) and tighten up. A screw can be placed through the iron at C to hold the upright F. Near the top of piece F bore a ½in. hole and insert a 7in. length of ½in. dowel, fixing it by glue and nails through the edge. To finally stiffen up the model, two battens, marked G in Fig. 4, should be screwed on. The model will now stand any amount of rough usage.

Mark out a paper pattern to the sizes shown in Fig. 5, and a glance at Fig. 6 will show how the carrier is made. When it is stitched together, undo one end of the cot and slip the round irons through the hems. A piece of three-ply wood, 19in. by 9in., placed in the bottom of the carrier, will greatly improve the shape. All that remains to be done is to fix a screw-eye in the top of each leg and pass a tape through them—the drapings can be attached to the tape by a hem. The curtain should be suspended from the dowel rod.

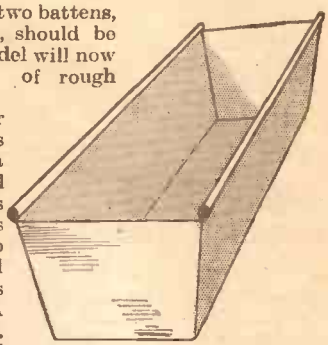


Fig. 6.—The finished carrier.

SOME BATTERY QUERIES ANSWERED

By a Battery Engineer

WHAT is a Storage Battery?—A storage battery is a device which may be used repeatedly for the storage of energy. Energy, in the form of electricity, is put into the battery when it is charged and given up in the same form when the battery is discharged.

What are its Essential Parts?—Two unlike plates (positive and negative) in a solution (electrolyte). The electrolyte acts upon the plates and gives to the positive a tendency to deliver current and to the negative a tendency to absorb current.

What is the Electrolyte?—It consists of a mixture of pure sulphuric acid and distilled water. If you are filling your own batteries and "breaking down" strong acid to the required strength, the following precautions should be observed:—

(1). Vessels should be of glass, earthenware or lead, and *never* of any other material.

(2). Pour the acid *slowly* into the water. *Never* water into acid.

(3). Stir *well* with a stick or wooden spoon, and (4) allow to cool before taking gravity readings.

Is It Necessary to Keep a Battery Dry and Clean?—Yes! Dirt and moisture allow the current to leak away, and reduce the efficiency of a battery. They also tend to start corrosion by attracting and absorbing minute quantities of acid.

How May Corrosion be Prevented and Cured?—Corrosion is best prevented by removing all traces of acid from terminals and connections (by wiping with a rag moistened with ammonia) and then coating all metal parts with pure vaseline.

Once corrosion has started, it is necessary to scrape the affected parts clean, remove all traces of acid as before, and smear with vaseline.

What About Discharging?—No harm is done to the plates if the battery be discharged at any rate of current that it will deliver. The higher the rate of discharge, however, the faster the drop in voltage, and if a battery is discharged at higher than the "normal" rate the full number of ampere hours will not be obtained. A high rate of discharge should not be confused with over-discharging (too many ampere hours taken out of the battery). If a battery be accidentally over-discharged, and *immediately* recharged, little damage will be done.

Can Hydrometer Readings Always be Relied Upon?—Not always. If acid has been added to a battery instead of water, the specific gravity of the electrolyte will have increased and might be at fully-charged strength when the battery was only half charged. The reverse of this would be the case if electrolyte had been spilled and replaced by water. The hydrometer should have a graduated float as readings obtained by the "coloured ball" type of hydrometer are not reliable.

Is Sediment Cause for Alarm?—Not if it is only present in small quantities. As the battery is operated the amount of sediment increases, but it only deposits rapidly if the battery is operated incorrectly. There is a thin layer of sediment in a perfectly new battery.

DO YOU KNOW—

THAT the small British Colony of Papua has followed the lead of Australia, and raised the internal rate of postage from 1½d. to 2d.?

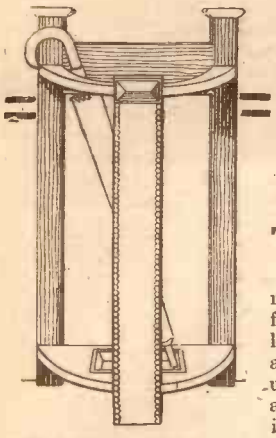
That the change took effect on January 1st, when the 1½d. stamp appeared with the surcharge "Two Pence"?

