Making Castings at Home

1/3

PRACTICAL MECHANICS

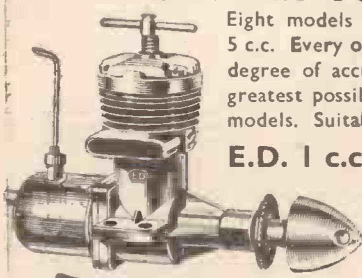
EDITOR : F. J. CAMM

DECEMBER: 1958

CONTENTS

ED Xmas Gifts

THE FINEST ENGINES FOR YOUR MODELS



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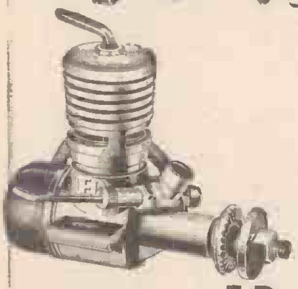

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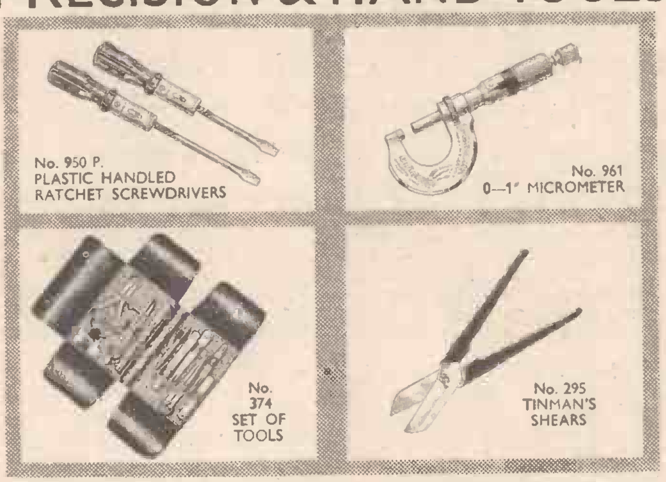

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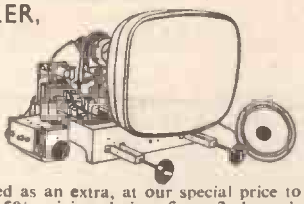

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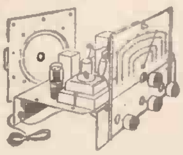

5-valve superhet chassis including 8in. P.M. Speaker and valves. Four control knobs (tone, volume, tuning, w/change switch). Four w/bands with position for gram p.u. and extension speaker. A.C. Ins. carr. 5/6.

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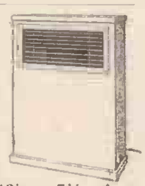

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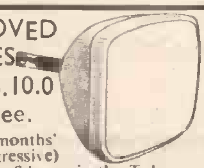

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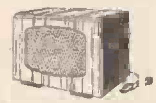

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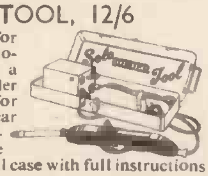

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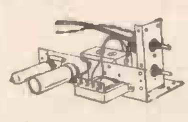

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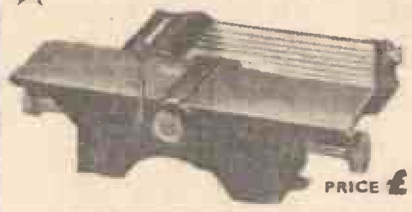

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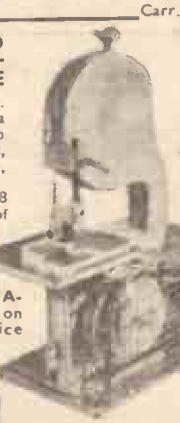

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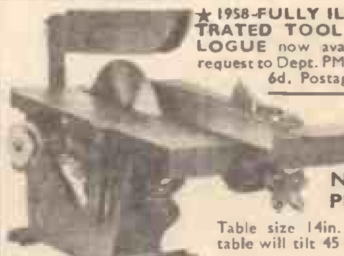

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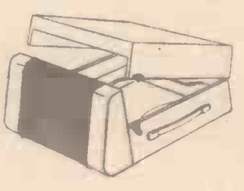

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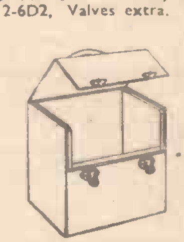

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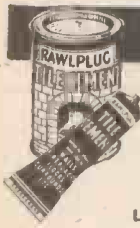

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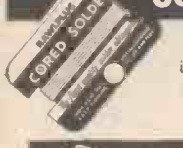

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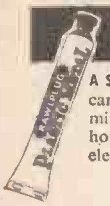

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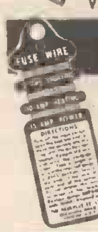

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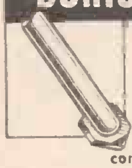

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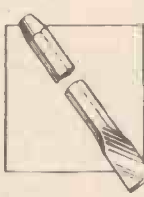

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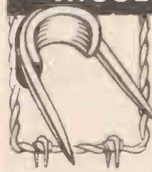

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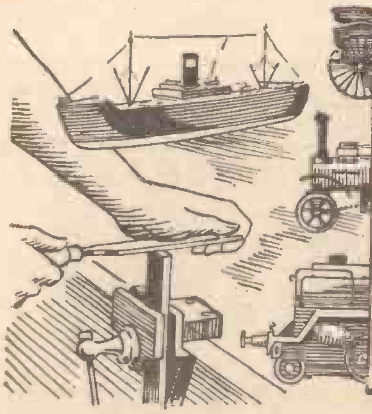

Practical Mechanics

Vol. XXVI. No. 298 DECEMBER, 1958

"The Cyclist" and "Home Movies" are incorporated

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CONTENTS:

THE CYCLIST SECTION

CONTRIBUTIONS

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Mechanics." Such articles should be written on one side of the paper only, and should include the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, "Practical Mechanics," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

FAIR COMMENT

THE CAR OF THE FUTURE

ALTHOUGH this year's Motor Show did not disclose any startling change in design, it did exhibit certain tendencies from which we may be able to discern the car of the future. The motor car has evolved from the horsedrawn carriage, and whilst many of the earlier features of carriage design have now vanished from the motor car, some still remain, notably the leaf-spring suspension system, which is crude. The old wooden bodies fixed to body irons, the old-fashioned diamond and box pleated upholstery with old-fashioned upholsterer's springs, windows which were lowered and raised by a strap, leather hoods, wooden wheels, to mention but a few of the items, have vanished and have been replaced by the modern steel body of welded construction. Sponge rubber for the upholstery has replaced horse hair and springs and external shapes of body have taken on a more streamlined form. The shoe brake now has a competitor in the form of the more expensive disc brake, at present only fitted to the more expensive cars, and automatic transmission will eventually replace the manually operated gearbox. Power steering is coming to the assistance of drivers of heavy cars. It is a somewhat surprising fact that pneumatic tyres were introduced to make mechanically propelled vehicles more comfortable. They have, however, only been regarded as an addition to the leaf-spring suspension system. No one hitherto has thought of applying pneumatics to suspension.

The inefficiency of the leaf spring is obvious from the fact that in all cases to-day large section pneumatic tyres must be used in connection with it, plus, of course, shock absorbers to damp out vibration caused by the road surface. Air suspension is already being used in America on long-distance coaches. Such a system is easily installed and provides a constant frequency spring. They also maintain a constant standing height of the vehicle, irrespective of changing loads. It can be accommodated in the space at present allotted for leaf springing or coil springing. One leading tyre manufacturer in this country is developing the air spring. The suspension system is supplied with air from a compressor. If air is good enough for tyres, which after all carry the main load of the vehicle, it should be equally good for suspension. Leaf springs cannot be properly lubricated, they tend to settle and they cause squeaks and rattles, whereas air is silent. The car of the future will undoubtedly, therefore, have air suspension, smaller section tyres, power steering, automatic transmission and possibly a steering system which will enable the cars to travel crab-wise for parking in restricted spaces. For obvious reasons, the jet engine cannot replace the piston engine on motor cars. The heat problem alone cannot be satisfactorily resolved, present road surfaces would not stand up to it, and there is, of course, the problem of silencing the engine. These pending improvements were not readily visible to the eye at the Show, where manufacturers concentrated too much, in our view, on colour schemes.

THE "P.T." AND "P.W." FILM SHOW

READERS of this journal are invited to apply for a free ticket for the film show which we are arranging in conjunction with Mullards Ltd., to be held at Caxton Hall, Westminster, on January 22nd, 1959. Three films will be shown dealing with the Principles of the Transistor, the Manufacture of Junction Transistors and a more general film in colour entitled "The Conquest of the Atom." There will be an interval for refreshments which are also free. I shall be in the chair. Applications for tickets should be sent to the offices of this journal marked "Caxton Hall" in the top left-hand corner of the envelope.—F. J. C.

The January, 1959, issue will be published on December 31st. Order it now!

How to Make a Billiard Table

By J. W. Nicholls

Size is Determined by the Playing Space Available

THE table described here has been made to the proportions of a full size one, but for balls 1¾in. in diameter. It is the height of the cushions that affects the size of ball to be used. It is not really important for the overall size of the table stated to be strictly adhered to, as an inch or two out is not of any great disadvantage for home entertainment.

All the materials required are readily available. The baseboard, for which laminated board is recommended, could also be made of lumber board, or ⅜in. or thicker hardboard supported underneath with strips of 2in. × 1in. wood. Timber for the sideboards should be of a kind that can be polished or varnished, which although not really necessary, puts a finish to the final job that is worth the extra trouble. Any kind of wood will do for the cushions as these are completely covered. The cloth for which proper billiard table material is naturally best, but which is also very expensive, can be of the green felt sold for covering card tables. The metal strips (see Fig. 2) to hold up the pockets can be of any kind that can be bent yet remain fairly firm. Quarter-inch brass rod or aluminium rod, flattened at the ends to take the screws, is ideal and more suitable than the flat strips shown in the sketch. The rubber for the cushions must not be too hard, usually a rubber merchant will be able to recommend the right kind.

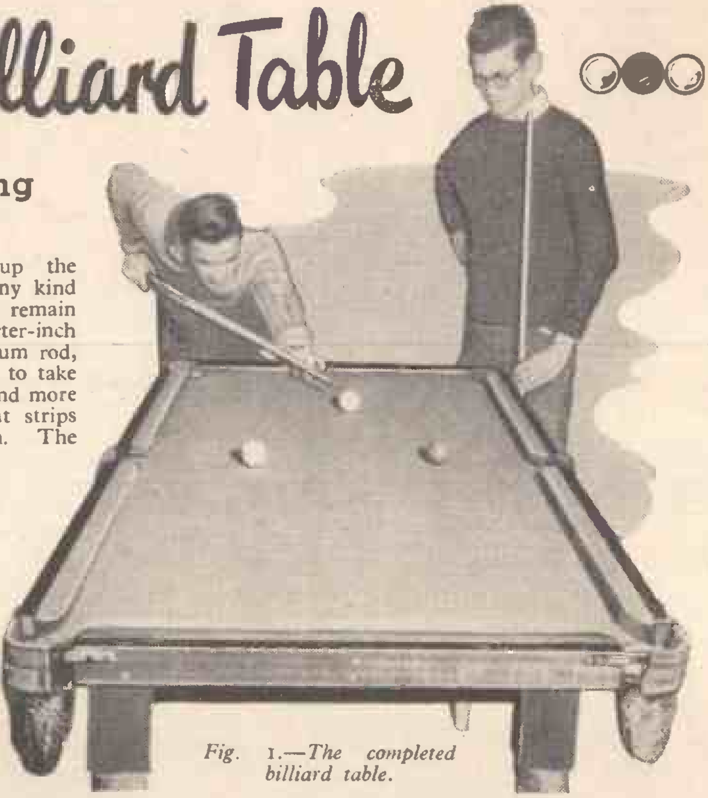


Fig. 1.—The completed billiard table.

MATERIALS REQUIRED

TIMBER—6 pieces 26½in. × 2in. × 1in. for the sideboards. 6 pieces 26½in. × 1⅛in. × 1⅛in. for the cushions. 1 piece laminated board 5ft. × 31½in. for the base.
FELT—3 yards 3ft. wide.
POCKETS—Bought or made from any material, 6. They should be about 6in. wide sloping to 4in. deep in front and 6in. at back.
RUBBER—6 strips 28in. long × ⅜in. × ⅜in.
SCREWS—1 doz. of 1½in., 3 doz. of 2in., 2 doz. of ½in.
METAL STRIPS—6 about 10in. long.
TACKS—¼lb. ⅜in. long.

Making the Base

Draw a portion of a circle at each corner of the laminated board with a compass set at 2½in., and in the middle of the two long sides a half circle with the compass set at 1¼in. Cut these out with a keyhole saw and sandpaper smooth. Slightly chamfer the top edge all round the board including the cut-outs. This is to prevent tearing the cloth when stretching it over the sides. Drill holes for the screws ½in. from the edge and 4in. in from each cut-out and countersink them on the underside.

Lay the base aside for the time being and make a start on the cushions.

Making the Cushions

Round off the ends of the six pieces of 26½in. × 1⅛in. × 1⅛in. wood, and then cut a rebate in the front top edge and round the rounded part ¼in. wide and ⅜in. deep. This is to accommodate the rubber which should come flush with the top and project over the bottom edge of the rebate by ⅛in. Stretch the rubber slightly and fix it with a nail at each end. It can also be glued on, although this is not strictly necessary as the cloth will keep it in position. Any surplus at the ends should be cut off.

Put the cushions into position on the table and screw them to the base with the 1½in. screws. Each curved end should meet and slightly overlap the cut-outs on the base.

Sideboards

Place one against the outside of the cushion, keep it level with the top and mark it for screwing into both cushion and base. Drill the holes (three to each), countersink them, and fix into position with the 2in. screws. Repeat this procedure for all the cushions. Now number each section, i.e., each cushion, sideboard, and its position on base are given the same number—and then take it all to pieces. Varnish or polish the three outside edges only of the sideboards.

Putting on the Cloth

Prepare the base for covering by first filling in any large crevices which might be in the wood with plastic filler, and lightly sandpaper the whole surface.

With the aid of another person, stretch the cloth as tightly as possible over the base and tack it to the edge of one long side with tacks about 1in. apart (but not in the pockets). Pulling tightly across the table repeat the operation on the other side, then still pulling tight, tack down the ends and cut off the surplus. Now pull the cloth tightly into each of the cut-outs, tacking it on the underside of the base. Because the cloth has plenty of stretch in it it will fit quite snugly round the curves, and creases at the ends will be covered by the sideboards.

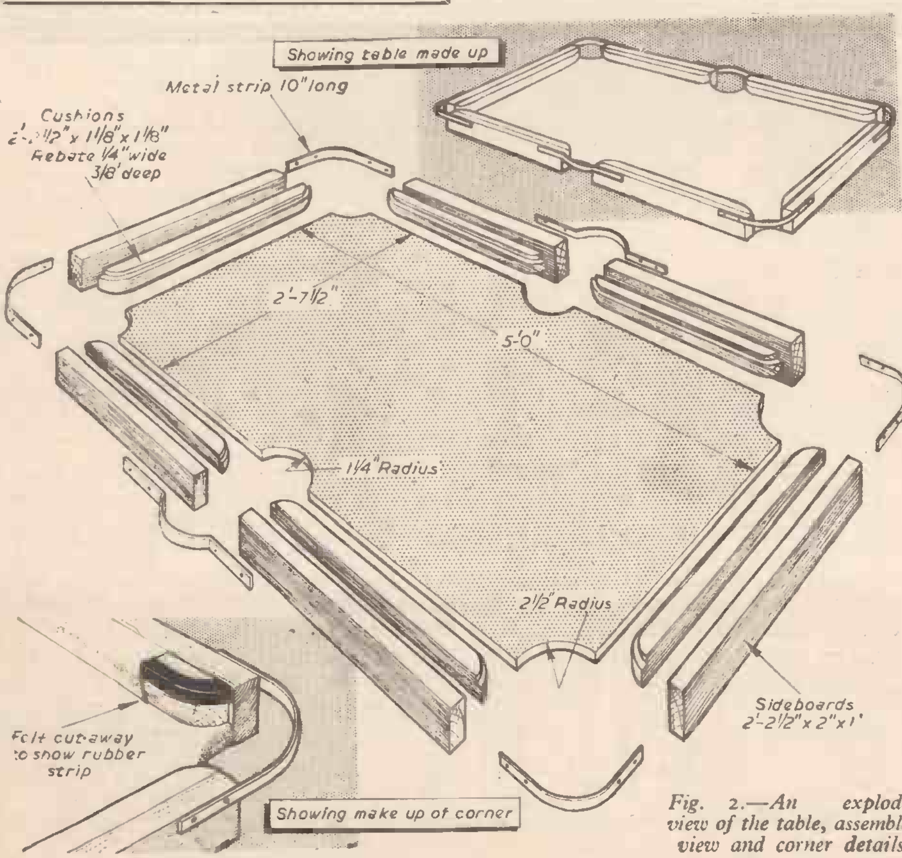


Fig. 2.—An exploded view of the table, assembled view and corner details.

Covering the Cushions

Tack the cloth along the bottom, pull it round the front, over the rubber, and tack it to the back. Pull the ends round the curved part, stretching it tight and getting all the inevitable creases at the back where it must be firmly tacked. It is as well when doing this to mark the number of the cushion on the cloth with a piece of chalk.

Reassemble all the parts; then turn the lot over and cut off any surplus material that might show hanging down between cushions and sideboards.

The Pockets

The metal strips for the corner pockets must now be bent so that the straight portions are at right angles to each other and screwed on to the ends of the sideboards, either on top or on the top edge of the sides, as shown inset in Fig. 2. The bags, of course, should be slipped on to the strips first; if they are home-made, a simple seam in the top is necessary. The other sides of the pockets are tacked round the cut-outs on the underside. For the centre pockets a straight piece of metal can be used, but they look better if a slight curve is made in them; the curve starting at one cushion and finishing at the other. They are all fixed in position with ½in. screws.

Marking the Table

The baulk line should be drawn with a black pencil crayon 12½in. from one end and the top spot 5½in. from the top cushion. The "D," a half-circle with compass set at 5in., should be cut out of cardboard and drawn round when centred on the baulk line. The centre spot should be in line with the middle pockets and the pyramid spot exactly halfway between the middle and top spots. It is possible to buy proper spots made of silk to stick on.

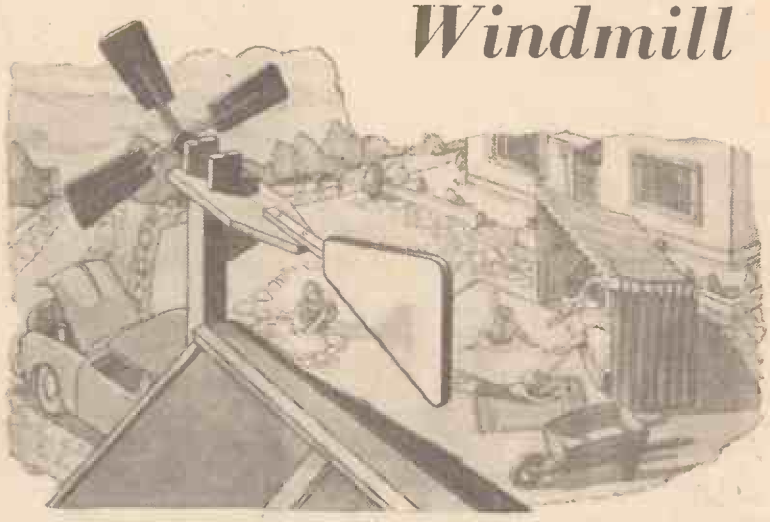
With a clothes brush remove all dust from the table. Heat the iron used for the family wash, getting it as hot as possible without any danger of scorching (try it first on a piece of surplus material) and iron the table. Take the iron from top to bottom of the table, moving it the way the nap of the cloth falls and repeating the process until the cloth is ironed all over.

The table is now finished and merely has to be set up on the kitchen or other firm table, made level by packing it with bits of cardboard where necessary. If a spirit level is not available, put some balls on the table and see which way they run, then pack it underneath until they remain still.

A Small Garden Windmill

It is Intended to be Both a Wind Direction Indicator and an Ornament

Described by James Coe



WHEN finished this simple windmill (Fig. 1) can be mounted on top of a summer house or other suitable place in the garden.

For the arms which carry the sails, take two 12in. lengths of ½in. by ⅜in. stripwood and with a chisel pare away one edge at each end, as shown at AA (Fig. 2). The bottom edge is removed on the left, and the top edge on the right of each arm. At the back of one arm, in the centre, cut a slot ½in. wide by 3/16in. deep. Make a similar slot in the other arm from the front as at B.

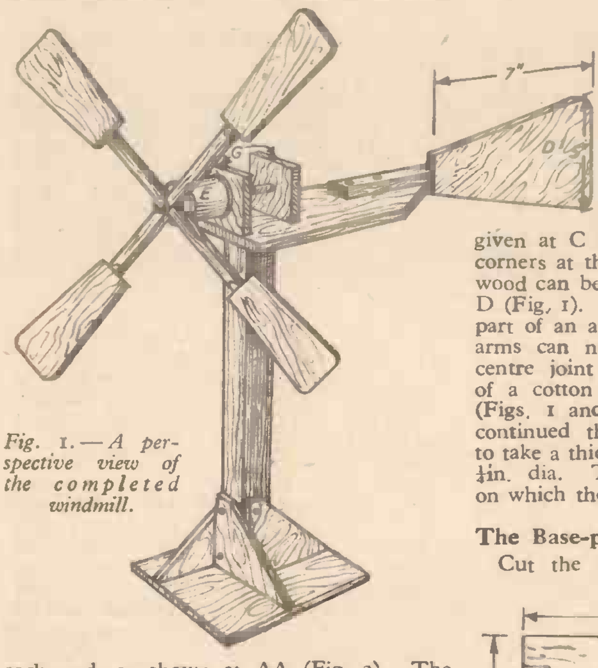


Fig. 1.—A perspective view of the completed windmill.

The Sails

To make the sails, cut out with a fretsaw four pieces of thin wood to the sizes given at C (Fig. 3) and round off the two corners at the wide end. Pieces of ⅛in fretwood can be used for the sails and the tail, D (Fig. 1). Each sail is fixed to a bevelled part of an arm by three brass screws. The arms can now be pressed together at the centre joint and then screwed to the end of a cotton reel, which forms the hub, E (Figs. 1 and 4). The hole in the reel is continued through the centre of the arms to take a thick wooden knitting needle, about ¼in. dia. This forms the windmill shaft on which the hub revolves.