That an American Senator, himself a prominent stamp collector, has proposed a special stamp for the benefit of the sufferers from the great drought last year?

That a great philatelic exhibition is to be held in Hamburg from August 22nd to 30th next.

That the current Chilian stamps with overprint "Servicio del Estado" are used only on official postal matter for foreign countries?

That Newfoundland has just issued a fine set of pictorial air stamps?



A HOME-MADE UMBRELLA STAND

Here is another practical piece of home furniture any amateur carpenter can undertake. It can be cut out in oak and put together in an hour or two from these instructions.

THIS umbrella stand with its semi-circular front occupies but little room, and is most suitable for the small house or bungalow. It is a job which any amateur woodworker may undertake with confidence, and the cost of the material is small. The stand is made with a framed back, consisting of two uprights and a cross rail. The top rail and the bottom are semi-circular in shape, they are screwed to the back frame, and are joined by an upright at the front. Oak is the best wood to use for a piece of furniture of this kind, and all the parts may be cut from ¾in. light oak fretwood as supplied by Hobbies Ltd. The parts required are two uprights 2ft. 3½in. long by 1⅝in. wide, a cross rail 1ft. 2in. long by 3½in. wide, front upright 2ft. 0½in. long by 3½in. wide, and two pieces of wood 1ft. 3in. long by 7⅛in. wide, from which the top rail, bottom, and other small parts may be cut. In addition, a metal draining tray (No. 6144), plain oak oblong wood ornament (No. 213) size 3½in. by 1⅝in., and 4ft. of the half-round ⅜in. ball beading (No. 53) will be required to complete the stand.

The edges of the uprights and cross rail are planed straight and square, and the back frame is made by half-lapping and screwing the cross rail to the uprights (see Fig. 1). The joints should be carefully set out. The lapped portions at the ends of the cross rail are cut with a tenon saw, and the recesses in the uprights with a saw and chisel. Try up the joints to see they fit, after which they may be finally fixed with glue and screws.

The edges of the front upright are planed straight, and the top rail and the bottom are cut to the pattern shown at Fig. 2. A pair of compasses should be used for setting out. The top rail is 1⅞in. wide, and an opening is cut in the bottom for the draining tray, as shown also at Fig. 4. A fretsaw fitted with a heavy blade will be found useful for this part of the work. Recesses ¾in. deep are cut in the front edges of the rail and bottom to receive the front upright, which is fitted in and fixed with glue and screws. The wooden ornament (No. 213) is fixed at the top of the upright, and the beading is fixed at the edges. In driving the screws or nails between the upright and bottom care should be taken to place them near the edges, so that they will be covered by the beading.

Two shaped bracket pieces 4½in. long by 1in. wide, and two capping pieces 3½in. long by 1½in. wide (Fig. 3) are cut from the waste pieces left over from the top rail. The bracket pieces (Fig. 3) are screwed to the bottom edges of the back frame, as shown at Fig. 1. The bottom rests on these bracket pieces and screws are driven through them into it, whilst both the bottom and the top rail are screwed through the back frame. The front and end edges of the capping pieces are rounded over, and glued and nailed to the top ends of the back uprights (Fig. 4). The completed stand should be stained with Hobbies' fumed oak stain and wax polished. All the parts should, of course be thoroughly sandpapered, and any glue which has squeezed out must be cut away. Any superfluous glue can be wiped away with a damp rag before it has set.

Let us have a photograph!

We want photographs of fretworkers and some of the Hobbies' designs they have cut. Unusual pieces of work, too, are often worth a picture. Take a good snap of them and we will pay you 2/6 for every one used. A print should be sent, with your name and address and particulars of the picture. Have the photograph as large and sharp as possible, and send to Hobbies Ltd., Dereham, Norfolk, marking the envelope "Fretwork Photograph."