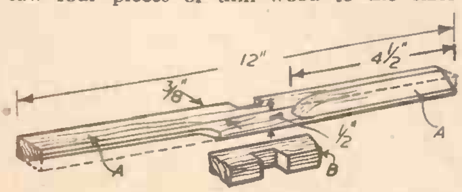


Fig. 2.—The sail arms.

The Base-piece

Cut the base-piece, F (Fig. 3), out of wood ¼in. thick, and screw on to this from underneath two pieces of ½in. wood, 2in. wide and 1½in. high, in the positions indicated by the dotted lines. Make a hole through the middle of each piece of wood to take the shaft, which is held firmly in place by two screws, G (Fig. 1). The wooden head of the knitting needle keeps the arms and the hub from slipping off the shaft.

The tail-rod, H (Fig. 3), is 7in. of ⅜in. stripwood, cut away for part of its length to take the tail-piece, D (Fig. 1), and fixed in place by three countersunk screws. The other end of the tail-rod is fixed to the base with two screws.

Mounting

To mount the windmill ready for working, make a hole, K (Fig. 3), in the base-piece to take a stout round-headed screw, which can be driven into the top of a long post in the garden, after slipping on a large washer under the head of the screw. This screw, which forms the pivot, must be driven just sufficiently to allow the base of the windmill to turn easily. Another way is to use a short post about 12in. long supported by wooden angle-pieces on a baseboard, as shown in Fig. 1. The baseboard can then be fixed in place on the top of a shed or outhouse.

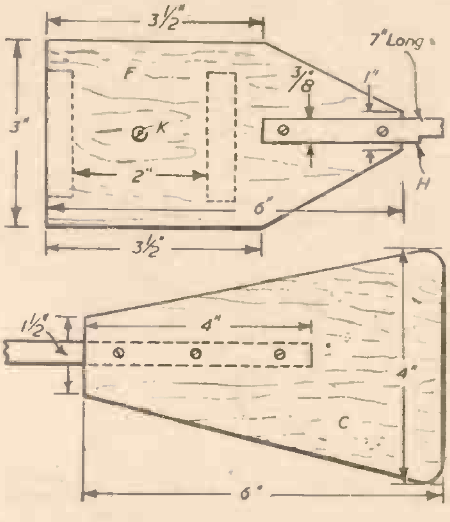


Fig. 3 (Left).—Details of the platform and the sails.

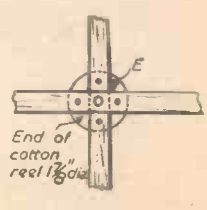


Fig. 4 (Right).—Fixing the arms to the hub.

Paper Decorations for Christmas

By S. T. Nicholas

Chain Decorations, Cut-out Shapes and Chinese Lanterns

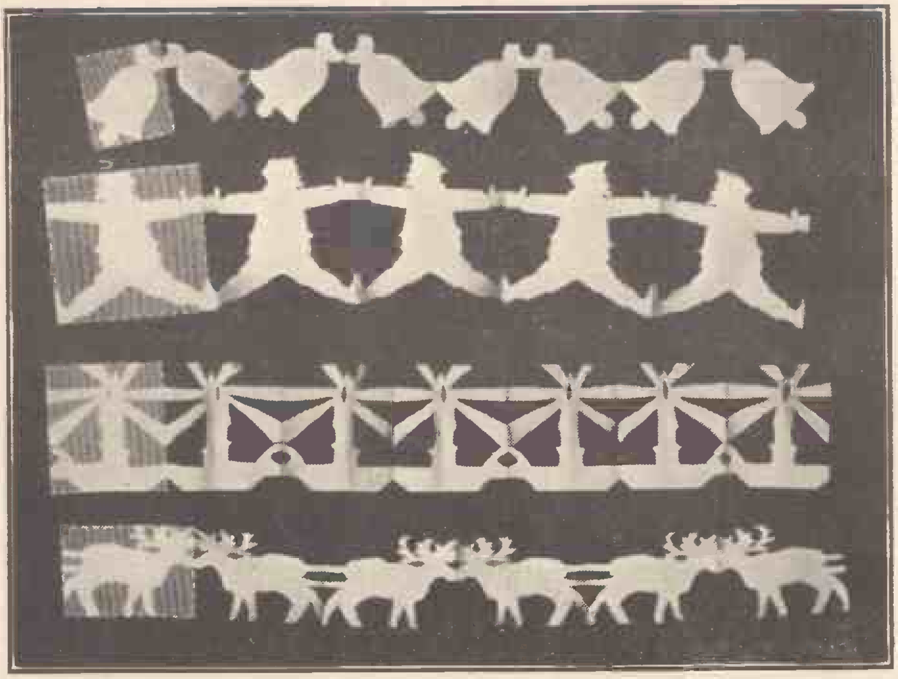


Fig. 3.—(Right) Examples of repeated cut-out shapes.

THE ever popular and gay chain decorations may be made up in several attractive ways and some methods are illustrated. The brightest colours are best and strips in suitable size may be cut for the various styles of loops, pull-outs, garlands, chains, concertinas, bells, lanterns, fans and many other kinds of continuous decorations for the home and club upon festive occasions. Scored along the narrow way and folded, they give more finish and appeal than the flat chain papers normally made up. Strips may be cut from off-cuts from other work and these should always be saved for other smaller kinds of job.

Fig. 1.—An example of the Chinese lantern.

A hand cutter will enable the worker to mass-produce suitable quantities of cut strips. The cut strips may be put together in all kinds of interesting forms, some of which are shown in Fig. 2. They can, for instance, be folded to give the formation of a continuous chain. The concertina will need two long continuous strips of coloured paper and these are affixed at one end to form the letter "L" and the upper section is then folded into the lower section, square by square, making the well known concertina bellows which, when extended, give the effect of the instrument itself. Serrated edges to the cut strips make the decorations all the more exciting.

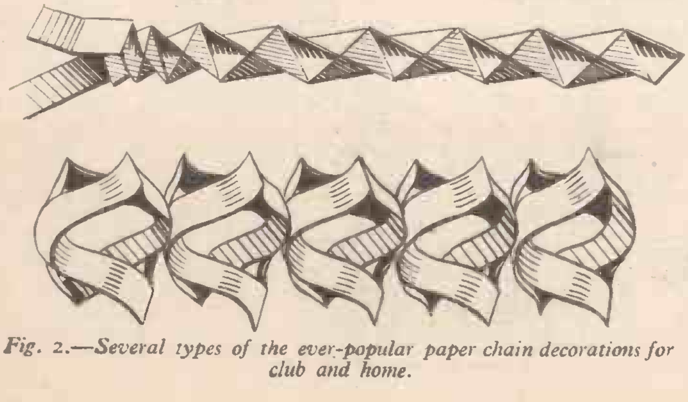
The garland style is obtained by sticking units of four pieces together in a long continuous length and this style of chain folds and opens up as required rather on the lines of the shop garland made up professionally.

Hanging shapes, circles, stars, finely cut strips, fringeing and toothing of paper and other styles may be used to further decorate the long chain. The use of metal paper, in gold or silver, available from handicraft shops, will assist in producing really attractive decorations, chains and motifs.

A Hanging Lantern

The design in Fig. 1 is easy to make up. A rectangular piece of thick paper, white or coloured for decorative use, is rolled into a plain tube, and another rectangular piece of paper is cut and afterwards rolled. The former supports and holds the shape of the latter, which is an oblong of size to suit the lantern: it is carefully cut out and ruled with horizontal lines which are half scored and with vertical lines, afterwards cut through the paper. The scored and cut

(*Concluded on page 136*)



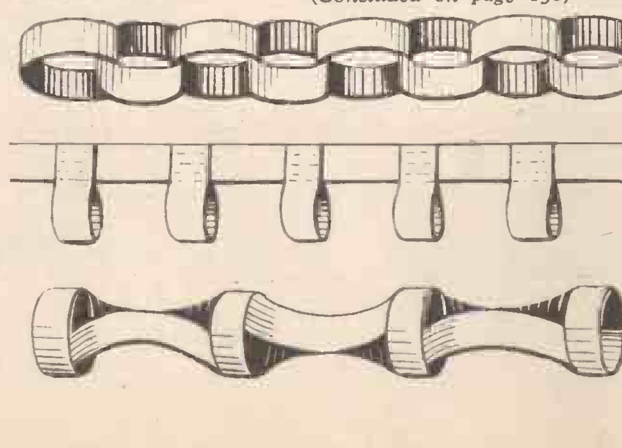
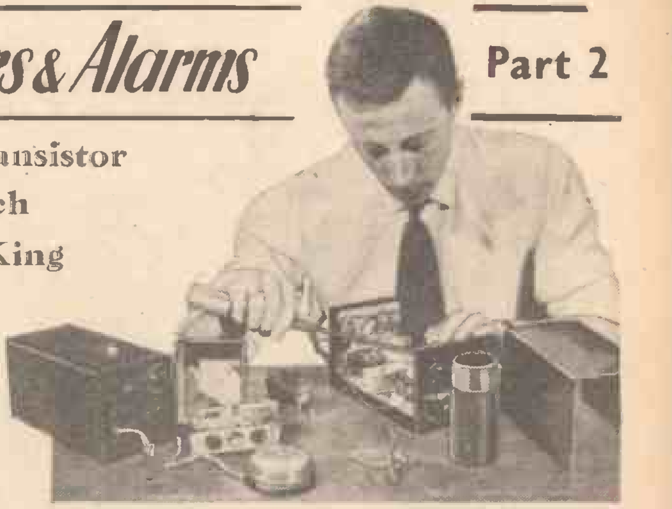


Fig. 2.—Several types of the ever-popular paper chain decorations for club and home.

Transistor-Operated Counters & Alarms

Part 2



Describing Construction of a Photo-transistor Light-operated Change-over Switch

By E. V. King

BASICALLY this is a unit which will switch on, or switch off any external circuit when a light beam is either made or broken as required. Provision is made for minimum current being drawn when the unit is in its usual condition, be it dark or light. It can be the basis of alarms, counters, and secret or novelty devices.

Readers may make this unit up in any

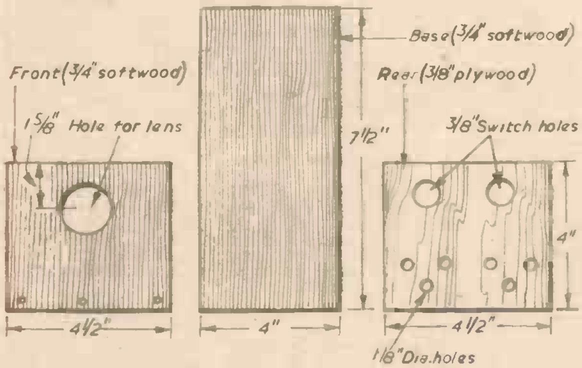
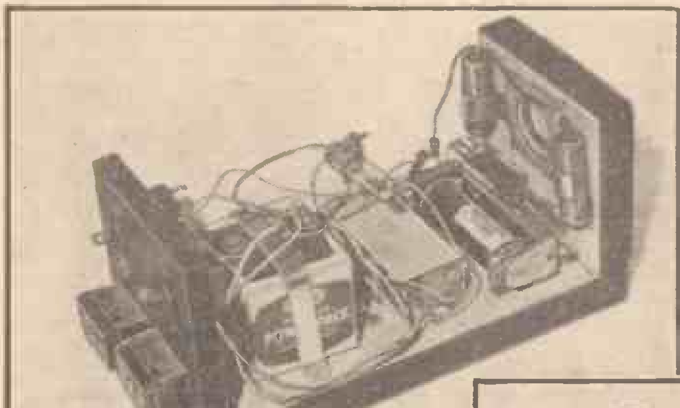


Fig. 13.—Details of the wooden base and front and back of the unit.

shape provided the lens system is correctly aligned and focused as there are no feed back or other troubles associated with radio circuits. The layout given works well and is easily made by the most inexperienced. It is possible to make the unit appreciably smaller but some skill would be required.

The completed unit is shown in Fig. 14.



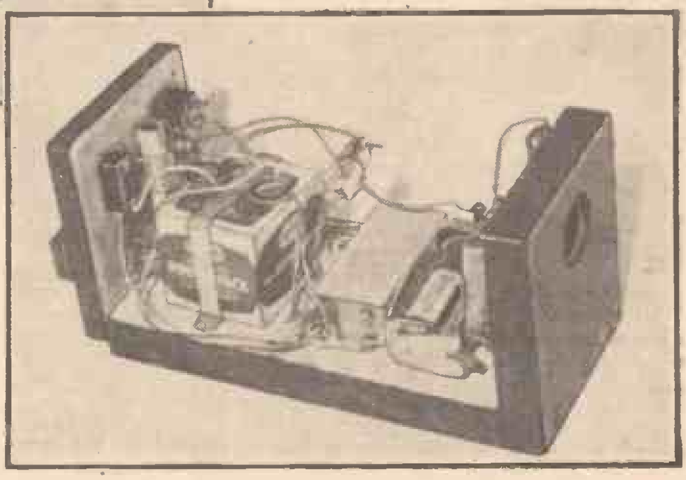


Fig. 14.—(Left and below) Two views of the completed unit.

Preparing the Base and Lens Mount

The prototype was made up on a wooden base with a metal cover, but all metal could be used by those used to metalwork. If the unit is to be situated in much infra-red radiation, wood has an advantage in its thermal insulating properties.

The base is cut out, taking care to keep the end square in each direction. The front and back are made as shown in Fig. 13, using the parts given in the list. The lens is mounted in exactly the same way as the one in the lamp house and in the position shown in Fig. 14. The front and back are then fixed to the base using long thin screws to avoid splitting the wood. Details of the lens mounting are shown in Fig. 17.

Before the components are mounted it is necessary to carry out minor modifications on the relays, and details for this are now given.

Primary Relay No. 1

Any delicate type operating on a few mA would do but the coil resistance should not be too high or there might be danger of harming the OCP71 with high induced voltages, especially if modulated light fell on the unit.

The author found that a relay with about 2,000 Ω coil resistance was very satisfactory, and a Siemens Relay of 500 plus 500 Ω (1,000 Ω) also worked, but needed more careful adjustment. The more delicate the relay, the less current required to operate it and the more sensitive the unit when completed. In any event the total resistance of the relay, if it is less than 2,000 Ω, should be made up with a series

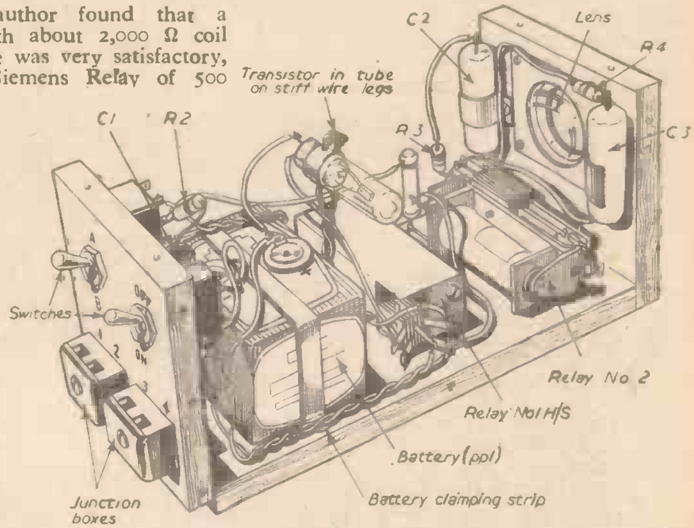


Fig. 15. — (Right) Chassis construction and main components.

resistor of ½-watt to prevent any possibility of thermal runaway in the transistor.

A P.O. type 3000 with a resistance of some 30 or 40K, with sufficient battery voltage, should work, but the author did not try one as he considered the possibility of transistor damage too great.

A useful relay of only 100 Ω is available from Messrs. H. English of Brentwood. It is advertised to work on 1 mA and on test worked well on 1½ mA and fell out on ½ mA. It was tried in the prototype and worked very satisfactorily. It is cheap at 7s. 6d. and is used in one of the photographed pieces of equipment. A resistance of 1,900 Ω must be placed in series with the coil. The contacts equivalent to "A" and "B" of Fig. 16 have no tags or terminals so the author put tags under the locking screws.

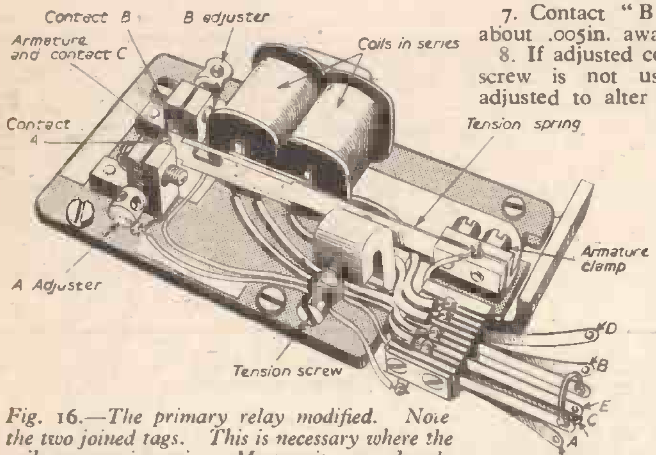


Fig. 16.—The primary relay modified. Note the two joined tags. This is necessary where the coils are not in series. Most units are already so wired.

Relay No. 1. Examination and Test

It is assumed a Siemens H.S. type is used. If a new device to the reader, examine it in conjunction with Fig. 16, which shows the modified unit.

The two coils are in series and when carrying current cause the armature to contact on "B", when no current is flowing the armature springs back to contact on "A." There is a screw with a milled edge which acts as an adjuster of the spring tension, and the contacts "A" and "B" may be adjusted by loosening off the locking screws shown.

All surplus equipment should be tested before use. Connect the ends of the coils (which finish at tag strips) to a D.C. source of 12 or 20 volts. The armature should move smartly over. It will probably work on 9 volts if very carefully adjusted.

Modification of No. 1 Relay

The H/S relay may be made to work well on 1 mA with care and on 2 mA very easily by carrying out this procedure:

1. Undo the two screws holding the armature clamps in Fig. 16. Remove armature assembly.
2. Slip out the tension spring which is not required and not shown in Fig. 16.
3. Refix armature, leaving screws semi-tight. Hold points on the armature in line with "A" and "B" and do screws up tight.
4. Loosen off the milled tension screw and the contacts "A" and "B."
5. Look down on the relay from overhead and make sure that the armature is parallel to and only about 1/64in. away from the magnet poles. If it is not, it must be removed and bent into such a position and refixed. A few trials will probably be necessary.
6. Only when the latter operation has been carried out must the contact "A" be slowly screwed up until it just pushes the armature .001in. or so nearer the magnets. Contact "A" is then locked.
7. Contact "B" is adjusted until it is about .005in. away from the armature.
8. If adjusted correctly, the milled tension screw is not used although it can be adjusted to alter the armature spring conditions.

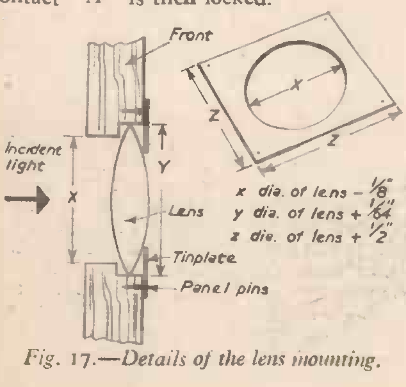


Fig. 17.—Details of the lens mounting.

Checking Relay No. 1

Connect up the relay as shown in Fig. 18. Set the 5K potentiometer to minimum resistance and switch on. The relay armature should move over. If it does not, the operations above described have not been done correctly or the coils are faulty. Now slowly increase the resistance in circuit switching on and off all the time to make sure the armature responds. When the armature eventually refuses to move try very careful adjustment of the screws "A" and "B." Try moving them half a turn both in and out as the results are often the opposite to what one would expect.

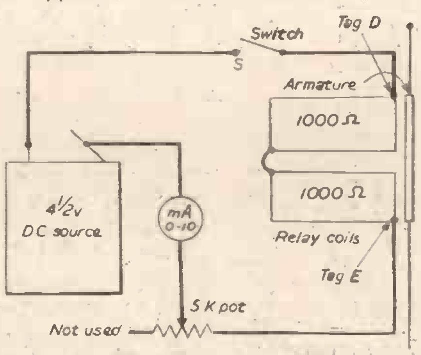


Fig. 18.—Relay test circuit.

Using this procedure it is possible to get these relays to work on under 1 mA, but aim at it working on $1\frac{1}{2}$ or 2 mA and falling out in the first instance on $\frac{1}{2}$ mA.

If no milliammeter is available, the relay may be worked off an old type grid bias battery, with no resistance and gradually tap down until the relay will work off $4\frac{1}{2}$ volts ($2\frac{1}{2}$ mA will flow). This will be satisfactory, but try and get it to work off 3 volts ($1\frac{1}{2}$ mA will then flow).

Make sure the contacts "A" and "B" are actually making and breaking as further adjustment on the made-up instrument is rather difficult. Clean the points by drawing some clean drawing paper through them. Replace the cover until the relay is actually required.

The points are made to take a current of about 250 mA but only 20 mA maximum is in fact taken, so they will be almost everlasting.

Secondary Relay No. 2

If you have purchased one new, this does not require modification. A great financial saving is possible as these relays are available as surplus for 2s. 6d. and are fitted with dozens of contacts. Most of them are not required and could be left in situ, but extra current is then required to provide a satisfactory contact pressure.

The prototypes use relays purchased from Messrs. Annakin. See Fig. 19. It is not known of what metal the contacts are made, but if heavy switching is required, they should be of nickel silver, when currents of over 5 amps. may be drawn. Normally, however, about 1 amp. is reasonable.

Assuming you have the relay mentioned, check the resistance printed on the coil. Press the armature manually on to the magnet and observe the operation of the contacts. Pick out any two pairs of contacts, one of which closes and the other opens when the armature is moved. Make a note of them for retention in the instrument.

Parts are Required :-

Softwood about ¾in. thick; $7\frac{1}{2}$in. × 4in. for the base, $4\frac{1}{2}$in. × 4in. for the front.
Plywood about 3/8in. thick; one piece for the back $4\frac{1}{2}$in. × 4in., or use same wood as front panel and recess components.
Tinplate, Aluminium (not dural) or iron sheet (oil drum) one piece 13in. × $8\frac{3}{8}$in.
Relay No. 1 (Delicate). Siemens type, High Speed 1,000 ohms plus 1,000 ohms obtainable surplus from Lyons Radio, 3, Goldhawk Rd., W.12, L. Wilkinson (Croydon) Ltd., Dependable Radio Supplies, 12a, Tottenham Court Road, W.1., Huggets Ltd., 2, Pawsons Rd., Croydon or new from Messrs. Keyswitch Co., W.10.
Relay No. 2 (Heavier). P.O. Type 3,000, coil 200 ohms, only one make and one break *or* one change over is required. Unwanted contacts may be removed. Obtainable surplus from Messrs. Annakin, 25, Ashfield Place, Otley, Yorks, or Messrs. W. A. Benson, 136, Rathbone Rd., Liverpool, 15. New from Messrs. Keyswitch Co.
S1. Single pole one-way toggle switch (1P1W).
S2. Double pole throw over toggle switch (2P2W).
Tr.1. Converted Red Spot or Mullard OCP71 transistor.
Junction boxes or tag strips. Two are required of two terminals each, or one with four terminals. Covers are required if external circuit carries high voltage.
Resistors (all ¼ watt, 20%).
R1 150Ω, R2 47Ω, R3 47Ω, R4 47Ω.
Condensers, C1, C2 and C3 all .1 μF 500v. working.
Battery, Ever Ready, Transistor Type PP1, 6 volts.
Battery Clips. Removed from old battery or obtainable from Messrs. Electronics (Fleet St.) Ltd., 152/153, Fleet St., E.C.4.
Lens. Larger the better but of short Focal length. Use the same one as in lamp house. Nos. 24 or 65 from Messrs. H. English are very suitable.

Removing the Unwanted Contacts

If you are not fussy about appearance simply snip off the unwanted contacts with tin snips. Make sure the pieces left do not short on to the wanted contacts. If this method is used you have no reserve contacts should they burn out or be otherwise damaged.

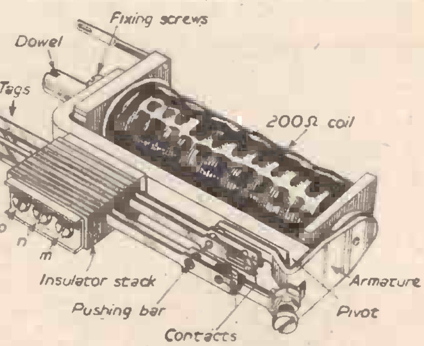


Fig. 19.—The modified P.O. relay.

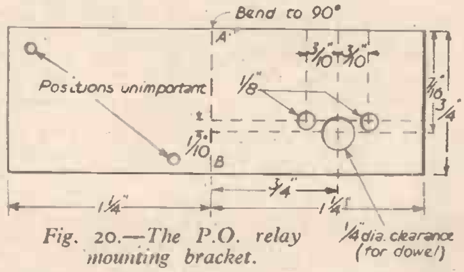


Fig. 20.—The P.O. relay mounting bracket.

Otherwise proceed as follows:

1. Refer to Fig. 19 and remove the three retaining screws m, n and o.
2. Remove the same screws of the other bank of contacts which are not visible in the diagram.
3. Remove the banks complete.

4. Pick out the necessary leaves and insulator blocks.

5. Cut the insulator tubes to the necessary size using a hack-saw or file. These are the tubes which sleeve the screws m, n and o.

6. Replace n and screw it up tight.

7. Replace the stack on the relay and tighten m and o.

8. Carefully bend the contact strips so that j and h are in contact in the static position and l and k in the energised position, and vice versa with both contacts.

9. Check that a very light finger pressure on the armature will operate the points. If too much pressure is required bend the strips k and, at push rod end, to relieve it.

10. Check that the relay will work easily on 4½ volts fed to the coil contacts. Try the relay in all positions.

Warning

Do not screw in m, n and o too far so that they foul the coil windings, and do not bend the strips if you ought really to have fitted more insulator blocks to keep them all parallel.

Mounting the Relays

When completed they are mounted in the positions shown in Figs. 14 and 15.

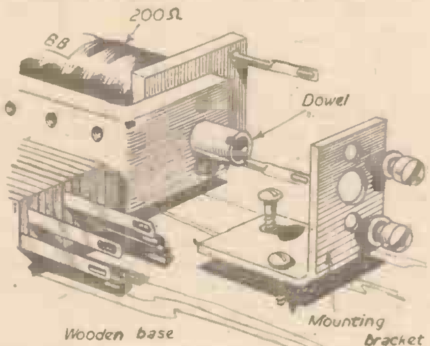


Fig. 21.—Mounting details of the P.O. relay.

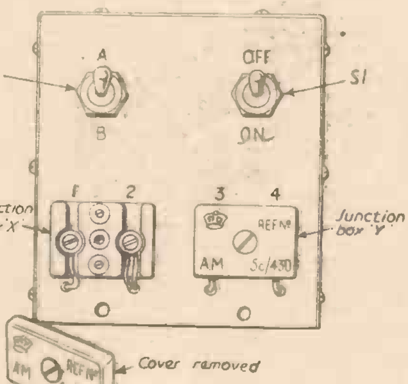


Fig. 22.—Rear view of the unit.

Relay No. 1 is mounted by removing the cover (slides off) and removing two of the screws which hold the Paxolin to the base. Nuts and bolts or wood screws will then hold the Paxolin to the base as well as fix the unit down.

Relay No. 2 is mounted sideways with the aid of a special bracket made out of a piece of mild steel (used for mending the corners of broken windows, etc.), obtainable from any ironmonger. Full details of it are given in Fig. 20. Except for the distances between the holes, the measurements are not critical Fig. 21 shows the method of mounting on the bracket.

Note that the central dowel of the relay is never touched and fits easily through the large hole in the mounting bracket.

Mounting the Other Components

The components are mounted as shown in Figs. 14 and 15.

The junction box (or boxes) position is given in Fig. 22.

The positions of condensers and resistors are in no way important so long as shorts cannot develop. The battery is clamped down with a thin metal strip or strong rubber band.

The transistor is mounted in the same manner as the bulb in the lamp house as described last month, and is mounted as nearly as possible at the focal point of the lens. This may be found by holding the apparatus up to the sun and getting a spot image of the sun on a piece of paper. Never do this with the actual transistor in position.

Wiring

Be careful not to get the hot iron near the transistor. It is a good plan to wire up according to Fig. 23, leaving out all resistors and condensers except R1 in the first instance, when the unit should work. Finally, to prevent sparking at the contacts, the condensers and resistors may be added.

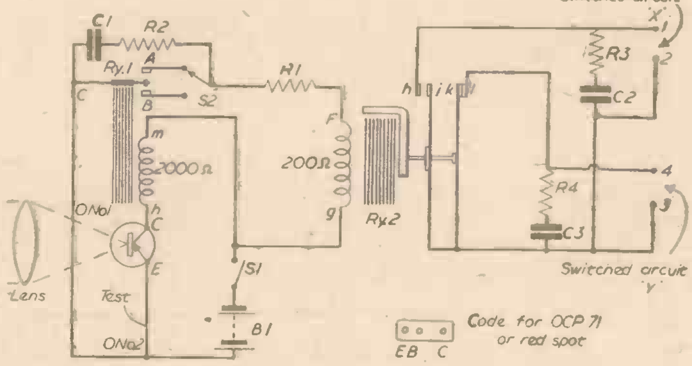


Fig. 23.—Basic photo transistor "throwover" switch.

Testing the Instrument

Place the lamp house 4 or 5ft. away and direct it carefully so that the parallel beam of light enters directly through the lens of the photo-switch. If a meter is available, insert it in the lead marked test in Fig. 23 and put it on the 5 mA range. Adjust the position of the spot of light until it is in the most sensitive position. A deflection of the meter of at least 2½ mA and probably about 5 mA should be obtained. Now interrupt the light and the meter current should drop to almost zero.

Relay No. 1 will be pulled in when the transistor is illuminated and will fall out when in the dark. This can be seen and a meter need not necessarily be used.

Readers may insert a P.O. jack in circuit, the female portion being wired in the "test" lead. It must have shorting contacts (or a switch fitted across the tags) so that the emitter is connected when the jack is withdrawn. The jack leads are then connected to the meter which may be plugged in to help in the lining up process.

Relay No. 2 will be operating also, according to the setting of the switch S2. This switch should be in such a position that relay No. 2 is only drawing current when in the normal static condition of light or dark. Otherwise the drain on the battery is more than is necessary.

If in doubt about the correct position of

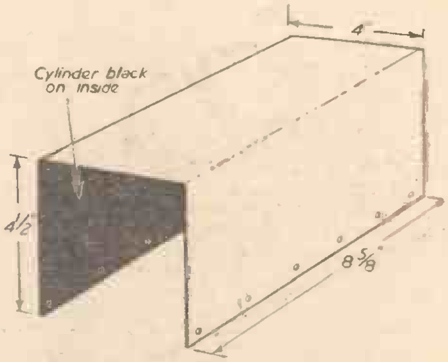


Fig. 24.—Details of the cover.

this switch for maximum economy, set it so that the second relay is in the out, non-energised position for the bulk of the time.

On A.C. the condensers C_2 and C_3 are omitted.

Switch Setting Data for Economical Operation

Unit normally illuminated.

S1 on. S2 to A.

Circuit X is on and Y is off, illuminated.

Circuit Y is on and X is off, dark.

Unit normally dark.

S1 on. S2 to B.

Circuit X is on and Y off in the dark.

Circuit Y is on and X is off, illuminated.

When not in use always put S1 to off.

The more usual position of S2 will be to "A" and the usual useful circuit will be "Y."

Completing the Unit

Make up the tinplate cover shown in Fig. 24 and give the inside a coat of black paint. Blow out all dust from inside and screw the cover in position. Correct operation of the unit will cause clicking as the second relay moves in and out, this is audible by placing the ear on the cover as the hand is moved in and out of the light beam.

Fig. 25 gives the arrangement used for a simple alarm system which can be adapted for scores of uses. The light beam holds the contacts of the circuit "Y" off. If the beam is in front of a safe, secret documents or across a window, warning will be given of an intruder. A better burglar alarm system will be detailed later.

(To be continued.)

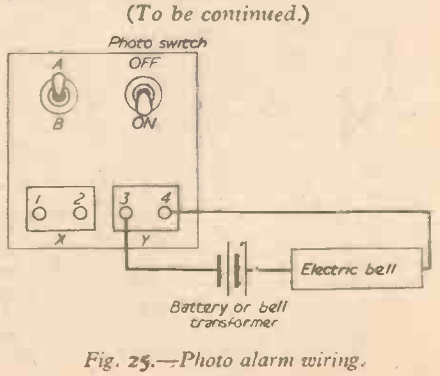


Fig. 25.—Photo alarm wiring.

A Revolving Xmas Tree

By IAN STILL

THE appearance of a Christmas tree can be greatly enhanced by having it revolving and the fairy lights flashing on and off at the same time. For those readers who are electrically minded and who have a turntable to hand (a record player could be adapted for those who feel confident to tackle it on the same lines) here is how it can be done.

Take a 6in. square piece of insulating fibre and using two hand cramps, cramp between two pieces of plywood. Draw two diagonal lines in pencil from opposite corners and where they intersect will be the exact centre. Mark with a bradawl the centre, bore a 1in. hole through this point with a 1in. expanding bit (the plywood will enable clean holes to be bored through the fibre without danger of splitting). This hole is to allow the spindle of the turntable to pass through. Measure ⅜in. from the edge of the 1in. hole, bore opposite each other, two 3/16in. holes with a 3/16in. bit, for the two machine screws to pass through, to hold the fibre to the underside of the table top. Keep these clamped together and leave to one side, as more holes have to be bored at a later stage.

The Collector Rings

These are cut from a 6in. piece of metal. For the outer ring, draw two diagonal lines in pencil from opposite corners and where they intersect will be the centre. Using a centre punch, make a centre mark on the intersection. Set a pair of dividers at 2⅜in. and with one point on the centre mark scribe a circle 4¾in. in dia. Cut the waste metal off with a pair of tin snips and then clean up with a smoothing file and polish with fine emery paper.

Clamp the piece of metal at a point less than ½in. from the edge, on to a block of wood and fix in the vice. Set dividers at 2⅛in. and with one point on the centre mark scribe a circle 4¼in. in dia. Keep scribing until the metal is cut through and clean up with emery paper; this is the outer ring complete.

This Device is Based On a Gramophone Turntable

For the inner ring, set the dividers to 1½in. and with the point on the centre mark, scribe a circle 3in. in dia., then cut off the waste metal with tin snips and smooth as the other ring. Clamp the metal and wood in the vice as before, set the dividers at 1¼in. and scribe a 2½in. circle. Keep scribing until the metal is cut through and clean up with emery paper.

This completes the inner ring (Fig. 1).

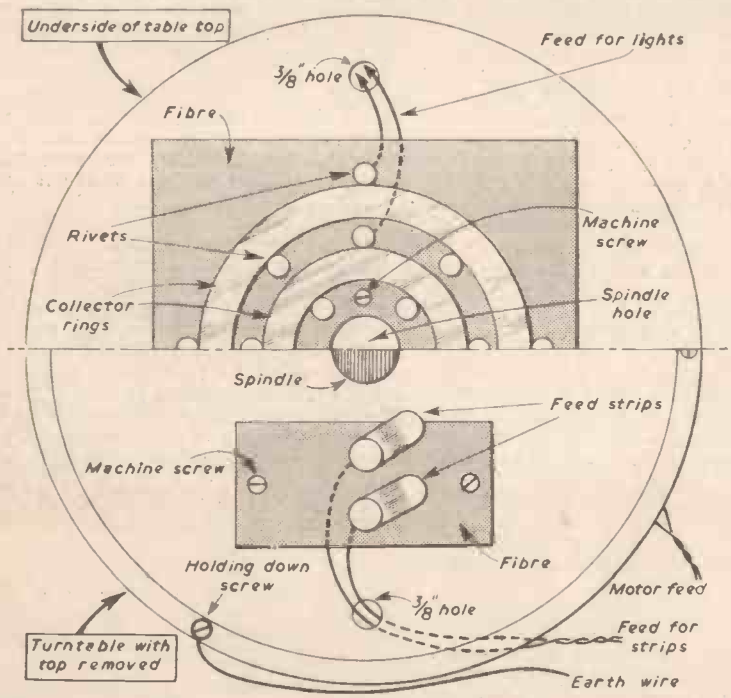


Fig. 1.—A combined view of the underside of the table top and turntable with top removed.

Fitting the Rings

Place the rings concentrically in the middle of the piece of fibre (still clamped between the sheets of plywood). Drill four holes ¼in. dia. round the outside perimeter of the rings and four more the same size round the inside perimeter at the points shown in Fig. 1.

Remove the plywood, place the rings on the fibre and fit all the eyelet rivets except one on each ring and flatten out.

Cut a length of twin flex 12in. approx., bare two leads at one end, and wind on the remaining two eyelet rivets under the head, push through the fibre and flatten out. This will be a current feed from each ring. Cover the heads and tails of all rivets with insulating tape. Bore a ⅜in. hole, 2in. in from edge of the turntable top and insert a rubber grommet to prevent the flex from chafing. This completes the assembly for mounting underneath the table top.

Place the fibre under the top with the heads of the flex-attached rivets hidden, and bring the flex out through the ⅜in. hole.

Centralise the fibre and mark on the underside of the top through the 3/16in. holes with centre punch. Drill and tap two 3/16in. holes for machine screws and screw the fibre to the underside of the top. Connect the leads on the table top to the female side of a twin connector. This completes the table top.

The two feeder strips (Fig. 1) are clamped together between two pieces of plywood and a ¼in. hole is bored through at one end.

The feeder strips are mounted on a 4in. × 2in. fibre board. Four holes are bored, two 3/16in., ½in. in from each end, and two ¼in. holes, 2in. from each end (use the wood bit and carpenters' brace for clean holes). Remove the strips from between the wood protection pieces and place on to the fibre securing them by means of ¼in. holes and rivets. Before fixing the rivets cut off 12in. of twin flex, bare two leads at one end and wind under the heads of each rivet.

Cover the heads and tails of the rivets with insulating tape. At this stage a ⅜in. hole is bored in the turntable body 2in. from the edge and another hole ⅜in. bored on the side near where the electrical connection to feed the motor is placed; two rubber grommets are fitted into these holes. Position the fibre with feeder strips approx. 2in. from the spindle, near the ⅜in. hole in the body, with flex-wound rivets hidden, and bring the flex through the body and out at the side.

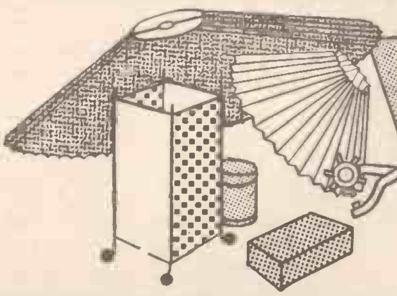
Centre punch through the two 3/16in. holes in the fibre and bore and tap two 3/16in. holes; screw into the turntable body.

(*Concluded on page 136*)

MATERIALS REQUIRED

Electric turntable (or record player).
One piece of fibre insulating material to hold collecting rings, size 6in. square × 1/16in. thick.
One piece of fibre insulating material to hold feeding strips, size 2in. × 4in. × 1/16in. thick.
6in. square × 1/32in. thick brass sheet to make 2 collector rings, size ½in. × 4¾in. o.d. outer ring. ½in. × 3in. o.d. inner ring.
Two brass feeding strips, ½in. × 1½in. × 1/32in. thick.
Twin flex (approx. 3ft.) for turntable, 6 to 9ft. for connection to wall socket and a single length as an earthing wire. (Lampholder and 15 watt bulb for testing purposes only.)
Xmas tree and fairy lights.
Two 3in. twin connectors.
1 pear switch.
1 three-pin plug (5 amp.).
18 × ¼in. brass eyelet rivets.
3 × ⅜in. rubber grommets.
4 × 3/16in. × ½in. long machine screws.
Tape for insulating rivets.

LAMPSHADE MAKING AND PARCHMENTCRAFT



F. T. Day Describes the Materials, Tools and Methods Used

PARCHMENTCRAFT has developed from actual lampshade making, a use having been found for off-cuts of material which may be turned into table-mat covers, serviette and doyley holders, sandwich flags and pendants for parties and the club, bookmarks, stencils for wood and metal work, greeting card work and etchings and hosts of other items of everyday use.

Parchments, extremely light in weight, bright in colour, easy to handle and model, are now available in handicraft shops in all shades, with smooth or matt finish, and printed with contemporary and conventional designs and motifs.

Sheepskin Decorative Parchment

Imitation sheepskin parchments are most attractive and are made in cloud effect, white, biscuit, flesh pink, pale green, pale salmon, pale blue, old gold and cherry pink. Some are plain, others are printed with designs and they are made in light, medium and thick weights for various kinds of work. They are also supplied with an embossed finish, i.e., lizard, lantern, basket, frost, check, wicker and many other patterns. These parchments are inexpensive and are made in 20in. × 30in. sheets and on rolls for big work; they are semi-opaque with a smooth matt finish. The material also lends itself to punching, such as is required for stitching cut pieces on to wire frames in lampshade making or for cut-out letters and stencil patterns or other motifs used in conjunction with other work.

This material is also first-class for pen work and lettering with waterproof ink. Designs, plans, etching, sketches, notices and other forms of artistry may be carried out with perfect ease. These parchments also take airbrush work, transfers and paint so that they are suitable for poster and similar applications.

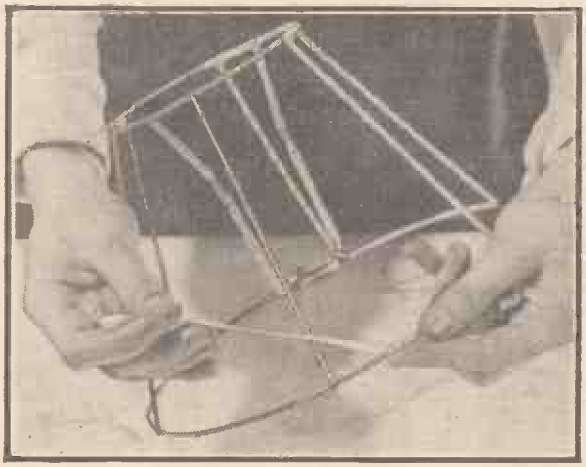


Fig. 1.—Binding a plain empire frame with raffia.

Oiled Parchment

Imitation natural parchment is another variety of material used for lampshade making, stencil work and handicrafts. The base material is strong manilla which has been oiled. It is waterproof and dustproof and mellows with age, a feature which may have an appeal in lampshades for the hall and dining room. Its surface may be made suitable for water-colour work by an application of ox-gall. This parchment is made in thin, medium and extra thick weights in light brown and many colours, some with embossed surfaces as already described for sheepskin. It is purchased at the usual shops and stores in sheets 20in. × 50in. and 24in. × 56in., and on 20yd. rolls in various widths. Some of the current patterns are polka dot, crackle, veined, crepe and many other motifs which go to make up first-class contemporary or just plain modern shades and objects. Some of these parchments are made with one side natural or plain while the top side is treated with colour, design or embossing.

Old Deeds

Vellums and parchments have long been used for lampshade making and old legal and other records may be obtained from shops. Such materials make up into first-class lamps for clubs and institutes. Old deed material sometimes has a crease at the fold due to age and storage and this is ideal for panel pieces in making up small shades or other components of a larger job. This material is also used for paper sculpture display work where durability is desired.

Crinothene

This plastic material, now popular among handicraft workers for all kinds of work, has one big advantage in that it may be washed. Being transparent it has the special property of permitting a good volume of light to pass through so that the finished lampshade permits a larger amount of illumination. Made in many pastel colours, ivory being the most popular, its crinkled surface and wearing qualities commend themselves to home workers. It is easy to handle, cuts well, punches out into clean shapes and may be stitched.

Real Vellum

This is prepared leather with good wearing qualities and is most appropriate where various forms of decorative work are to be carried out, notably, hand-tooling. Hand-made papers such as vellums and heavy cartridge may be used for lampshade work and display, such as paper sculpture.

Buckram

This material is gaining favour, especially in view of the new tints now obtainable. Modern lampshades may be made up and look most effective. It lends itself to pleating and fluting. Sizes may be cut as desired.

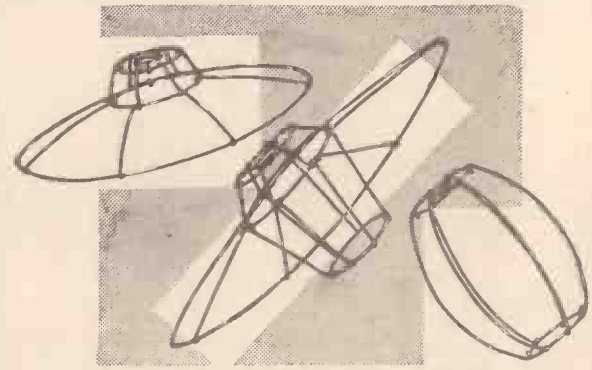


Fig. 3.—Some alternative frame designs.