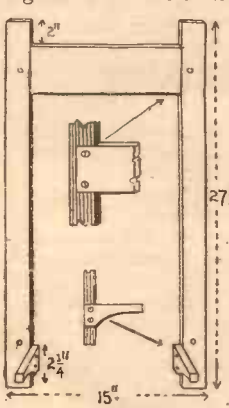


Fig. 1.—This is how the framework of the back is constructed, with details of the joints used.

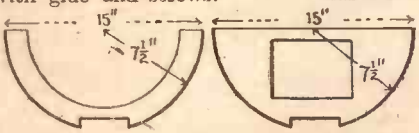


Fig. 2.—The shape and dimensions of the top rail and the bottom for the draining tray. Both can be marked out and then cut with a fretsaw.

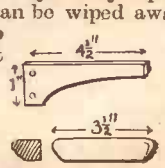


Fig. 3.—The top detail is of the brackets supporting the bottom; the lower one shows how the caps are shaped.

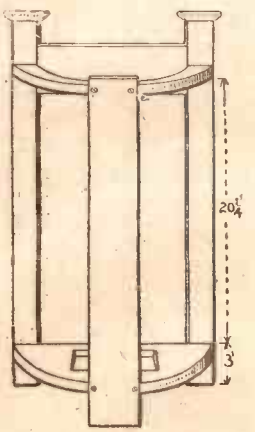
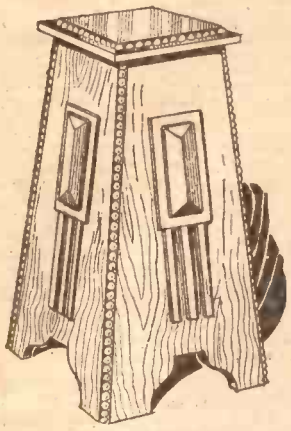


Fig. 4.—The general outline of the work showing how the various parts are fitted in place.

A PLANT STOOL.

WE illustrate an easily-constructed and artistic little pot pedestal. It stands 15in. high and is 8in. square on top. The four sides consist of ¼in. fretwood or three-ply wood, and what makes for simplicity is the fact that they are all cut exactly alike and to the same size. Take a piece of wood 15in. long by 9in. wide and down the centre of this width draw the centre line. On each side of this, at the top end, set out 3in. and then connect up the points marked to obtain the correct taper. From the measurements given set out the simple shaping see Fig. 1) at the foot and then cut out with the fretsaw. The ong cuts forming the tapers may be cut with an ordinary hand saw, the rough edges being afterwards cleaned off. Lay one completed side on the other three pieces of wood and mark round with a sharp pencil. Clean them all up after cutting and then proceed to screw the fillets (consisting of ¾in. by ¾in. stripwood) to two of the sides as shown in Fig. 2. Keep the fillets exactly flush with the edges so, when the other sides are screwed on, a right angle will be formed (see Fig. 3). Trim off the ends of the fillets to the correct angle at the feet. Countersunk-screws should be used for screwing on the sides, the holes afterwards being filled with plastic wood.



The top consists of two pieces of wood, one piece being cut 8in. square from ½in. wood, and the other piece 6¼in. square from ¼in. wood. Glue and nail the pieces together and then glue round the strips of the No. 58 beading in the angle formed between the two pieces. Fix the completed top to the sides by means of gluing blocks inside. The beading is also inserted in the four angles of the sides and glued and pinned securely.

Four plain 3/16in. thick overlays are now set out and cut 4½in. by 2¾in. and glued to the sides in the position shown in Fig. 1. To these overlays are fixed the four fancy oblong wooden ornaments (No. 213). To finish the embellishment to the sides, strips of oak measuring 4in. long by ½in. wide are glued beneath the large overlays, a space of ¼in. being allowed between each strip. If oak is used it should be stained light oak and finished with two coats of clear varnish laid on with the brush, a light sandpapering being carried out between each coat.

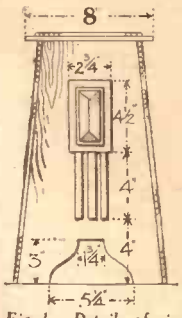


Fig. 1.—Details of size and cutting shape of one of the sides.