Flock Paper

Flock papers with a plush-like surface finish and rich colouring are inexpensive and may be purchased by the sheet at all stores specialising in handicraft materials. It may be plain or embossed as desired and can be cut with razor blade or scissors and moulded or twisted as desired. It is very flexible and is something between a paper and a textile, the surface finish being suede, baize, velvet or plush. It may also be used to line card and other table tops, home-made billiard tables, for knife box lining and other work. The surface is durable and the cost is low.

Workers may also use any other similar materials to hand such as cretonne, nylon, georgette, silk, gingham, chintz, all of which, when stitched to wire frames, make up individual lampshades that can tone in with their surroundings.

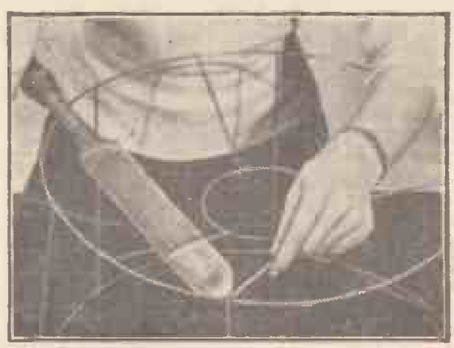


Fig. 2.—Soldering up a frame.

Trimmings

These may be obtained in the form of braids, fringes, tassels and gimps in guaranteed matching colours. Tubular thonging cord, silk braids and coloured plastic materials are all suitable for providing the essential finishing touches to the shade. Gimps in suitable colours and widths are best used for the stitched shade and to outline panels, and when used in conjunction with matching fringe for the lower edge the completed shade will look most attractive. Shade cards may be seen at the stores when a selection may be made. Tassels and bobble fringes may be made up by the worker from off-cuts of material from knitting or dressmaking. These decorative trimmings have special application for the table or standard type lamps.

Fig. 4.—Cutting a paper pattern.

Raffia can have a use and application in lampshade making and by interweaving, lacing or fringeing, effective shades may be produced. Raffia can be used for binding cut panels and parchment pieces to wire frames. Coloured silk is also used for these purposes.

At this stage, it is well to remember that wire frames, whether new or those being re-covered, should be cleaned or bound with raffia (Fig. 1) to avoid and discoloration in the completed lampshade which may result from rust marking. Sandpaper will clean up very old wire frames effectively.

Tools

Pleated parchments may be obtained ready for use, also some with holes ready punched for easy assembly, but some workers will wish to carry out pleating and hole punching, either of which is quite easy. Cutting and trimming is carried out in the usual way with scissors or sharp knife. A six-way punch will be required for punching out holes and the size of hole may be chosen. The simple hand appliance is cheap and may be adjusted as desired. A plier gauge is useful for the accurate spacing out of the holes from each other and from a given edge of the material used for the work. Footrule or tape measure will give accurate lengths for pieces, as much will depend upon precise cutting. Thread may be used for stitching panels and cut pieces on to wire frames which are afterwards covered with decorative material such as coloured cotton, silk or raffia as desired. Coloured wools are often most suitable for some types of work.

Where a good body is required for parchmentcraft work, cardboard may be used as a base material. Parchment may be cut and glued or stitched either side of a sandwiched piece of thick card, thus giving bulk and strength to the finished work. Flimsy fabrics may also be supported in this way. Work may be held together with clips or pegs so that there is no movement while stitching is in progress.

Wire Frames

Suitable gauge wire may be purchased in coil form and shades made up by hooking the supporting ribs of the circles and soldering (Fig. 2). The wire is pliable and easy to cut, and not at all expensive to buy. Ready made frames in all sizes and shapes for the table lamp, standard or hanging type may be purchased. Old frames may be re-covered after they have been cleaned up and sometimes, new wire and new frames need a little cleaning. All the components, such as gimbal and wire rings, bulk clip rings, shade carriers, spider gimbal, duplex ring for floor standard lamps, and pendant rings, are standard and may be purchased as units. These small fittings form the wire part which holds the bulb in the various styles of frame.

There are some two dozen ready made styles of lampshade including coolie, square corner, skirted floral, bowed hexagon, bowed empire, floral, French, scallop, cylinder, etc., all of which are descriptive of shape and style. Each is available in several sizes. Some alternatives are shown in Fig. 3.

Paper Patterns

When covering old wire frames with new material, a pattern may be obtained for size from the old pieces taken away. All pieces must be cut accurately in the same size and shape if a good fit is to be obtained. When covering new wires, a pattern may be made from paper (Fig. 4). However experienced the worker may be, all patterns should be cut from previously drawn shapes and a template or master pattern may be cut from card for the purpose of repeat cutting.

Thick paper rubbed against the wire shape will take up the shape for cut pieces, the paper being cut at the crease marks. Some panels are wider one end than the other and some economy of material may be made by cutting such pattern top and bottom, i.e., by laying the wide end of one panel next to the narrow end of another panel. Some allowance should be made for turning the material where this is essential. Parchments and similar material are cut to the exact size, while fabrics and silks will need an allowance for turning over the wire and stitching.

Cylinder lampshades are quite simple to make up and in most cases, if the sheet of parchment is pinned down to a table, the wire frame may be rolled across its surfaces and a pencil drawing made of the complete pieces or shape required to cover the wire. One cylinder join only is made in such styles.

Novel Lamps from Old Jars and Bottles

Such empty bottles as are decorative in shape may be used for novel lamps. Liqueur bottles, which are made in many choice shapes, particularly the French and Italian varieties, empty ginger jars, toffee bottles, large ink bottles and certain jam jars are most suitable for making into table lamps. The completed job gives originality and a touch of charm to the room and the cost is small while the work is most absorbing. Italian wine bottles and French liqueur bottles are very shapely and are often covered with coloured straw or raffia. Bottles with screw tops and of suitable weight and shape will be found easiest to work. The glass or pottery jar or vessel may be hand painted or decorated as desired.

The lamp attachment is simple to fit and the Pifco adaptor is a popular type used for this work. The tapered cork stopper may be peeled down in diameter to fit the neck of the bottle, thus giving a good fitment.

The empty bottle should be weighted with sand to avoid the table lamp, when completed, being knocked over. Top-heavy bottles should not be used.

In the case of a small-necked bottle, a wire gimbal may be shaped and soldered to the metal cap of the bottle in order to hold a pendant socket fitting. In the case of the large neck, a batten socket may be bolted to the cap of the bottle. Before wiring takes place, the bulb holder must be firmly attached. The flex may be passed behind parchment used to cover the bottle. A hole has to be bored to allow the flex to be led through. The adaptors are supplied with flex and a two-pin ivory plug.

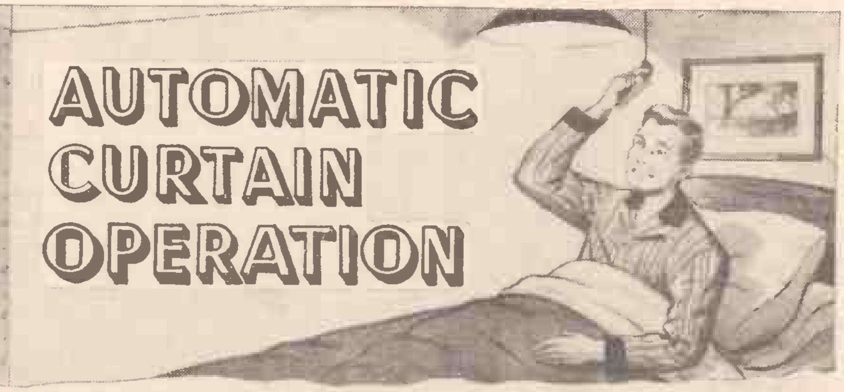
When a raffia-covered type of empty bottle is being used for the work, a lampshade made up in similar style can look most effective. In this case, the coolie type of frame may be used and covered with interwoven cut strips of parchment, making up a woven pattern; ½in. and 1in. cut strips in, say, green and red parchment to match the raffia on the bottle will look effective. The over and under interlacing or woven pattern is simple work, yet produces some most attractive results. Glass or stone bottles or jars may have other types of shades made up in panels or all in one piece and there are many suitable styles of wire frame ready made or easy to make up as desired. There are some 12 styles suitable for such work, including the floral, hexagon, bow, coolie and empire.

Fig. 5.—Hand-painted ginger jar fitted with a flared hand-painted shade of sheepskin parchment on a wire frame. Also shown is the Pifco adaptor with tapered cork stopper.

(To be concluded)

Flashgun Extension Unit—Correction

IN Fig. 2 of the article describing an extension unit for the Electronic Flash outfit, which appeared on page 42 of the October issue, we regret that no connections were shown between two of the condenser switches and H.T.+. These connections must, of course, be added.



AUTOMATIC CURTAIN OPERATION

J. B. Barley Describes a Method of Automatically Drawing Back Bedroom Curtains as Light is Switched Off

MOST people like to sleep with the curtains drawn back and after, perhaps, reading a while dislike getting out of bed to do this. Therefore, the following simple method of automatically opening the curtains as the light is switched off was devised.

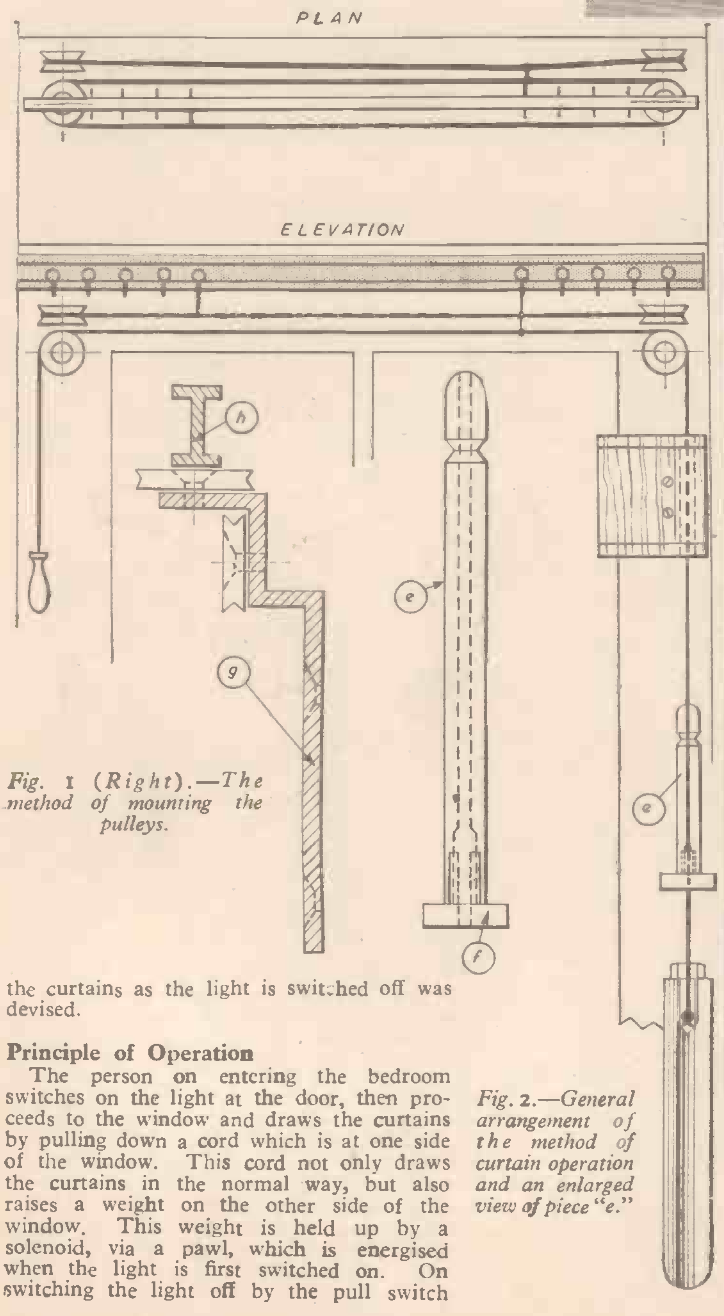


Fig. 1 (Right).—The method of mounting the pulleys.

Fig. 2.—General arrangement of the method of curtain operation and an enlarged view of piece "e."

Principle of Operation

The person on entering the bedroom switches on the light at the door, then proceeds to the window and draws the curtains by pulling down a cord which is at one side of the window. This cord not only draws the curtains in the normal way, but also raises a weight on the other side of the window. This weight is held up by a solenoid, via a pawl, which is energised when the light is first switched on. On switching the light off by the pull switch over the bed, the weight is released and the curtains are drawn back. The general arrangement can be seen in Figs. 2 and 6.

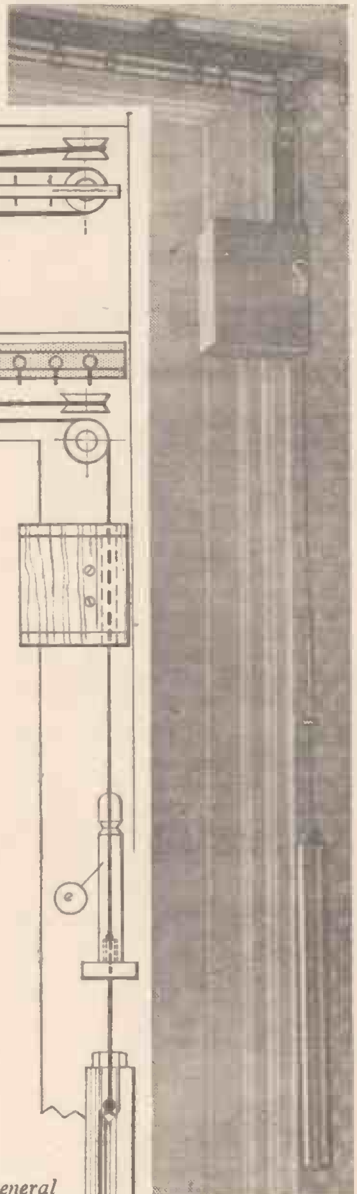


Fig. 3.—The right-hand side of the window, showing the solenoid and weight.

MATERIALS AND PARTS REQUIRED

Small solenoid to work off mains voltage from old motor starter or similar.
4 small grooved pulleys.
$\frac{1}{8}$in. × $\frac{3}{4}$in. mild steel strip for brackets.
Weight, mild steel 1in. diameter × 7in. (or according to weight of curtains).
Piece of 14 s.w.g.-M.S. for pawl and lever, etc.
3$\frac{1}{2}$in. of 5/16in. bore steel tube.
3in. of $\frac{1}{4}$in. M.S. round.
Length of cord, non-stretch type.

Construction

Start with the weight retaining unit (Fig. 4).

The construction of this will depend upon the type of solenoid obtained, but dimensions are not important, except to obtain about $\frac{1}{8}$in. of movement at the end of pawl "b" (Fig. 4) when the solenoid is energised, and to keep the unit as small as possible. The pawl "b" is pivoted on to the lever "a" and rests on the upper part of that lever, as shown. The reason for this loose pawl is to prevent the pole pieces being forced apart when the weight is raised. The lever "a" is pivoted to the moving core of the solenoid and to the bracket "d." This bracket is silver soldered to the tube "c," which is bell mouthed at the bottom and has a slot cut at the top to allow the pawl to enter. The bracket is screwed to the solenoid by means of the screws shown. The unit (shown in Fig. 5) is fitted into a hardwood box, leaving the ends of the tube "c" unobstructed and a hole is left for the cable to enter. The

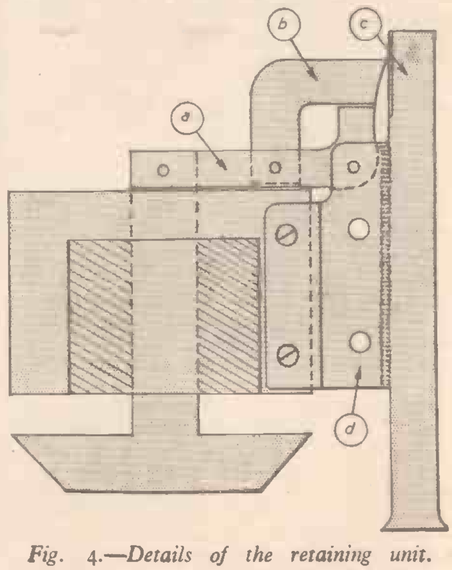


Fig. 4.—Details of the retaining unit.

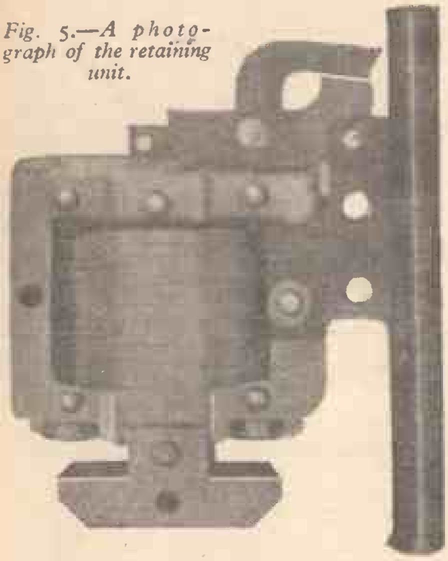


Fig. 5.—A photograph of the retaining unit.

complete unit is screwed to the window frame or wall behind the curtains, as shown in Figs. 2 and 3. The solenoid is connected with twin 1/.044 cable to the light ceiling rose above the ceiling so that as the light is switched on the solenoid is energised. The pole pieces, incidentally, should be quite flat and fit together perfectly with faces slightly oiled to ensure silence in operation.

The Weight

This is rounded at the bottom and the top is drilled and tapped ¼in. B.S.F. to take a screw drilled for the cord. This weight, 7in. in my case, should be varied according to the weight of curtains. (See Fig. 2.)

The next piece "e" in Fig. 2 is of ¼in. round M.S. A groove is made around this about ½in. from the top for the pawl "b" to lock into. A hole is drilled down the centre for the cord to pass through and the lower end is tapped 3/16in. to take a ferrule "f," providing space for the knotted cord and a stop to prevent the whole thing being raised too high.

The only other pieces to be made are the brackets on which are mounted the pulleys. These are made of ½in. × ⅛in. M.S. and are shaped to hold the pulleys in position relative to curtain rail "h" as shown in Fig. 1. When these have been screwed to the window frame the cord can be fitted, attaching it to rollers on the curtains, as in Fig. 2, the weight, etc., one side and a rubber handle the other. The device, after some adjustments to the cord, should then be ready to function. The weight may need to be reduced if the curtains draw back too violently.

Fig. 6.—A view of the window with curtains removed, showing the general arrangement of the withdrawing device.

Patents in the Channel Islands

Some Notes on the New Legislation

IT is a mistaken belief, held by many people, including manufacturers and traders in Great Britain, that British patents, design registration and trade mark registrations granted by the London Patent Office under the Laws of the United Kingdom of Great Britain and Northern Ireland extend to and afford protection in Jersey, Guernsey and the other Channel Islands. The true position is that neither the United Kingdom Patent, Design or Trade Mark Laws, nor other statutes of the British (United Kingdom) Parliament, operate in the British Crown Territories of the Channel Islands, which are self-governing with respect to all internal affairs.

Jersey Legislation

In the past it has been the practice, in the absence of statute laws, to register patent specifications, designs and trade marks in the Royal Court of Jersey, in the hope that, by doing so, it would be possible to safeguard such rights as might accrue thereto, at Common Law. The first statute laws, namely, the Patents (Jersey) Law, 1957, the Registered Designs (Jersey) Law, 1957, and the Trade Marks (Jersey) Law, 1958, provide that nothing contained therein shall derogate from such rights as may be possessed by any party by virtue of any registration in the Royal Court but the statutes do not define the scope, effect or term of any such rights. On the other hand, the various other provisions of the Statutes make it abundantly clear that such registrations in the Royal Court are virtually valueless.

Trade mark rights are not protected by virtue of their United Kingdom trade mark registrations. Only the obtention of fresh trade mark registrations (and patent and design registration, as the case may be) under the new Statute Laws will afford protection in Jersey.

Guernsey Legislation

Patent, design and trade mark registrations in Guernsey dated subsequent to 3rd November, 1922, were effected under a Statute Law provisionally enacted in the year 1922. This law, which was confirmed in the year 1932 and amended in the year 1957, is still in force.

Trade marks registered in Guernsey are liable for the payment or renewal fees, but there is no occasion to effect new registrations or re-registrations in Guernsey of patents, designs and trade marks registered in the island on or after 4th November, 1922.

Owing to lack of knowledge concerning the legal situation, many thousands of unregistered trade marks are being used in Guernsey. Full protection in respect of such trade marks can be obtained only by registering same under the Statute Law of Guernsey.

Jersey Patent Law

The first statute law of Jersey entitled Patents (Jersey) Law 1957 came into operation on 1st March, 1958. Patent protection may be obtained in Jersey only by first obtaining the grant of a British (United Kingdom) patent and then registering it in Jersey.

Infringement

No proceedings for infringement may be instituted in respect of acts committed before the date of registration in Jersey of a United Kingdom patent.

Offence

It is a punishable offence for any person to sell in Jersey any article falsely marked with the word patent or patented and the word Jersey or the words registered in Jersey or any other words expressing or implying that the article is a patented article.

Jersey Trade Marks Law

The first statute Trade Mark Law of Jersey entitled "Trade Marks (Jersey) Law, 1958," came into operation on the 1st July, 1958. Only trade marks which have been registered by the London Patent Office in the British (United Kingdom) Register of Trade Marks may be registered in Jersey.

Infringement

No proceedings for the infringement of trade mark rights may be instituted or damages recovered in the case of a trade mark which has not been registered in Jersey, or in respect of acts of infringement committed before the registration of the trade mark in Jersey.

Offences

It is a punishable offence to represent a trade mark as being registered of goods for which it is not registered in Jersey.

Guernsey Patents Law

The "Patents, Designs and Trade Marks Ordinances, 1932 and 1957" is the title of the Statute Law in force in Guernsey which regulates the granting of patent rights for inventions. Patent protection may be obtained in Guernsey only by first obtaining the grant of a British (United Kingdom) patent and then registering it in Guernsey.

Infringement

No proceedings for infringement may be instituted in respect of acts committed before the date of registration in Guernsey of the United Kingdom patent.

Marking—Damages for Infringement

The use of the word patent or patented will not disentitle a defendant from pleading that at the date of the infringement he was not aware and had no reasonable ground for supposing that the patent was registered in Guernsey. The words "Registered in Guernsey" or similar words together with the year of the registration and the number of the patent must be used in order to preclude such a defence and to qualify the registered proprietor or registered licensee of the patent in Guernsey for the award of damages for infringement.

Novel Christmas Cards

J. B. Andrew Gives Some Paper Sculpture Designs

Fig. 1.—A group of completed Christmas cards; the candle, reindeer and snowflakes are flat designs.

"PAPER Sculpture" is an easy way to decorate Christmas cards; no particular artistic skill is required and mistakes are difficult to detect. On the other hand, paper sculptures are both appealing and eyecatching, and designs look attractive and intricate, but are very simple to make.

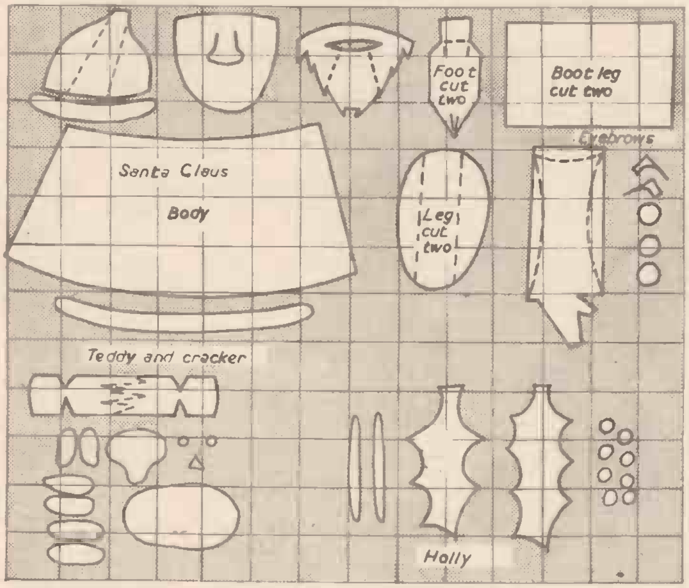


Fig. 3.—Cutting plan for Santa Claus, teddy, cracker and holly designs.

Materials

These are easy to obtain, cheap, and easy to handle. A good cartridge paper is most suitable for use, but practically any fairly stiff white paper will do. White card is required for mounting. Choose a good quality paste which dries quickly, preferably one which does not stain the paper if you make a mistake. The only tools required are a sharp pair of scissors and a razor blade.

Some form of lettering will be required such as the words "Merry Christmas," and, if you are not skilled at painting lettering, do it with rough brush strokes rather than attempt neat letters. This makes this part of the job much quicker to carry out.

Use white paper and card, and letter in black, with just an occasional word in a colour, such as red and green, when attention is to be drawn to it. Paper sculpture, I think looks better in white, some of the effect being lost if coloured paper or card is used; mistakes seem to show up more, too, but you can always experiment with colours for yourself and the photographs show coloured cards.

Flat Designs

The flat designs shown in Fig. 1 are very simple to make. The shapes are cut from card, as paper is too thin for this job, then pasted in position on the base card, overlapping pieces where required to give thickness.

It is not necessary to centre the design in every case but some attempt at balance should be made. The candlestick design is balanced by a sprig of holly underneath (a cutting plan for these is given in Figs. 2 and 3).

Inside the card, a simpler cut-out, the teddy bear falling from the cracker, is mounted, balanced by the one word, "from." The teddy bear is cut as shown in Fig. 3.

No difficulty will be found in cutting and assembling, but cleanliness is essential, and it is a good idea to cover as much of the card with blotting paper as possible while working. Do not use too much paste as this will press out and look unsightly. One or two dabs on the back of each piece will usually be enough.

Other designs of this kind can be made from seasonable shapes such as lanterns, bells, mistletoe, Christmas trees, etc. If you wish to draw in any details, pencil marks always look much better than ink.

Rounded Figures

These three dimensional figures are much more effective than flat designs, though almost as easy to make; humorous figures are the most popular.

The figures are cut out of paper and folded to give depth. The result is a small paper doll which, after having been pressed flat in an envelope, soon stands out as a round figure again. An example of this is shown on the Valentine card in Fig. 4.

Santa Claus

To make up this figure cut out the shapes given in Fig. 3 and fold where indicated. Wrap the body piece into a tube, paste, and flatten slightly. The join is at the back. Paste on the strip of trimming. Cut the nose with a razor blade and lift it up like a flap. Paste the beard on to the face with the moustache under the end of the nose to lift it slightly. Roll the boot legs into tubes and fasten, then paste the leg in one end and the flap of the foot in the other. Paste them to the inside of the body tube. Paste the tabs on the arms to the back of the body, then paste the head on. Assemble all the parts together, pasting on the eyebrows, buttons, hat, etc. When fastened to the card Santa holds out his arms in a welcoming manner. The finished card is shown in Fig. 5.

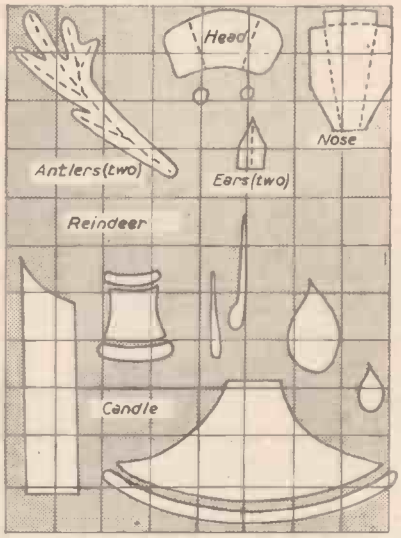


Fig. 2.—Cutting plan for reindeer and candlestick designs.

Inside the card, some simple design will suffice such as a snowflake, as shown in Fig. 6, pasted on loosely. After you have cut out a snowflake it may be necessary to iron it out flat.

The other designs illustrated are made in a similar manner.

Larger versions of the figures shown make

Fig. 4.—Examples of round and flat designs for other occasions.

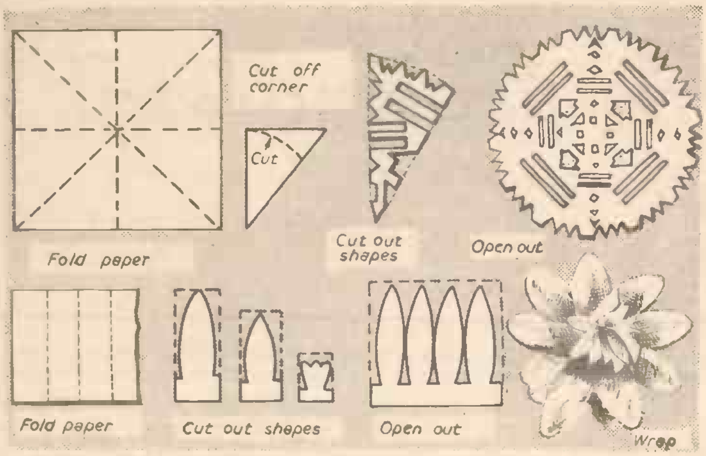


Fig. 6.—Method of cutting the snowflake and artificial flower.

very attractive and unusual house decorations for Christmas.

Never cut out one shape at a time, always cut through several thicknesses of paper and store the pieces in a clean envelope. Cutting out is the job which takes the most time, the cards can be assembled in a very few minutes from pre-cut pieces. Once you have a stock of cut-out pieces you can assemble the cards as required.

Novelty Cards

A small artificial flower stuck on the front of a card can look very effective. Fold a length of tissue or crêpe paper into a wad about 3in. wide × ¾in. and cut out the petal shape as shown in Fig. 6, leaving the bottom edges attached to one another. Cut two other bundles of petals, each smaller than the other. Unwrap the strips, draw a finger along each petal to stretch the paper, then, starting with the strip of smallest petals, wrap it round and round into a bundle. Follow on with the larger petal strips in turn, then tie off the stump with cotton or adhesive tape. Gently arrange the petals.

The flower can be made more effective by dipping it into melted wax before fastening it to the front of the card.

If you have a typewriter try this one. Type out the phrase, "Now is the time for all good men to come to the aid of the party," on a sheet of paper until you have covered it. If you have a ribbon change, type some in red, some in black and some in alternate rows of red and black. Cut shapes from the typed paper and fasten them to the front of the card.

Inside the card is fastened one other shape, and by it is typed, "Now is the time for all good men. . . ." followed by "to wish you a Merry Christmas" in bold brush strokes (Fig. 4).

Finishing

Send your cards in envelopes of suitable size. Any which may crush, such as those decorated with flowers, will require boxes.

It is wise to use the word Christmas in full on your cards as some people object to the abbreviation Xmas.

Fig. 5.—The completed Santa Claus card and a chef Christmas card design; both these figures are moulded.

A REVOLVING XMAS TREE

(*Concluded from page* 130)

Place the table top in position and bend the feeder strips carefully to make smooth contact with each ring. Make sure that each strip touches one ring only.

For testing purposes only, the other side of the connector on the table top is connected by 6in. of twin flex to a lampholder and a 15 watt lamp inserted.

Connect the flex at the side to the male side of the twin connector.

The female side is connected to another length of twin flex, which is led to positive and negative pins (the two small pins) of a three-pin plug. (No connection is made to earth at this stage.)

The positive lead of the twin flex which connects to the motor is cut approx. 6in. from the turntable and a pear switch inserted to stop and start the motor. These leads are fed to the same two pins on the three-pin plug. A separate lead is taken from the earth pin on the three-pin plug to a screw on the body of the turntable (Fig. 1). One of the holding down screws will do provided it makes clean contact with turntable.

The turntable is screwed to a board for easy handling and the leads from plug to turntable positioned so that children will not trip over them. This completes the turntable.

Testing

With the table top in position and a lamp in the lampholder, plug in and switch on the motor. The light will go on and the top revolve. To make sure the rings are being fed all the way round, place a weight on top and watch to see if the light flickers. If it does, stop and disconnect everything, bend the feeding strips to make better contact with the rings. When all

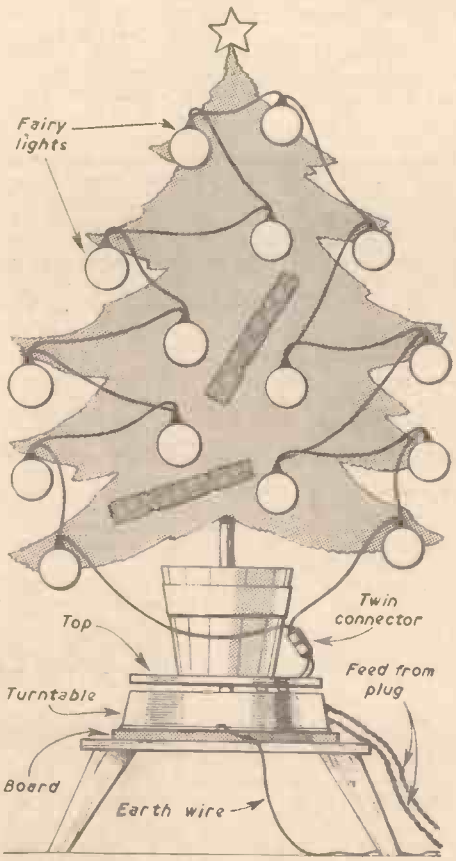


Fig. 2.—The general layout.

is working properly, place the tree, which is in a pot with weights to give balance when revolving, on the turntable.

Drape the fairy lights over the tree. The male side of a twin connector is fitted to the fairy lights, and plugged into the female one on the table top (see Fig. 2). The tree will revolve with the lights on. A "flasher" bulb inserted in the fairy light circuit will make the lights flash on and off while the tree is revolving.

The pear switch only controls the feed to the motor and when switched off will stop the motor, leaving the lights flashing on and off.

PAPER DECORATIONS FOR CHRISTMAS

(*Continued from page* 126)

paper is rolled and joined to form a cylinder. The tube is then pressed into shape thus forming the lantern shape. Bands at the top and bottom give both strength and character to the finished lantern. The more the lantern is pressed into shape the wider the cut slits become.

Repeated Cut-out Shapes

A long strip of paper is folded, a pattern drawn and cut, and the strip when opened up forms an attractive repeat pattern or border for decorative purposes. A strip of paper 2in. wide × 12in. long may be used as an example. This is folded into four, a pencil drawing is made and half the design only drawn. Care must be taken to see that neither edge of the folded paper is cut away completely so as to sever the design. The folded edges must be left to serve as hinges when the strip is opened out. Scoring will give tone and effect not obtainable by using the paper flat. Examples are given in Fig. 3.

Where paper decorations are to be used outside, paper such as glossy flint should be used as it is waterproof. Other paper may be made waterproof by a coating of copal varnish. With some experience, paper masks, flowers, lettering, figures from cones and tubes and other practical decorations may be worked out.

An Enlarging Photometer

Avoid Wrong Enlarging Exposure!

By S. V. Anderson

FINDING the correct exposure for any negative is easily and quickly accomplished with a photometer working on the grease spot principle. The construction of the meter shown in Fig. 1 is simplicity iself, and it can be made in an evening.

Materials Required

We require the following items: A bell transformer of 3.5.8 volt, a 3.5-volt pocket torch bulb, an M.E.S. batten holder, a radio potentiometer (or volume control) of 25 or 50 ohms, a few pieces of covered copper wire, a few feet of flex, a plug to connect into an existing plug point of the house wiring, two pieces of flashed opal or ground glass, approximately 1in. × 1½in. each piece and a small piece of drawing or typewriter paper without a water mark.

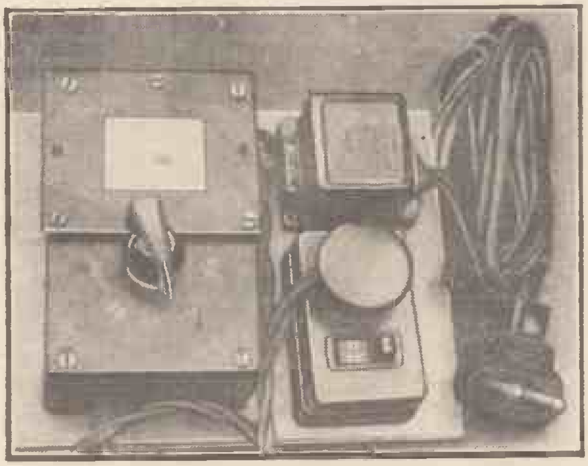


Fig. 1.—Showing the completed photometer.

Construction

Make a wooden box just large enough to hold the potentiometer and M.E.S. holder (Figs. 1 and 4). Alternatively the transformer could be mounted in the box and the box made correspondingly larger. Drill a hole in the lid of the box to take the potentiometer stud (threaded brass part) and also cut a hole 1in. × ¾in. immediately above the M.E.S. holder which should be screwed to the bottom of the box.

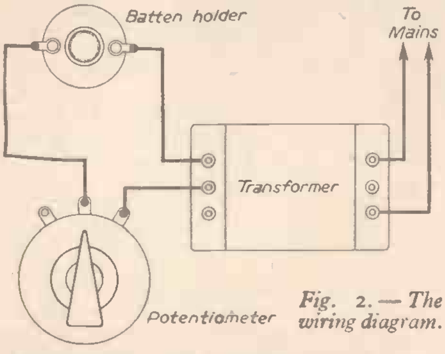


Fig. 2.—The wiring diagram.

Punch a ¼in. dia. hole in the piece of paper and make a sandwich of the paper and the two pieces of glass. Make a frame to hold this sandwich. The frame can be made of plywood and rebated to hold the glasses by cutting away one or two layers of the ply. Glue the frame, complete with the glass sandwich, over the 1in. × ¾in. hole (note: if ground glass is used the ground side should be face down). Paint the inside of the box matt black to stop any reflections.

Wiring

To wire up the circuit, run a short length of covered wire from the centre terminal of the potentiometer to one terminal of the M.E.S. holder. Take the flex, and connect one wire of the flex to the other terminal of the M.E.S. holder and the other wire to either one of the outside terminals of the potentiometer. Solder these connections.

The flex is now run outside the box through a hole drilled in the side and connected to the 3-volt terminal and the centre terminal of the transformer (if the terminals are not marked, follow the instructions supplied or ask the shopkeeper). From the mains side of the transformer connect a length of flex with a suitable plug at the other end to plug into the house mains.

These connections are shown in Fig. 2.

Attach the potentiometer to the underside of the lid, screw the bulb into the holder and screw the lid on to the box. Paint the outside of the box black, attach a radio knob to the spindle of the potentiometer, plug the transformer into mains and test by turning the knob.

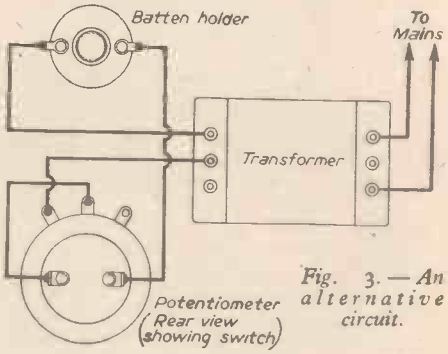


Fig. 3.—An alternative circuit.

Calibration

An alternative circuit incorporating a switch is shown in Fig. 3. To calibrate the instrument, select several negatives of different densities so that a range of exposure times can be made. Place a negative in the enlarger, focus and make a test strip in the usual way. After ascertaining the exposure required, say 20 seconds, and before moving the enlarger or negative, place the meter on the enlarger board so that the spot is under an average part of the image thrown by the negative. Adjust the light of the meter bulb by turning the knob until the spot just disappears. Mark the body of the meter with the figure 20 in white paint at the place where the knob pointer rests. Adopt the same procedure with the other negatives selected.

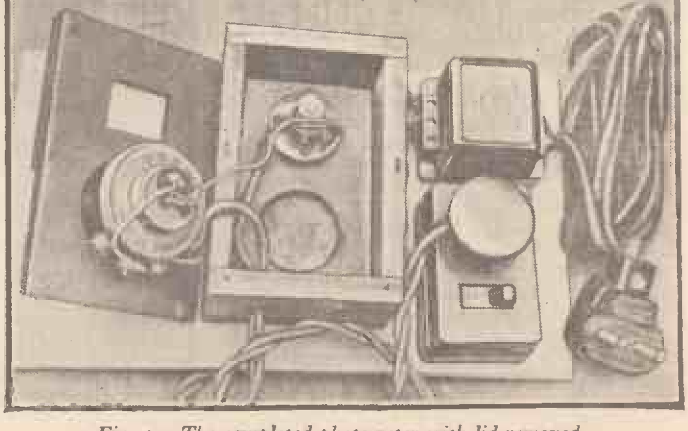


Fig. 4.—The completed photometer with lid removed.

Making Castin

TWO PROCESSES OF SPECIAL IN AND JEWEL

By P. WYX

THE two home craftsmen directly concerning us—the model-maker and the jeweller—have three casting processes to choose from. One, a kind of foundry practice in miniature, using casting flasks and sand, is not described because the preparation of the mould is rather tedious. The other two—the cuttle-bone, and the waste wax process—are very simple, quick and cheap, and all the equipment is home-made.

Waste Wax Process

This is widely used in industry for making precision castings, and there is no finer method where seamless replicas of very detailed or undercut originals are required. Factory methods need not be discussed, but one form of this process is ideal for home use.

Fig. 1.—Removing the original from the flexible mould. The jacketed container for melting Vinamold can be seen in the background.

You will need a quantity of wax—either paraffin wax or glitterwax—an asbestos mat of the type sometimes used on gas stoves, some dental casting plaster and one or two pieces of thick steel pipe. The diameter of pipe used depends upon the size of your casting. It should allow at least ¼in. space all round when the model is held inside one end of the pipe. Saw off a length of pipe, making it the depth of the model plus 1½in., and file both top and bottom edges perfectly flat, testing them against a sheet of plate glass.

The Model

This is made of wax. If you are designing the part to be cast you can simply cut it from a block of wax. If you have to copy an existing part there is a choice of two methods. If the master has one flat side and is not undercut, an impression can be taken from it by pouring some plaster into a suitable container, oiling the surfaces of the master, and embedding it in the wet plaster. When hard, the resulting impression is filled with molten wax. If the original to be copied is very complex and undercut, you can make an intermediate mould from Vinatex flexible mould material, suspending the master in this, allowing the mould to harden, then removing the master as shown in Fig. 1, slitting the mould if necessary. Modelling wax is melted and poured into this impression (Fig. 2) and when cooled the wax replica removed from the mould Fig. 3.

Having arrived at a wax model, take a piece of wire (about 11 s.w.g.) and dip it in some molten wax in order to coat it fairly thickly. Warm just the tip of the wire and press it a little way into the wax model. Choose a place where this will not spoil the design and where the structure of the model is fairly thick (Fig. 4).

Cut a square of asbestos large enough for the steel ring to rest on and lay the two in position on a firm surface. Leave mixing the plaster to the very last minute, as it sets quickly. Make a few trial mixes to get the right consistency: it should be creamy yet not too thick to pour. Plaster and water must be mixed together quickly—it is no use adding water a little at a time—stirred very briefly and vigorously, and poured immediately into the containing ring.

Fig. 2.—Melted wax is poured into the mould.

Fig. 3.—When cool the wax replica is carefully extracted.

Fig. 4.—Dental plaster is poured round the wax replica.

Hold the end of the wire bearing the wax model at its lower end, place it in the ring and hold it central with the bottom of the model ½in. from the asbestos at the bottom. Pour the plaster in quickly, seeing that it touches the model all round as the depth increases until the wax is completely buried to a depth of ½in. (see Fig. 4). This should leave the surface of the plaster ½in. below the rim of the pipe. Fig. 5 illustrates this stage. The plaster will generally harden quickly enough for you to be able to let go of the wire after a few moments, but it may be more convenient to have the wire suspended by a piece of thread from some simple support, such as three pieces of wood tacked together to form two uprights, and a cross piece to which the thread can be tied.

Drying of the plaster can be hastened if necessary by standing the ring and its asbestos base on a warm stove by the fire or on the brazing hearth. When dry increase the heat until the wax melts, the wire becomes free and can be pulled from the mould, and, on inverting the mould, the wax from inside runs out through the hole (see Fig. 6). With the mould still upside-down, enlarge the hole at the centre with a small pen-knife blade, making a fairly generous conical opening, but leaving the hole its original size where it joins the hollow impression beneath the surface. (See Figs. 5 and 7.)

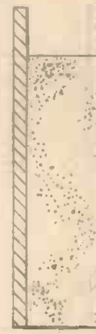


Fig. 5.— steel pipe of the wax

Steam Pressure Casting

Stand the ring and its asbestos base on a block of charcoal of the type supplied to jewellers, and support this on a heavy steel plate or on a brazing hearth. Surround the ring with pieces of coke to help in retaining the heat.