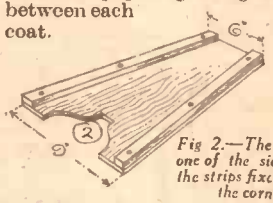


Fig 2.—The inside of one of the sides, with the strips fixed to hold the corners

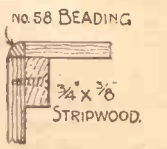


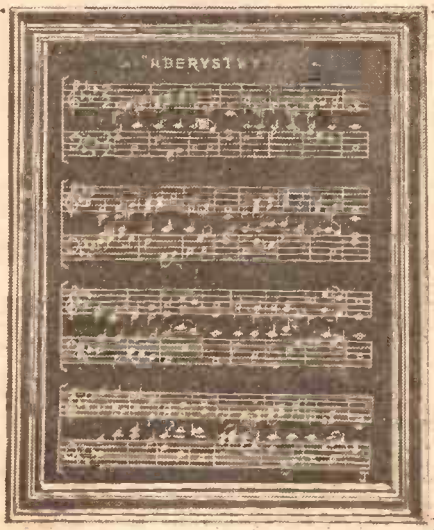
Fig. 3.—Looking down on the corner to show sides, the fillet strip, and the corner decorative beading.

CUTTING LIST.

Four pieces ¼in. three-ply, 15in. by 9in.
One piece ¼in. oak, 8in. by 8in.
One piece ¼in. oak, 6¼in. by 6¼in.
Four pieces 3/16in. oak, 4½in. by 2¾in.
Twelve strips 3/16in. oak, 4in. by ½in.
Four pieces, No. 58 Beading, 7in. long.
Four pieces, No. 58 Beading, 16in. long.
Four Oblong Ornaments, No. 213.
The wood and ornaments may be obtained from Hobbies Ltd.; prices on application.

A Hymn Tune

IS there anything wrong with this piece of music? How many can see the wrong note? It is a photograph of a piece of work undertaken by a reader of HOBBIES—Mr. J. Tupman, of Exmouth—22 years ago. The popular hymn tune of "Aberystwyth" is cut out and glued to a backboard in a frame. The frame measures 22½in. by 26½in. inside and every part was cut with a 12in. fretsaw! How's that for enthusiasm? The tune was enlarged from a printed postcard on to thin paper and then pasted to the wood. The problem of the long staves was overcome by cutting them in



In Fretwork.

portions and gluing them carefully together in the frame. And how many pieces do you think there are? Mr. Tupman tells us there are 1,047—and we are prepared to take his word rather than have to count them. But, alas, when the hymn was stood up to play from, the organist struck a wrong note! Yes, there it was . . . So the work had to be taken in hand again, the wrong note cut away and the correct one put in its place. But the photograph was taken before the right one was put in. Now, who can find where the mistake occurred? No prizes offered, but a good test of music reading.

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.

"Everyday Actions" Competition Result.

THE many thousands of readers who entered for our "Everyday Actions" competition will be pleased to know that the judges have at long last waded through the claims, and that the result will definitely be published in next week's issue. As I stated a few weeks ago, a further Picture Puzzle Competition will appear shortly, as this form of competition seems so popular, and I have increased my competition staff so that, in future, there will not be such a long lapse between the closing date of the competition and the announcement of the result.

Held Over.

I MUST apologise to my readers for having to exclude from this issue the article promised for this week entitled "A Long-Distance Biplane," and also for the non-appearance of the article entitled "A Two-Valve Wireless Set," owing to extreme pressure on our space.

Coming Events.

WE are within a few weeks of completing the first volume of the *New* HOBBIES. I know from my correspondence that the journey has been a pleasant one; and if it has been strenuous, too, it is only because I have achieved what I set out to do when we placed the new scheme of things in your hands with our issue dated Oct. 4th, 1930. This old-established journal (it is approaching its fortieth birthday) stamped the seal of popularity on itself when, with that issue, it came out in its present format; and if the hall-mark of popularity is the establishment of personal contact between Editor and Reader, then surely HOBBIES carries that hall-mark! My correspondence each day is delightfully heavy, and it has increased in volume daily. I want it to go on increasing; I want you to feel that in me, as your Editor, you have an adviser to whom you can turn when problems connected with your hobby arise. As we approach the end of this first journey together, I want to say how pleased I am that readers avail themselves of the free reader-service which I extend to them. Whether you have a query to ask or not (and I am able, with the assistance of an expert staff, to reply to queries on almost every conceivable hobby), I welcome letters from *you*. Do not hesitate to criticise constructively; write to me if you want to *know* something, and you may rest assured that within a post or two helpful advice and information will be forthcoming. Exceptional queries may take a little longer. For example, a reader the other day desired to know the total area of the average human body! Another wished to know the history of the land speed record for motor-cars! And yet another, why it was that a bull-dog did not bark! The diverse nature of these queries did not stump us, but we were unable, of course, to give authentic information by return of post. In most cases, however, we reply immediately. Every query receives careful attention.