The remaining piece of equipment is simply a tin lid, fitted with an asbestos lining. The diameter of the lid is not important as long as it is larger than the ring. It must have a flat top and straight sides. A piece of wood is screwed to the top of the lid to form a handle; a cotton reel is suitable. A circle of asbestos is now cut to fit inside the lid. This should hold itself in position if cut a shade on the large side and pressed in.

Next thoroughly soak the asbestos with water and lay the lid to one side where it can be picked up quickly. A brazing torch

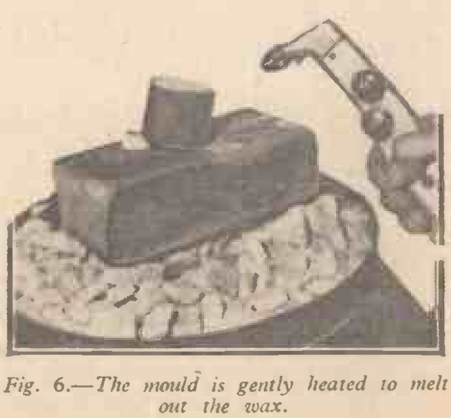


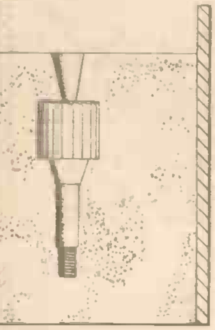
Fig. 6.—The mould is gently heated to melt out the wax.

...gs at Home

...NTEREST TO MODELMAKERS ...LLERS

is best for heating the ring and mould (Fig. 8), though a powerful petrol blow-lamp will give sufficient heat if you are patient. Place the scrap metal to be used—this should be about double the quantity you estimate will be taken by the actual impression—in and over the conical hole, adding a suitable flux. This will be powdered borax in the case of copper, brass, silver or gold.

At first play a gentle flame on the mould in order to dry it out. Turn on full heat as soon as it stops steaming. Heat the walls of the mould first, bringing the whole thing to even, dull red heat, and avoid melting the scrap metal too soon. Rather, let its melting be an indication that the entire mould is at the same temperature as the metal to be cast. The molten metal will run into a spinning globe immediately over the hole (Fig. 8). Heat for a little longer to make quite certain of a high enough temperature, then remove the flame and quickly press the lid over the ring (Fig. 9). Keep it there for a few seconds with a good pressure. Remove the lid, let the ring cool to a dull red, and then throw it and its contents into a bucket of water (Fig. 10). When cooled in this way the plaster becomes soft



...—A section through the ... showing the position ...x replica in the plaster.

Fig. 7.—A conical opening is cut, using a penknife.

Fig. 8.—The mould is heated in the brazing hearth.

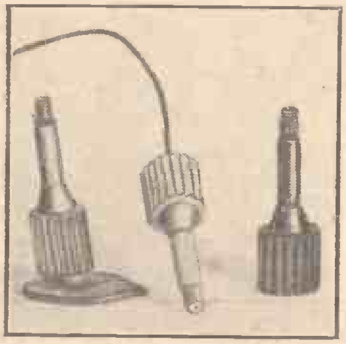


Fig. 12.—The finished casting, wax replica and original model.

and crumbly, and you can easily remove the casting (Fig. 11). The steam pressure generated when the wet asbestos is brought into contact with the mould is high enough to

Fig. 10—The mould is dropped into a can of water.

Fig. 9.—Using the tin lid with wet asbestos to generate steam pressure.

overcome the resistance offered by trapped air, and the metal should penetrate into every crevice of the impression.

Castings made in this way have a fine surface and show every detail, and they need little or no finishing, apart from cutting off the thread of metal joining the casting to the superfluous metal left in the conical hole, and making good the join at that place. Surprisingly thin castings can be made, almost down to the thickness of a piece of paper. An original, wax replica and actual casting are shown in Fig. 12.

Incinerated Models

Instead of a wax model, any original that will incinerate to fine ash may be used. Thus, a leaf can be cast from a real original by the simple method of sticking the wax coated wire to a place somewhere along its thicker part—say, near the stem—embedding the leaf in the plaster in the usual way. The leaf turns to ash on heating the mould, and the amount of this is not sufficient to interefere with the passage of the metal. Beetles and various other insects can be treated in a similar way. For model-makers it should be interesting to try carving the original from balsa wood and allowing this to incinerate in the mould. To the best of my knowledge, this is a

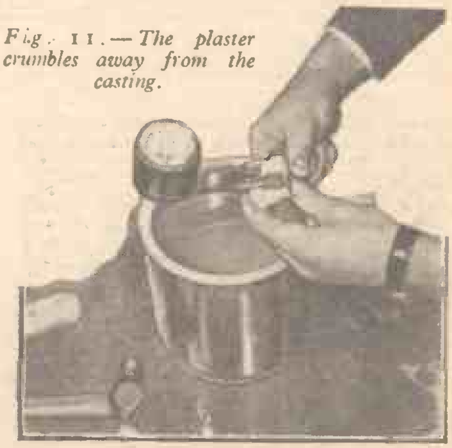


Fig. 11.—The plaster crumbles away from the casting.

method that has yet to be tried, but, since the density of balsa wood is so low, it should reduce to a very small proportion of ash. Owing to the porous nature of this wood, it would probably be necessary to dip the master in some very hot paraffin wax in order to seal the pores and permit a casting with a very fine surface.

Cuttle-bone Process

The size of the casting is limited only by the size of the cuttle-bone obtainable—and quite large ones, specially selected, can be bought from suppliers of jeweller's materials and tools. You can copy an original made from any hard material—it might be a signet ring, part of a locomotive, or a cylinder head—but it must not be undercut. (If it is undercut, you will have to use the first process.) Alternatively you can carve the model from a piece of hardwood.

With a hacksaw blade, divide the cuttle-bone into two slices. Rub the cut surfaces on a piece of fine glasspaper laid on a flat surface and finish by rubbing the two surfaces together to get a really good fit.

Register Pegs and Gate

Matchsticks make very good register pegs. Cut three so that the length of each is slightly less than the thickness of the complete cuttle-bone and press them in one of the slices so that rather more than half

Addresses of Suppliers:

Dental casting plaster from S. S. White & Co. 126, Gt. Portland Street, London, W.1., and W. H. Palmer & Co. Ltd., 82 and 84, Old Street, London, E.C.1.

Charcoal blocks and cuttle-bone, etc., from E. Gray & Sons Ltd., 12/14, Clerkenwell Road, London, E.C.1.

Muffle furnaces, crucibles, etc., from A. Gallenkamp & Co., 17/19, Sun Street, Finsbury Square, London, E.C.2.

Modelling wax from Messrs. S. S. White & Co.

their length is left projecting. Leave plenty of room between the top two for the master. Now lay the two halves together and press them so that the pegs form holes in the second slice of cuttle-bone. Separate them, lay the master you wish to copy between the two top pegs, leaving about ¼in. between it and the top of the cuttle-bone, register the pegs with the holes, and press the halves firmly together. If difficulty is experienced in making the surfaces meet, as in the case of a rather large original, place your hands between your knees for extra pressure.

Again separate the halves, remove the master and cut the gate from the impression to the top of the cuttle-bone (Fig. 13). This is funnel-shaped and must be ⅛in. to 3/16in. in diameter where it joins the impression, and about ⅜in. dia. at the top. The gate is cut with a small penkife blade from both halves of the mould. Radial lines are scratched with the tip of the blade

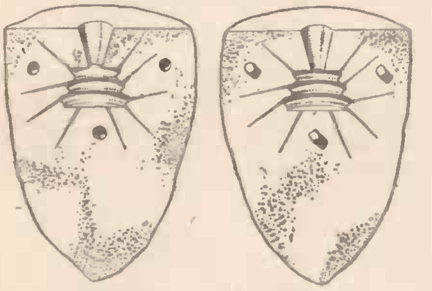


Fig. 13.—Two halves of the cuttle bone mould showing the locating pins.

from the edges of the impression to act as air breathers.

Now register the pegs and wire the two halves together, after doing some careful

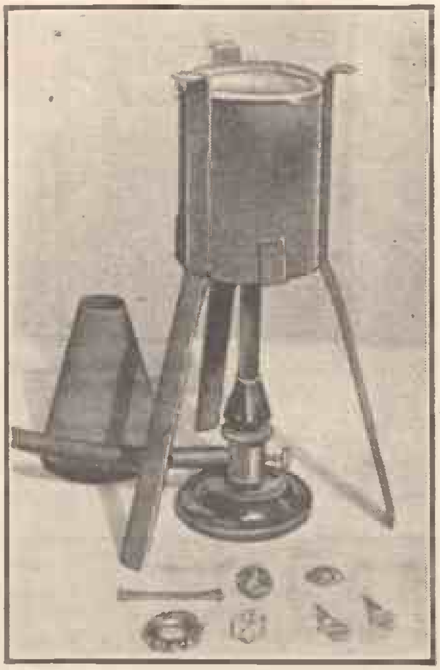


Fig. 14.—A small muffle furnace with a gas burner of the venturi type.

work with an artist's brush to remove any stray particles of cuttle-bone.

Pouring

The next stage depends upon what metal you wish to cast and also upon the size of the impression. If pewter or white metal is to be poured, you can melt quite large quantities in a strong metal container or a fireclay crucible, using either a blowlamp, a brazing torch or an ordinary household open grate as a source of heat. I have on occasion used an open fire, well stoked with a fuel such as Coalite, and burning bright and clean to melt metals up to the melting point of silver (1,650 deg. F.) using a fireclay crucible and crucible tongs for pouring. If you hold the mould while pouring, a thick leather glove should be worn in case of accidents. Some molten metal will probably spill over, for the gate must always be filled quickly and right to the top, the metal going in in a continuous stream. When cool, the mould is opened, the casting eased out and the superfluous metal sawn off. Castings made in this way have good detail and need very little finishing. Any of the non-ferous metals can be cast. With those of higher melting point the mould can be used once only for an accurate reproduction. With pewter you may be able to make as many as half a dozen good castings. One cuttle-bone, used economically, may accommodate several small impressions side by side, and the burnt impression of one mould can often be sliced away, still leaving sufficient thickness for a further casting.

A small muffle furnace with a gas burner of the venturi type (Fig. 14) is not expensive and provides a clean and simple way of melting metals up to the melting point of about 2,000 deg. F. It holds one crucible of useful size, and has a cone which can be stood on top to increase the draught through the fireclay interior.

A brazing torch does just as well for either of the processes, in which case the crucible is stood on an iron or steel tray, surrounded by pieces of coke. Plenty of flux of the appropriate type for the metal being cast should be added to the scrap before heating commences.

Doubling Number of Exposures

Written by D. E. Cragg in Response to a Request in "Information Sought," October Issue

A 120 film has numbers on the covering paper in three lines, 1-8, 1-12, 1-16, I put in another window at the back of my camera, in line with the numbers 1-16, and fitted a mask in front of the film, and on the view finder.

Why not fit a window at the back of the camera, over the line of numbers 1-12 and so fit this that the numbers can be read off twice, first by the winding knob and then by the window?

Another way to do this is to fit *two* windows in the back of the camera, approximately 1⅛in. apart, both in line with the numbers 1-12, so that here again the numbers can be read off twice (Fig. 1). Before doing this, take the backing paper from the film (this can be replaced afterwards and the film used). On the back of the covering, or backing, paper the numbers 1-8, 1-12 and 1-16 will be seen. Now by placing the covering paper in or over the back of the camera, it will be seen just where the windows are to be fitted (Fig. 1A). It is best to fit a swivel cover for each window, the camera can then be used for 24 or 12 exposures (Fig. 1B). A mask must be fitted in the back of the camera, in front of the film, as shown in Fig. 2. The mask can be made from thin tin painted matt black and two wires.

The view finder: this also must be fitted with a mask, this is best done by placing a piece of ground glass up to the mask at the back of the camera, then open up the shutter, you can then mask the view finder so that the same amount of picture is seen on it as on the ground-glass screen. The view finder could have two fine wires or pins across; it then could be used for 12 or 24 exposures (Fig. 3).

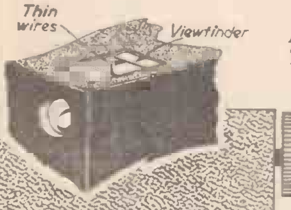


Fig. 3 (Left).—The view finder.

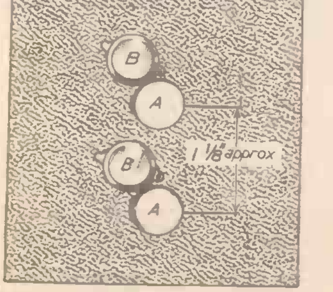


Fig. 1.—Positions of the windows.

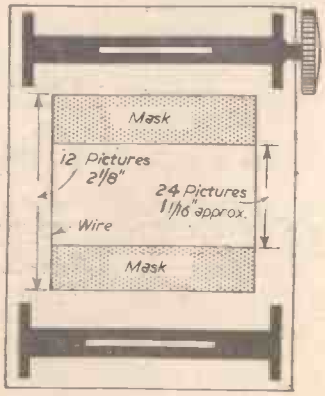
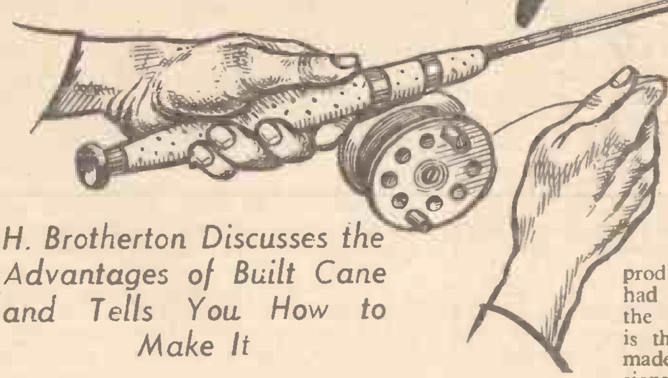


Fig. 2.—The mask.

Built cane for Fishing Rods



H. Brotherton Discusses the Advantages of Built Cane and Tells You How to Make It

BAMBOO cane has the lightness and strength so desirable in a material for fishing rods, but in its natural form its usefulness for this purpose is limited. It is excellent for rigid rod-sections,

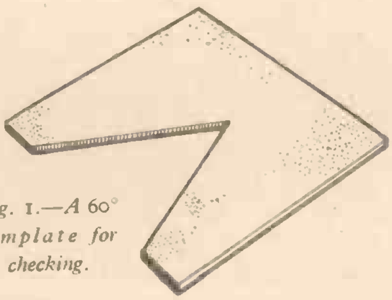


Fig. 1.—A 60° template for checking.

but its natural hollow structure makes it unsuitable for the more slender sections which are subject to repeated bending stresses. Nor is it possible to achieve exact diameters and desired rates of taper with the natural cane, for almost all the strength of bamboo lies in its hard outer skin and it is unwise to make any appreciable reduction in its outside diameter.

A nineteenth-century American gunsmith named Phillippe is said to have been the first man to overcome bamboo's limitations as a rod material, by producing what he called "rent and glued cane." All he did, in effect, was to remove the cane's hollow centre. He split up his natural cane, planed up the resulting strips, and then reassembled them to form a *solid* cane. The result was bamboo without its natural shortcomings.

Phillipe's original "rent and glued cane" has, of course, been improved upon, but the basic principle has since revolutionised the craft of fishing rod making. "Built" or "split" cane, as it is now called, has opened up many possibilities. Cane can now be made to exact dimensions and with any desired taper or combination of tapers. This makes it possible for the performance or "action" of rods to be pre-determined scientifically. It provides a solid cane, an ideal rod material which Nature has neglected to provide, or, on the other hand, the built cane can be fabricated to form a *hollow* section which can be used with advantage for the stiffer rod sections which are usually made from the natural cane. The latter procedure may seem like going to a lot of trouble to produce what we already had in the first place, but the advantage, of course, is that built cane can be made to precise dimensions. With the natural cane we have to hunt around for the nearest dimensions that Nature has provided.

Methods of Construction

Phillippe's original built cane was a simple four-strip assembly, but the construction favoured nowadays is the much more efficient assembly of six triangular strips which gives the familiar hexagonal cross-section. This construction makes use of the maximum amount of the cane's hard outer skin.

Built cane is an expensive material to buy, which is understandable. The raw material is cheap enough, but a considerable amount of work goes into its production. A bamboo pole has to be split up and for each section of built cane six pieces have to be planed up into perfectly triangular tapering strips. These are then cemented together to form the finished hexagonal cane. It is only the introduction of some measure of mechanisation into commercial manfacture that has made built cane available at the price it is.

Yet it *can* be made quite successfully and at negligible cost by any amateur who can use a plane. The only problem is the

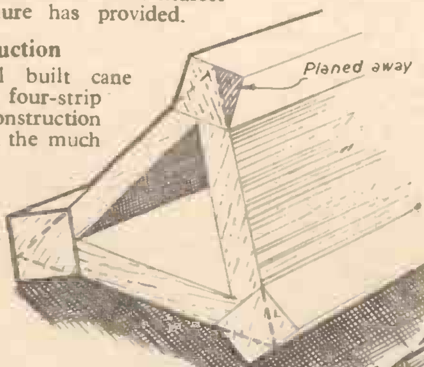


Fig. 4.—The former with the corners planed flat and square timber added.

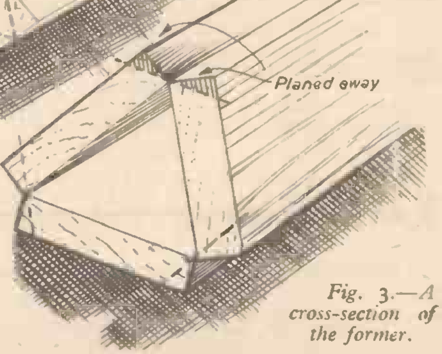


Fig. 3.—A cross-section of the former.

planing of the strips. The cross-section of these must be a perfect equilateral triangle and the required taper must be introduced into each strip, for, as the hard outer skin of the cane has to be retained, taper cannot be achieved after assembly. Such precise planing calls for some form of planing jig.

There are two usual methods of controlled planing. One is the "grooved-board" which consists of planing the strips progressively in a series of shaped grooves, the final groove giving the desired triangular cross-section. The other is the triangular former method. This consists of gluing the strips to the corners of a triangular former and then planing them to conform to the lines of the former. This latter method takes much longer as each individual strip has to be glued and subsequently removed from the former, but it is the most convenient method for the amateur to whom the time factor is not of great importance.

Removing finished strip from former.

Binding a glued strip to the former.

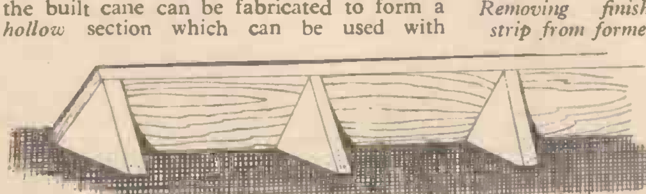


Fig. 2.—The ribs glued at 6 in. intervals along flat strips.

Making the Former

The former is of hardwood, a convenient size being 5ft. long, with a cross-section, an equilateral triangle 3in. × 3in. × 3in. Fashioning a perfectly true former to these dimensions from the solid timber is a formidable task which many a professional carpenter would hesitate to undertake without mechanical aids. For the amateur a "built-up" former is a more practical proposition. To make this, three 6ft. lengths of any good 2in. × ½in. planed hardwood are needed, together with three 5ft. lengths of similar wood 1in. square. These are, by the way, nominal measurements. The actual measurements of the planed wood will be about 1⅞in. × ⅜in. and ⅞in. square respectively. The dimensions are not, in any case, critically important, so long as the timber is uniform.

Twelve inches is cut from each of the flat pieces and this surplus is sawn up to make 11 triangular ribs, the sides of which must be exactly the width of the flat strips. These ribs are the basis of the former and it is essential that they be all alike and perfectly equilateral. It is advisable to make up a mitre-block with a 60 deg. saw-guide to ensure that the triangles are cut accurately. They should be checked after cutting with a 60 deg. template cut from tin-plate or stout cardboard (Fig. 1). This will be needed at a later stage for the final truing up of the former.

These ribs are now glued at six-inch intervals along one of the flat strips (Fig. 2). When the glue has set the two remaining flat pieces are added to the other sides of the ribs. This gives an assembly which, in cross-section, should look like Fig. 3. The corners of this triangular assembly are then planed flat and the square timber is added, which brings us to the stage shown in Fig. 4. Finally, the square pieces are planed away to conform with the sides, giving us a reasonably true triangular former with 60 deg. corners. Any slight inaccuracy can soon be corrected with the aid of the 60 deg. template. It is essential that a heat-proof glue be used throughout the job, as the former will have to be warmed later to remove the finished strips of cane.

Baking and Splitting the Cane

For making built cane suppliers of rod-making materials supply prime Tonkin cane poles from 1½in. to 2in. in diameter, with wall thicknesses ranging from about 3/16in. to 5/16in. These are usually about 12ft. long and have to be cut for delivery, so cutting instructions should be sent with the order. They should be cut into pieces about a foot or so longer than the intended length of the built cane.

The first job is to split the sawn-off lengths of cane pole into halves, using a blunt knife and a mallet. The half canes are then "baked" to harden them. Commercial manufacturers do actually bake the bamboo in suitable ovens, but the amateur can achieve a similar result by passing the cane slowly to and fro over a gas-jet until it begins to show traces of scorching. This drives out much of the natural moisture and hardens the bamboo considerably.

After baking the half canes are split down again into strips about ⅛in. wider than the finished width of the triangular strips. These rough strips may be slightly bent, but if they are warmed over the gas jet they become quite pliable and can easily be straightened. There will be protrusions at intervals where the nodes or "knuckles" of the cane have been. These are skimmed off with a sharp plane, care being taken that only the barest minimum of material is removed from the skin side of the cane. The task of gluing the strips to the former is made easier, too, if the rough split edges are planed up reasonably straight.

Preparing the Former

The former must first be stained all over with black wood dye, the purpose of this being to serve as a tell-tale precaution against any inadvertent shaving of the former during the planing of the strips.

The apex of one corner of the former is now planed away to form a tapering flat (see Fig. 5). This should be carefully done so that the progressive width and degree of taper corresponds with the flats of the proposed hexagon section of built cane. The beginner is often tempted to form *three* similar flats, one on each corner of the former, so that he can speed up the job by planing up three strips at once. This is definitely not a practical proposition. In the first place, it is almost impossible to form three flats exactly alike. Secondly, the beginner will not find it too easy to glue one strip to the former, let alone three! The other corners of the former can be used for making strips of different dimensions, but all the six strips for any one section of built cane should be made on the same corner so that they are identical.

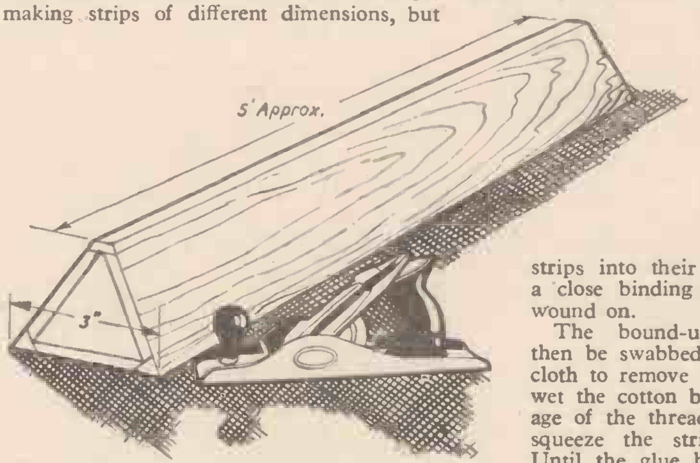


Fig. 5.—Finished former with flat planed on one edge.

Gluing on the Strips

Before the strips are glued on for planing they should be cut to finished length. Here we see the reason for having the cane cut 12in. or so longer than necessary. The potentially weak spots in the strips are the knots where the knuckles have been. With a foot to spare it is possible to stagger these knots when cutting to finished length so they do not coincide in the assembled cane.

The glue used to fix the strips to the former should be one of the animal glues which soften when heated. Otherwise it will be impossible to remove the strips after planing. The strips are glued in turn, skin side downwards, to the flat on the former and are held in position until the glue is set by a tight spiral binding of strong cord. Ample time should be allowed for the glue to set so that there is no danger of the strips coming away during the planing operation.

Planing the Strips

A good steel plane with a screw adjustment is needed. It should be finely set with the blade honed up to a really sharp cutting edge. It is, in fact, advisable to have the oil-stone at hand to touch up the blade from time to time as the work proceeds, for baked bamboo is quite hard and soon takes off the keen edge.

The surplus cane is carefully planed away from the bamboo strip until it is flush with the former, care being taken not to shave the surface of the former or to cant the plane during the finishing stages. The planing can be done most conveniently if a V-shaped cradle is knocked together from oddments of timber.

The finished strip is removed by running a hot soldering iron along the glued joint and at the same time gently prising the strip away from the former with the blade of a knife. It will tend to curl slightly as it comes away, but this does not matter as the strips automatically straighten up in the process of assembly. After each strip is removed the old glue must be thoroughly cleaned off the flat on the former, by rubbing down with a cloth soaked in hot water. On no account must it be *scraped* off, or the flat may be enlarged and the strips will not be identical.

Assembly

The six finished triangular strips are now given a liberal coat of one of the waterproof adhesives and are then assembled, *skin side outwards*, to form the hexagon section. It is best to assemble and bind together the thick ends of the strips first and then to work progressively towards the thinner ends, coaxing the strips into their correct positions as a close binding of cotton thread is wound on.

The bound-up assembly should then be swabbed down with a damp cloth to remove extruded glue and to wet the cotton binding. The shrinkage of the thread on drying out will squeeze the strips tightly together. Until the glue has set the assembly will be quite "sloppy" and malleable and any bends or kinks should be straightened out at this stage, for it is impossible to make any correction once the glue is hard. After the final check for straightness the finished section is laid on a *perfectly flat* surface until the glue has thoroughly hardened.

Finishing Off

The completed piece is then carefully cleaned up, a small flat file being handy for removing the binding and any remaining excess glue. Finish off with a light sandpapering, dealing with one flat of the hexagon at a time so as not to round away the corners. Fig. 6 shows a cross section of assembled built cane.

If all the work has been painstakingly done the result should be an inexpensive length of first-class fishing rod material.

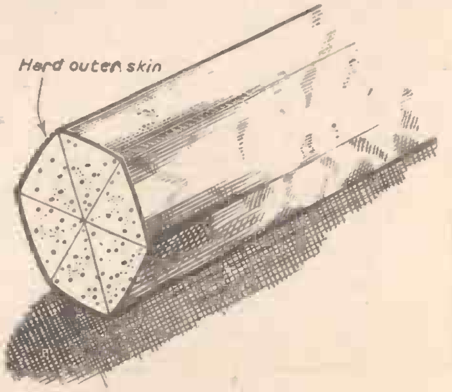
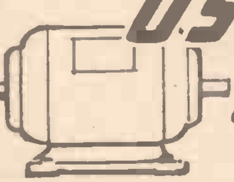


Fig. 6.—Assembled built cane.



USING A.C. MOTORS ON DIFFERENT VOLTAGES

By J. L. Watts

How to Adapt a Spare Electric Motor to Suit the Supply Available

THERE are occasions when a prospective user may come into possession of a motor which is rated for a different voltage to that of the available supply, or when a user moves to a district where the supply voltage is different, and the question arises whether a motor, or motors, can be used with, or without, modification. This involves questions of heating, insulation and motor design.

Series Motors on Reduced Voltage

The most common type of motor used on domestic apparatus is the series motor, sometimes called a universal motor. The field coils in this machine are connnected in series with the armature; usually one field coil is connected on either side of the brushes as shown in Fig. 1. Such a motor can be used quite safely on a lower voltage than that for which it was designed, but will then run at a lower speed. If the motor load is such that the rated current passes, the speed may be reduced almost in proportion to the voltage. However, the horse-power developed by the motor is then reduced approximately in proportion to the voltage, although the motor may be capable of developing its rated torque.

It would not be safe to increase the load so that more than the rated full-load current passed through the motor, otherwise the motor would overheat and the life of the insulation would be reduced, particularly as the ventilation is reduced at the lower speed. The starting torque will also be reduced on the lower voltage, so that the motor will take longer to pick up speed when switched on.

Per cent. of full-load motor torque	Per cent. of full-load motor speed
10	155
20	141
30	132
40	123
50	119
60	114
70	109
80	106
90	102
100	100

Table 1.—Variation of speed with load on a universal series motor.

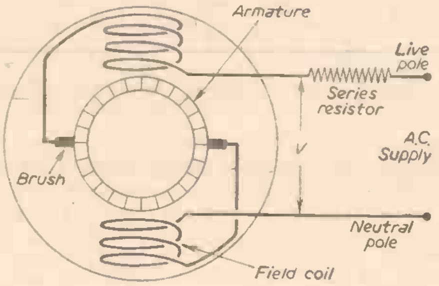


Fig. 1.—Connections of a series resistor used with a series motor.

In the case of many appliances, such as vacuum cleaners, where the motor drives a centrifugal fan, the torque required to drive the fan automatically falls on reduced speed. When used on reduced voltage the motor speed and current automatically change so that the torque developed by the motor is just sufficient to drive the load at the reduced speed. Thus on reduced speed the torque of a motor driving a centrifugal fan will be reduced below that required on normal voltage, as will also the current. Such an appliance can, therefore, be used quite safely on a lower voltage, as can other appliances where the resistance torque of the load is not increased on the lower speed. However, the reduced speed obtained may make operation on a lower voltage impracticable; in particular the suction of a vacuum cleaner may be considerably reduced if the machine is used on an appreciably lower voltage than that for which it was designed. In this case there are three possible solutions. One is to sell the appliance in a district for which it is suitable and purchase an appliance of the correct voltage. Another solution is to rewind the motor for the correct voltage, whilst a third alternative would be to supply the motor through a step-up transformer of the required ratio. The latter two alternatives allow the motor to be used with no loss of output and will be dealt with in more detail later.

Series Motors on Increased Voltage

In some cases it is required to use a series motor on a supply of higher than the rated voltage. If such a motor has been well designed and made it may be possible to use it without modification on a voltage up to about 15 per cent. greater than the designed voltage provided certain conditions obtain. First, the insulation of the motor must be quite sound so that it can withstand the extra voltage without risk of breakdown. Operation on increased voltage is undesirable in the case of a very small motor having only a few commutator segments. Secondly, the rotating parts must be robust so that they can withstand the extra centrifugal stresses, which stresses are proportional to speed^2. Thirdly, the load torque must not exceed the rated value, otherwise the increased current taken by the motor may cause the windings to overheat and possibly burn out. If a motor is used on increased voltage with rated current and torque it may run at a higher speed which is practically proportional to the voltage, the horse-power being increased almost in the same ratio.

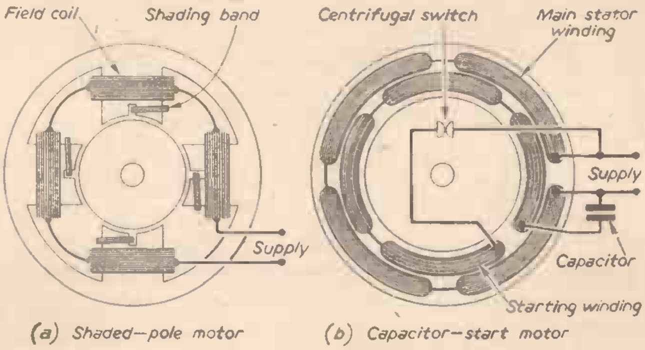


Fig. 2.—Connections of two types of four-pole single-phase motors.

However, in many cases, and particularly if the motor drives a centrifugal fan, the load will require an increased torque to drive it at the increased speed on the higher voltage. This automatically causes the motor to take an increased current, which is not permissable on account of overheating. Possible solutions are to sell or exchange the machine; to rewind the motor or feed it through a step-down transformer so that it runs at normal speed, or to connect a resistor in series with the motor as in Fig. 1.

Provided the insulation of the motor is adequate for the higher voltage the latter solution might be permissable if the load on the motor is constant, although the resistor may reduce the starting torque. In the case of a motor of rated voltage V volts and which takes a current of I amps. and is to be used on a higher voltage V_1 volts, a series resistor could be used with a volt drop of $V_1 - V$ volts. The resistor should be capable of carrying the current (I amps.) without overheating and its resistance R should be equal to $\frac{V_1 - V}{I}$ ohms, or slightly greater in the case of a motor which has a fairly low power factor. The motor would then run approximately at its

Watts rating of element	Normal current of a 200 volt element amps.	Normal current of a 220 volt element amps.	Normal current of a 230 volt element amps.	Normal current of a 240 volt element amps.
1,000	5	4.55	4.35	4.17
750	3.75	3.4	3.26	3.12
600	3	2.72	2.6	2.5
500	2.5	2.27	2.17	2.06
250	1.25	1.14	1.09	1.03

Table 2.—Current rating of various heating elements.

normal speed and develop its rated full-load torque with no more than its rated current. The value taken for I should, however, be the actual motor current, which may differ from its rated full-load current in some cases. Details of resistors will be given later.

There are, however, disadvantages in using a series resistor with a series motor if the load is not constant. The volt drop across the resistor is equal to I × R volts. Thus, if the load on the motor falls, the automatic reduction of the motor current I will reduce the volt drop across the series resistor, so that the voltage applied to the motor will increase, as will also its speed. Table 1 shows how the speed of a particular series motor varies on varying load even without a series resistor. A series resistor will increase the speed variation so it is most important that the motor should not become unloaded. If the variation of load is slight, a series resistor could be used to run the motor on a reasonably higher voltage, although it is better to rewind the motor or feed it through a transformer.

tically in proportion to voltage². If the motor is required to start against a heavy load, therefore, it may refuse to start, or may start much more slowly than on rated voltage. This must be avoided in the case of a split-phase or a capacitor-start motor as the starting winding and capacitor (if fitted) may be seriously damaged if the motor does not accelerate to its working speed in a few seconds.

It follows that if the starting conditions are difficult, or if the motor is required to develop its full-load torque and horse-power on the lower voltage, the motor should be replaced by one of the correct voltage, rewound to suit the voltage, or fed through a transformer of suitable ratio.

Induction Types of Motors on Increased Voltage

When an induction type of motor is run on increased voltage at rated frequency the magnetising current will be increased. If the motor is designed to operate with a rather high magnetic flux density the magnetising current might then be increased to such a degree that the machine tends to overheat even on no load. If the motor is rated for one voltage and is designed to operate with a fairly low flux density it may be practicable to use it on up to about 115 per cent. of its rated voltage at rated frequency without modification, however. In this case the starting torque will be increased in a higher ratio than the voltage, whilst the full-load torque and horse-power may be increased almost in proportion to the voltage. Many motors are marked with a certain voltage range, such as 220/250 volts, and it is generally inadvisable to use such machines directly on a voltage above the top limit.

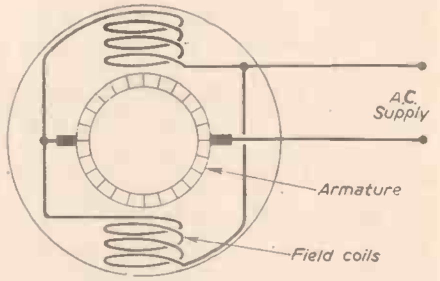


Fig. 3.—Re-connection of field coils in parallel in a series motor.

If the increase of voltage is not more than about 25 per cent. at rated frequency it may be practicable to feed the motor through a series resistor of R ohms, equal to $\frac{V_1 - V}{I}$, where V_1 is the supply voltage, V the rated voltage and I the full-load current (amps.). However, since the starting current is usually much greater than the full-load current, and the volt drop across the series resistor is proportional to the current, the use of a series resistor is liable to reduce the starting torque considerably, and also to reduce the peak motor torque. The series resistor method would generally be unsuitable for a split-phase or a capacitor-start motor which has to start against a fairly heavy load, due to the risk of overheating the starting winding before the centrifugal switch opens. In case of an appreciable increase of voltage it is best to rewind the stator or to feed the motor through a suitable transformer.

Rated horse power	Approx. watts input	Approx. current of a 110 volt motor. (amps.)	Approx. current of a 200 volt motor. (amps.)	Approx. current of a 220 volt motor. (amps.)	Approx. current of a 230 volt motor. (amps.)	Approx. current of a 240 volt motor. (amps.)
1/30	63	0.82	0.45	0.41	0.39	0.37
1/20	75	0.97	0.53	0.49	0.47	0.45
1/16	90	1.17	0.65	0.59	0.56	0.54
1/12	111	1.45	0.8	0.73	0.7	0.67
1/10	124	1.62	0.89	0.81	0.78	0.74
1/8	151	1.96	1.08	0.98	0.94	0.9
1/6	194	2.05	1.13	1.03	0.98	0.95
¼	260	2.5	1.36	1.24	1.18	1.13
½	490	6.4	3.5	3.2	3.1	2.9
¾	662	8.7	4.8	4.3	4.2	4
1	925	12	6.6	6	5.8	5.5

Table 3.—Approximate full-load currents of various single-phase A.C. motors.

Induction Types of Motors on Reduced Voltage

For driving lathes, drilling machines, washing machines, etc., one of the induction types of motors may be used, which motors are also used on refrigerators and for certain fans. Induction motors include shaded-pole motors, split-phase motors, capacitor-start motors, capacitor motors and capacitor-start-and-run (two-value) capacitor motors. In the smaller sizes all these types have squirrel-cage rotors with neither insulated rotor windings nor brushes. Split-phase, capacitor-start, and capacitor-start-and-run (two-value) capacitor motors are usually fitted with a centrifugal switch to cut out the starting winding, or alter the capacitor connections to the auxiliary stator windings, after the motor has accelerated to about 75 per cent. of the working speed at starting. The connections of two types of induction motor are given in Fig. 2.

The characteristics of all these types of induction motors are generally similar in that the speed is not greatly affected by change of voltage if the frequency of the supply is unchanged. Such motors can safely be used without modification on a lower voltage than that for which they were designed, provided the load is not excessive. Normally the load torque should be reduced in proportion to the voltage, under which conditions the motor will take approximately the normal current and the horse-power will be reduced practically in proportion to the voltage. The starting torque and the peak torque which the motor can develop without stalling will, however, be reduced prac-

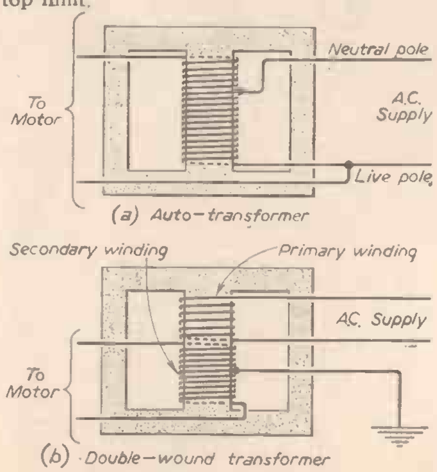


Fig. 4.—Types of transformers used to supply single-phase motor

Induction Motors on Changed Voltage and Frequency

It is sometimes desired to operate a motor of rated voltage V volts and rated frequency f cycles on a supply of different voltage V_1 and different frequency f_1. When used on a different frequency the speed of the motor will be changed approximately in proportion to the frequency. In order to avoid overheating due to excessive magnetising current it is important that the ratio $\frac{V_1}{f_1}$ should not exceed the ratio $\frac{V}{f}$. Thus a 220 volt, 60-cycle motor could be used on a 50-cycle supply up to 183 volts. On such a supply the speed would be reduced to 5/6 of the rated value, the full-load torque would be practically unchanged, and the full-load horse-power practically proportional to the voltage. The starting torque may be affected, depending on the design of the motor.

The motor could be fed from a lower voltage at 50 cycles, but the full-load torque and horse-power would be reduced. The motor could be fed through a transformer from a supply of more than 183 volts at 50 cycles, if required. It could be fed direct from a 50-cycle supply of less or more than 183 volts if each stator coil was rewound as decribed below, but the motor could not be run at its rated speed.

Series Resistors

If it is decided to use a series resistor to feed a motor at more than its rated voltage resistance wire from an electric fire element could be used. Table 2 gives the normal currents of various fire elements under operating conditions. If it is required that a resistor should have a volt drop of v volts when carrying a current of I amps. an element wire could be chosen which has a rated current of not less than I amps. (preferably not less than twice I). If an element is chosen which has a current rating of I_1 amps., of rated voltage V, the volt drop across the complete element when carrying I amps. would be equal to $\frac{V \times I}{I_1}$ volts. Thus if the volt drop required across the series resistor is v volts, a proportion equal to $\frac{v \times I_1}{V \times I}$ of the full length of the element wire may be used.

When used as a series resistor the element wire will heat up and it should be mounted in an element former which is designed to withstand such heat, and the resistor must be very well ventilated. Using thicker wire reduces the temperature at which the wire operates, but a given volt drop will require a longer length of wire. Whatever the size of resistance wire used the total heat generated will be the same, the total heat to be dissipated being equal to the product of the current I amps. and the volt drop v volts.

Rewinding a Motor for a Different Supply

When a series motor of rated voltage V is to be rewound to suit another voltage V_1 each armature and field coil should be rewound with a number of turns proportional to the voltage; i.e., for use on half voltage each coil should have half the original number of turns. The cross sectional area of the wire should be changed in the ratio $\frac{V}{V_1}$, which means that the diameter of the wire should be changed in the ratio $\frac{\sqrt{V}}{\sqrt{V_1}}$. For use on half voltage, however, each armature coil could be rewound with half the original number of turns, using wire having twice the original cross sectional area (141 per cent. of the original diameter), but the field coils could be reconnected instead of being rewound. Fig. 3 shows how the two field coils should be reconnected in parallel with each other instead of in series, making sure that the relative direction of the current in each field coil is unchanged. When rewinding an armature the coil span, connections and lead between the armature coils and commutator segments should be carefully copied. If a series motor is to be rewound for use on much less than its rated voltage it may be necessary to fit larger brushes, since the full-load motor current will be inversely proportional to the voltage.

It is not necessary to modify the rotor of an induction type of motor in any way when the stator is rewound for a lower or higher voltage, but each stator coil should be rewound with a number of turns proportional to the voltage, as in the case of rewinding a series motor. In the case of a motor which is used with a capacitor it is advisable that the size of capacitor (microfarads) be changed in proportion to $\frac{V^2}{V_1^2}$. Table 3 gives the approximate full-load currents of various single-phase A.C. motors.

If it is required to rewind an induction type of motor designed for a rated voltage V and frequency f for use on a supply of voltage V_1 and frequency f_1 each stator coil should be rewound with $\frac{V_1 \times f}{V \times f_1}$ of the original number of turns, using the thickest wire which can be accommodated in the stator slots with the required number of turns.

Transformers

If it is required to feed a motor of voltage V from a supply of voltage V_1 at the same frequency through a transformer, the latter will require to have a ratio of $\frac{V_1}{V}$ volts. If the full-load current of the motor is I amps. the rating of the transformer should not be less than V × I volt-amps., and the transformer should be capable of carrying the current for the required period without overheating. Thus, if the motor is required to run for more than half an hour at a time, a continuously-rated transformer should be used. However, if several motors are to be used at different times the volt-amp. rating of the transformer need not be equal to the sum of the volt-amp. ratings of all the motors.

If a motor, or motors, is to be used from a supply of lower voltage without modification it is cheaper to use an auto-transformer of suitable ratio, as shown in Fig. 4a, rather than a double-wound transformer. However, a double-wound transformer may also be used for supplying an A.C. motor from mains of more or less than the rated voltage. In this case it is an advantage to connect the mid point of the secondary windings to earth as shown in Fig. 4b. The maximum voltage applied between any part of the motor windings and its case is thus limited to half the rated voltage of the motor, thus reducing the stress on the insulation and reducing the possible shock risk.

Reading Machine for the Blind

A SCANNING device has recently been designed in America, which enables blind people to "read." It translates letters as musical tones. By means of a tape recording the blind learn the tone patterns, they are then taught to recognise words and phrases.

The unit is portable and the volume and light intensity can be controlled by means of knobs. The device is used by moving a small probe over printed material. There are two small lights and a lens in the probe, and these throw the image of the printed letter upon a row of photocells, which turn on an oscillator in the chassis to generate a pitch in accordance with the height of the black part of the letter. These pitches are changed into sound patterns by earphones.

The device housed in a wooden case, weighs approximately 9lb. and measures 7in. × 9in. × 8in. For the first time blind people can read normal print and this gives the device a great advantage over Braille. All printed material can be read provided it is in English type and a reading speed of 15 to 30 words per minute can be attained.