NEXT WEEK

FREE Design Sheet for a TABLE BOOKCASE

A TWO-VALVE WIRELESS SET

A POCKET GRAMOPHONE

Making a SAILING YACHT

Making a MODEL ROCKET AEROPLANE

COIN COLLECTING, Etc., Etc.

Chevrolet Competition Result Next Week.

IN next week's issue will appear the full list of prize-winners in our Model Chevrolet competition, in addition to the result of our "Everyday Actions" competition mentioned above. As the demand for this issue is bound to be enormous — yes, you know what's coming!—it is desirable to order your copy *NOW!!*

REPLIES AND QUERIES.

Renovating Leather Top of a Table.

Wash with warm water and ammonia, and allow to dry thoroughly, S. L. (Bournemouth). Then dissolve ½oz. of powdered borax and 1oz. of common shellac in ½pt. of boiling water (this will take some time to dissolve, and any sediment must be strained off); next add a teaspoonful of glycerine, and mix well. Stain the mixture thoroughly with blue aniline dye, and apply with a swab or sponge, giving as many coats as are necessary for producing a good, even colour. This will dry with a semi-lustrous surface; if a high gloss is required, glaze the surface with equal parts of white of egg and good quality gum.

Renovating Hand-Camera Covering.

First blacken the leather or leatherette with ink or aniline dye where needed, P. V. (Blackpool), and when dry apply a very little black boot polish, and rub with a clean cloth or velvet pad.

Making Luminous Paint.

Luminous paint may be made, T. C. S. (Lewisham), by taking Hypopus vulgaris 100 grammes (or parts by weight), sulphur 30 grammes, and bismuth nitrate 0.02 gramme. Hypopus vulgaris is an ornamental shell (white, with red spots), and is commonly called the "clam." The shell is placed in a clear fire until it appears to be friable, and then removed and ground to the consistency of flour. Or it may be heated in the fire very thoroughly, and quenched in cold water, drying the material before use. The substance is to be well mixed, and ground as fine as possible. Next, the substance is placed in a salamander crucible, which should be about two-thirds filled, and, with the cover well in position, the whole is ready for firing. The salamander is preferable, because it contains much carbon, and this serves to prevent undue oxidation of the substance within. The firing may be done by coal or gas, the critical temperature being about 1200° C. Assuming that a coal fire is employed, before placing the crucible therein, it is well to make a solid and flat pit for it. This having been done, the crucible and cover should be well fixed in position, and bedded thoroughly with heated material. If the result of the calcination is a crystalline substance, then the phosphorescence will be of a flame appearance; if amorphous, it will be only that of a glow. The flame phosphorescence gives the maximum of light, and is attained by strongly heating and then permitting a very slow cooling down. A No. 000 salamander crucible should remain in the fire for about forty-five minutes, gradually taken out of the hot bed, and permitted to cool down. When the crucible is quite cold, it should be gently tapped, and the substance allowed to drop on to white paper or cardboard. It should be crystalline, quite white, and the particles easily pressed apart with the fingers. If it now be exposed to sunlight or to good artificial light and then taken into a dark place, it will be found to be very highly luminous and of a pronounced violet colour. To prepare the paint, a little of the material should be mixed with water to the consistency of a thin paste; or it may be suspended in a good white varnish free from lead or manganese driers. The best results necessitate about three thin coatings, care being taken that each is dry before the next is applied.

Advertisements can be accepted for these columns at the rate of 4d. per word, prepaid.

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