Heavier-than-Uranium Element Discovery

A SYNTHETIC form of matter that does not exist naturally on earth and which may only be found on exploding stars, or in supernovae, has been made and purified in America. It was made in a nuclear reactor with up-to-date alchemical processes. The element, which is 1,000 times hotter than radium, is colourless and paramagnetic. Scientists put ½oz. of plutonium into a materials testing reactor six years ago and fed it with neutrons until a reasonable quantity had turned into californium.

Californium may become the most useful heavier-than-uranium element after plutonium.

Irradiation Vulcanization

VULCANIZATION, which is the process used for curing raw rubber and changing it into tough useful products, may soon be done by means of atomic radiation, instead of using heat and chemicals. Though this process will prove more expensive than the existing one for the next ten years or so, it will do away with many compounding ingredients and eliminate the use of curing pits and ovens, etc.

Experimental Car

A NEW experimental car, called Firebird III features a "no hands" steering control. It also has a wing-shaped Unicontrol handle which is mounted on a 4in. control stick in the centre of the car and which can be used by either passenger. Electronic steering control is provided and a dual engine system employs separate engines for car accessories and for driving the rear wheels. As well as furnishing the accessory power, the engine can also drive a 110-volt generator which provides a 60-cycle electrical power, and which in emergency could run household appliances. The experimental car also has a single dial electronic temperature system that combines air conditioning and heating controls. The body is made of fibreglass.

AGAINST the LIGHT

By E. CLEMENTS

Many of the Most Effective Pictures Seen in Magazines and Exhibitions Rely to a Great Extent Upon Strong Lighting Compositions

THE subject matter may or may not be interesting of itself but it is quite true to say that lighting alone can make a picture. Texture is always emphasised if the light comes from the side and therefore conveys a better feeling of the nature of the material whatever this may be. When one takes this even further so that the sun or lamps are shining from behind or almost from behind the subject one obtains a good feeling of texture (given suitable exposure and development) plus strength obtained from the strong contrasts of deep shadow and bright highlight. A lens hood is absolutely essential for this type of treatment and even then care must be taken for even with a hood it is possible to get "flare" which can completely ruin a shot.

Without considerable reflection of light into the shadows this technique of back lighting can sometimes become unmanageable and accurate exposure coupled with minimum correct development is essential.

Exposure

Determining exposure is best carried out with an electric exposure meter by taking a reading of both the deepest shadow and brightest highlight and, providing the contrast is not too great, giving an exposure between the two readings. In order, however, to obtain the highest quality in one area under high contrast conditions, either the shadows or highlights must be sacrificed. This decision must, of course, depend upon which is the most important or has the greatest area in the picture. Generally speaking the small areas of highlight such as rim lights can be ignored in a composition where they are the only accents and the exposure should be based upon the general reading. On the other hand, if the picture is mostly highlight in tone any small areas of shadow can be omitted from the calculations.

Some years ago it was always advocated that an against the light exposure should receive four times what would be required for a normally lighted picture, but the advent of developers (Promicrol or Microphen) producing good shadow detail without blocking up the highlights has reduced this requirement so that an increase of perhaps twice is to-day nearer correct. People in close-up or semi-close-up require special care when back lighted for it is seldom that a black face is acceptable. Adequate exposure must, therefore, be given and the rest of the composition must "take its chance." Water, particularly, whether at rest or in a fountain, needs back lighting to provide some texture and sparkle.

The use of flash to help fill in shadows has only a limited usefulness in most general subjects for one cannot get a sufficiently even throw of light over an area.

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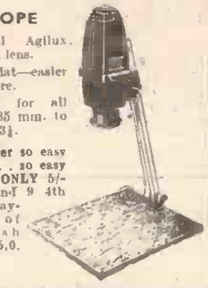

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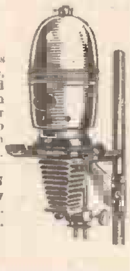

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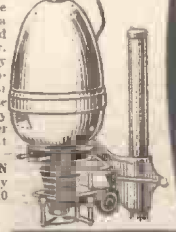

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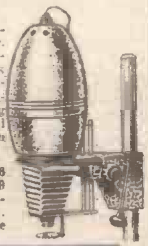

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BELL TRANSFORMERS. These guaranteed transformers work from any A.C. Mains, giving 3, 5, or 8 volts output at 1 amp., operate bulb, buzzer or bell. Will supply light in bedroom or larder, etc. PRICE 9/9, post 1/-. **Similar Transformer** but with output of 4, 8 or 12 volts, 13/6, post 1/6. BELLS for use with either the above or batteries, 6/6, post 6d.

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AN ELECTRIC GUITAR

Final Details of the Guitar and Amplifier Circuit

By J. E. Turner

TO complete the instrument two holes $\frac{3}{8}$in. dia. are drilled to take the volume and tone control potentiometers and a small four-pin socket fitted to the removable panel for the connecting plug from the amplifier (see Fig. 9).

The wiring inside the instrument is shown in Fig. 10.

The value of the volume control potentiometer will depend upon the pick-up and should be of a higher value by several times.

For the tone control a 1 MΩ potentiometer will be suitable.

Two suitable knobs fitted to the spindles complete the instrument.

The Amplifier

The circuit given in Fig. 11 is for the benefit of constructors wishing to build an amplifier of the simplest and cheapest type; no doubt many readers will have more advanced ideas. Certainly an amplifier of about 10 watts output utilising a push-pull circuit will give better results all round, but for average use the circuit given is quite satisfactory.

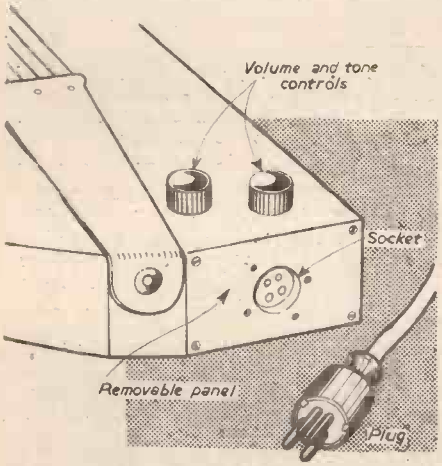


Fig. 9.—Removable panel and position of the control knobs.

An A.C./D.C. circuit is most convenient for cheapness, usefulness and weight.

A point that must be stressed particularly with A.C./D.C. apparatus of this nature is that the chassis of the amplifier is connected to one side of the mains and complete isolation of all leads from the amplifier to the instrument is essential by means of condensers, which have been included. As an added precaution, which applies to any electrical apparatus, always use away from earthed metal objects such as hot water radiators, metal window frames, etc. Stone floors are also to be avoided.

COMPONENT LIST

C1, 2, 3, 12—.1μF.
C 4, 9, 13—25 μF 25 v. wg.
C5—.5μF.
C6, 8, 15—8 μF 450 v. wg.
C7—.01μF.
C10, 11—.002μF.
C14—16μF 450v. wg.
R 1, 6—.5MΩ variable potentiometers.
R2, 10—4.7KΩ.
R3—220KΩ.
R4—33KΩ.
R5—1MΩ.
R7—3.3KΩ.
R8—56KΩ.
R9—10KΩ.
R11—.5MΩ.
R12—200Ω, 1 watt.
R13—100Ω, 1 watt.
R14—.3amp. mains dropper.
L1—Loudspeaker field or 10H. 60mA. choke.
T1—Input transformer (see text).
T2—Output transformer.
V1—6J7 or KTW61.
V2—L63 or 6J5.
V3—KT33C or 25L6.
V4—25Z6GT or 25Z4 or U31.

The component values given are subject to some variation to suit valves, etc., and some experimenting is worth while to obtain the best results.

The input transformer should be matched to the pick-up (see previous notes). It is more than likely that a high ratio transformer of 50 or 100 to 1 will be required with the low resistance primary connected to the pick-up.

The two potentiometers in the grid circuits of V1 and V2 are pre-set volume controls and were added after some experimenting and give much better control over the performance of the amplifier. The two pre-set controls (mounted on the amplifier) are adjusted to maximum required volume for any conditions, the volume range is then fully covered by means of the control on the guitar.

The tone control utilises negative feedback and can be varied in many ways to suit individual choice. The control leads from the amplifier should be well isolated with condensers C10 and C11.

The loudspeaker should be as large as possible to get the best results from the base side of the instrument. A mains energised loudspeaker can be used with advantage to reduce weight.

If varying mains voltages are likely to be encountered it is suggested that a three- or four-way switch be incorporated to select the correct tapping on the voltage dropper.

The various components should be mounted on an aluminium chassis. The

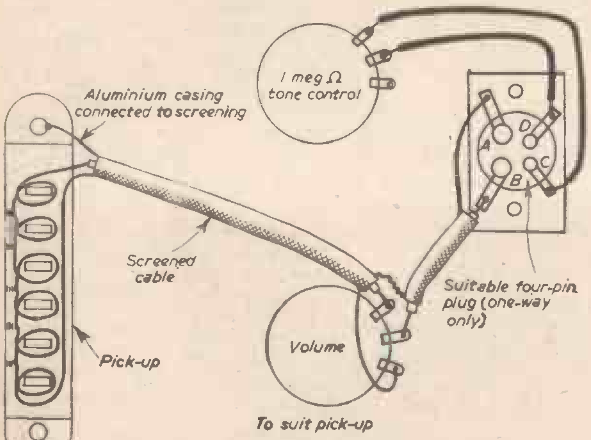


Fig. 10.—Connections inside the guitar.

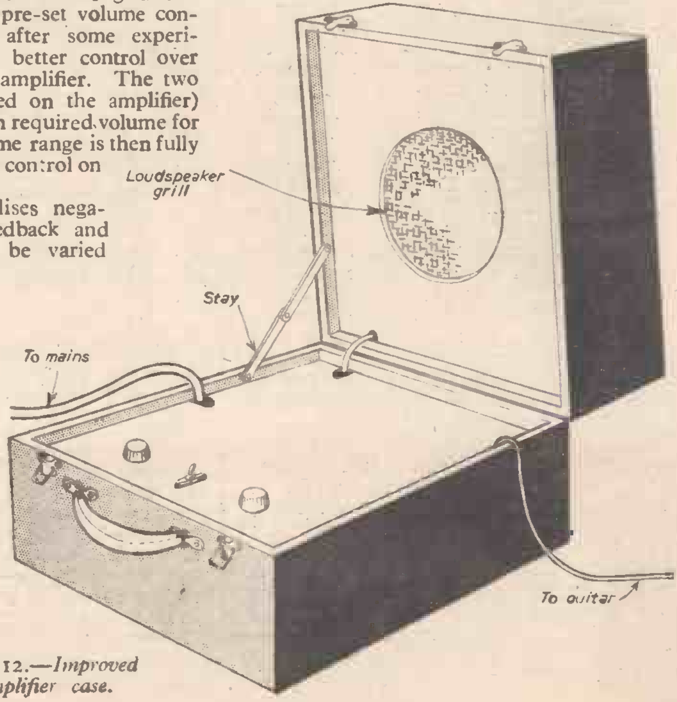


Fig. 12.—Improved amplifier case.

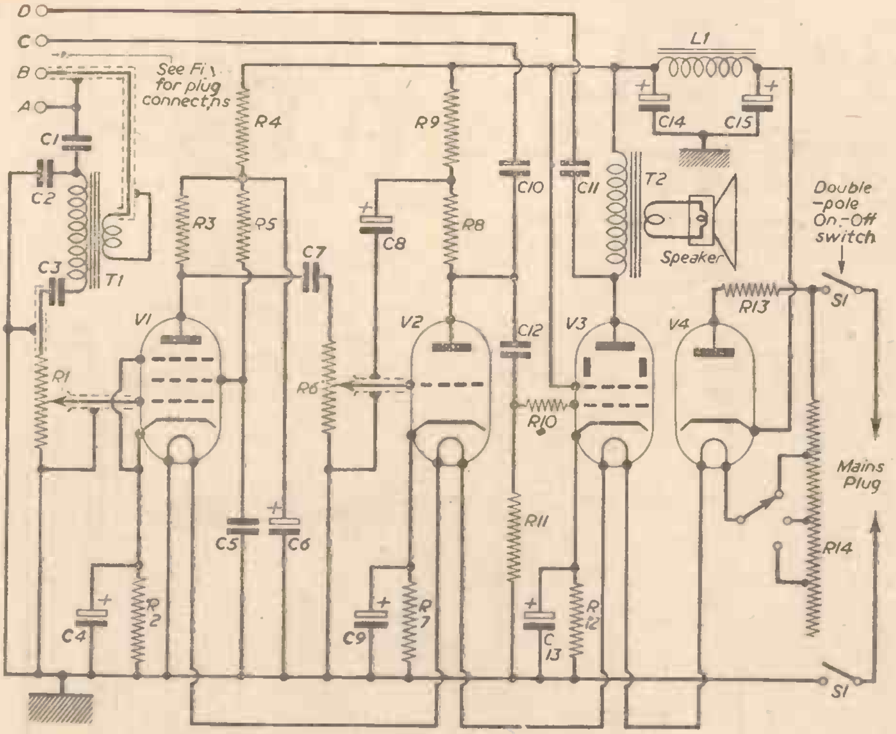


Fig. 11.—Circuit of the amplifier.

layout is not critical but the input side should be well away from the output and power supply. The voltage dropper should be isolated as it gets very hot in use.

The input cable from the guitar to the amplifier should be plastic-covered, single-cored, screened cable and can be twisted together with the two leads from the tone control which can be ordinary plastic-covered flex.

The Cabinet

The cabinet is 18in. high, 14in. wide and 7in. deep and is constructed from ½in. plywood with hardboard back. The back should have a series of holes drilled along the top and bottom for ventilation.

A plain circular hole to suit the speaker can be covered with decorative expanded aluminium sheet.

The two volume controls can be operated from outside the cabinet, fitted with two suitable knobs. The cabinet can be covered with leather cloth and should be fitted with four rubber feet and a carrying handle.

It is suggested that a better cabinet could be made in the form of a case with a deep lid, the amplifier being housed in the main body of the case and the loudspeaker in the lid, Fig. 12 illustrates this. In use the lid would be raised and held upright with a stay.

Both the amplifier and the shape of the guitar itself are, of course, capable of being modified to suit individual taste.

BOOKS Received

All the books below are published by Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

"Nuclear Reactors For Power Generation," Edited by E. Openshaw Taylor, B.Sc., D.I.C., M.I.E.E., F.R.S.E. 144 pages. 21s. net.

THIS book is recommended to all who require information on the latest developments in the expanding and vitally important field of nuclear power generation. Separate sections are devoted to: World Energy Requirements and Nuclear Energy Programmes; Nuclear Physics; Types of Reactor; Materials; The Physical Basis of Reactor Design; Safety and Instrumentation; Application and Economics. This is the fourth book to be based on a series of Advanced Lecture Courses delivered at the Heriot-Watt College, Edinburgh. There are over 50 illustrations.

"Disposal of Radioactive Waste," by K. Saddington, M.Sc., F.R.I.C., and W. L. Templeton, B.Sc., M.I.Biol. 102 pages. 17s. 6d. net.

SANITARY engineers, for whom the disposal of radioactive waste materials is a rapidly developing problem, will find this book of inestimable value. It is also addressed to the general reader interested in the future of atomic energy as well as to those actually engaged in the handling of radioactive materials. The whole problem of unwanted waste products from the atomic energy industry is surveyed. The book sets out to give to the reader some idea of the overall problem, to inform him on the basic data for establishing safe limits for discharge and describes those methods which have been sucessfully used to date to deal with this potentially highly dangerous waste material. Some considerations are given to future problem and the means, to cope with it. There are several useful appendices and a comprehensive index as well as many diagrams and photographic plates.

"Radiation Counters and Detectors," by C. C. H. Washtell. 115 pages. 21s. net.

THE author of this book has deliberately avoided cumbersome technical text and, instead, as written specifically for those possessing a general scientific education. It has been written expressly for the increasing number of workers faced, perhaps for the first time, with the use of counting devices in the variety of applications of radioactive techniques now finding their way into many fields of research and industry. This book contains 36 diagrams and 16 half-tone plates and a comprehensive index concludes the volume.

FULL-SIZE GUITAR—CORRECTION

We regret that in Fig. 1 of our article "A Full-size Guitar" in the September issue the distance of the sound hole from the top of the body was shown as 4in. This dimension should have been 5½in.

PUZZLE CORNER

1.—Codes

HERE is a code in which figures and letters take the place of letters. There are several clues; see if you can unravel it.

162374 575FI 87649170
XG7 X8727ZOP31 925P8X6ZG7
PK KPPO 6ZO 13554971

2.—Simple Multiplication ?

```
 BXOHY
    OB
------
 QFHPB
FFYYO
------
XOXFHB
------
```

Can you turn this multiplication sum of letters into one of figures ?

Answers

1.—When decoded, the sentence reads: "Samuel Pepys realised the tremendous importance of food and supplies."

2.—

```
 29371
    32
------
 58742
88113
------
939872
------
```

Letters to the Editor

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

New Theory of Gravitation

SIR,—With reference to Mr. J. R. Peverley's letter in the October issue, he is quite wrong in his criticism of Mr. Clayton's Theory. The mass of a body is determined by the number of minute particles it contains and the greater number of these there are then the more collisions there would be with particles from outer space. The mass of the body would therefore still be the vital factor. I do not agree with Mr. Clayton's theory, but I felt that the error in reasoning should be pointed out.

I would like to mention two facts in connection with this subject, Viscount Samuel in his book "Essay on Physics" states that neither he nor anyone he has asked can explain why a body continues moving when the force that was propelling it has been removed. I would think that he was joking were it not that I have never seen in any scientific book an adequate explanation. Yet the reason is quite simple. When a force is exerted on a body there are, apart from the mass, two reactions; that is, internal stress and external friction, both of which retard movement. When these have been overcome the body will move, and when the propelling force has been removed then the body will continue in motion until the sum of the retarding forces equals the propelling force at the moment of its cessation.

Briefly stated: When an impulsive force acts on a body then the body will move and will continue in motion until the sum of the retarding forces equals the original impulsive force.

The second fact is that I have frequently read that before the advent of the Relativity Theory scientists were unable to explain the equality of gravitational and inertial mass.

The reason is that when a force acts upon a mass then, since energy is indestructible and uncreatable, the force will lose energy, and this loss of energy is manifested by the "inertia" of the mass. In other words, the quality of "inertia" is not due to any resistance to movement but is due entirely to the transfer of energy from the force to the mass.

Now since gravity resembles a force proportional to the mass of a body and the transfer of energy is measured by the weight of the body then it follows that if a constant force equal to the body's weight is applied at right angles to the gravitational attraction then the body will be accelerated at 32ft./sec./sec.—J. F. (Durham).

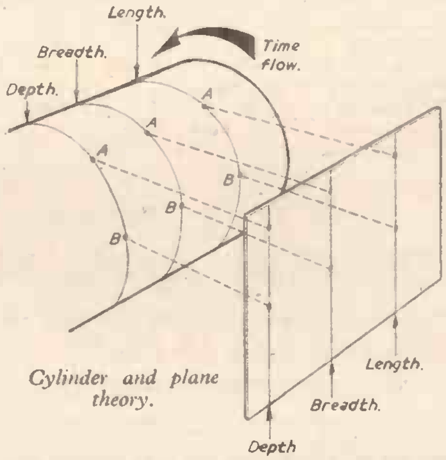
V-belting Suppliers

SIR,—We notice on page 58 of your October issue that our name is mentioned as suppliers of V-belting; we would like to point out, however, that we no longer operate from the Heckmondwike factory and our address is now Marfleet, Hull.—W. B. YEADON for J. H. Fenner and Co. Ltd.

FIELD THEORY OF THE UNIVERSE

SIR,—With regard to E. W. Beresford's letter (October issue), which I failed to understand, allow me to point out that there are four fundamental questions concerning the Universe.

1. If the Universe "began" at a certain time what was there before that time?
2. If space is bounded what lies beyond the boundary?
3. What causes gravitation?
4. What causes electro-magnetic phenomena?



Cylinder and plane theory.

These are four separate problems but as it often happens in such cases that one theory disposes of apparently unrelated problems by uniting them, so should the scientific aspirant attempt to do likewise. That is to say he should deduce certain basic properties of the universe such that each unexplained phenomenon would follow as a natural consequence and unless he is able to do this he might as well swap his theory at the start. (The late Professor Einstein in his Theory of Relativity disposed of the four problems I have mentioned, which is why his theory has ben accepted. However, I believe that his electro-magnetic theory is not widely accepted).

To give an elementary example of how movement would inevitably follow in a finite but unbounded universe consider this: imagine that in the true reality which we are unable to comprehend the dimensions of length breadth and depth are circles drawn on the curved side of a cylinder, and that from any point in space the ordinator of two separate bodies A and B are given their corresponding ordinates in the true reality, that is to say, on the circles on the cylinder. Now imagine the "flow" of time is manifested by the cylinder revolving and that the ordinates on the cylinder are projected so as to fall at right angles on to a plane. Now the spatial dimensions in the true reality are finite and unbounded and the ordinates of the two bodies A and B are stationary with regard to one another.

But we cannot with our senses in any way be made aware of this "curvature" of space nor can our intellects conceive of it. We are only aware of and can only comprehend the flat plane on which the ordinates of the curved reality are projected. Therefore, when the cylinder revolves, the ordinates traced out on the plane would give us the impression that the two bodies are attracted towards one another.

This is a very clumsy and imperfect analogy, but I think it is the simplest possible way to illustrate my meaning.—J. FORSTER (South Shields).

SIR,—As a Planeist I cannot accept the theory that we live on a globe, solid or hollow.

If three-fifths of the earth is water, and water finds it level—horizonal, the remaining two-fifths cannot form a globe. This is common sense. (*What about the tides?—Ed.*)

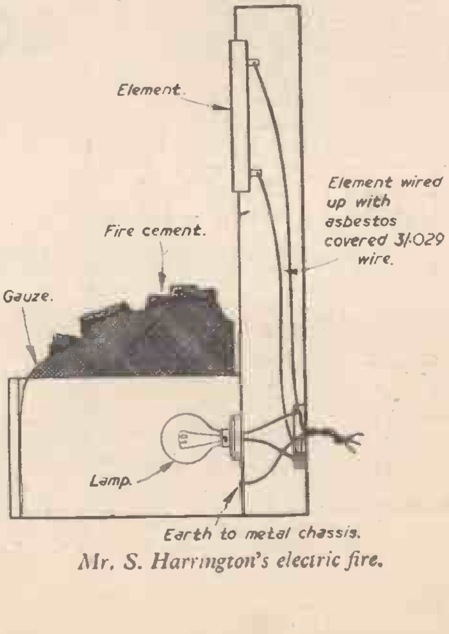
Another important argument is the fact that you can get a 45 deg. angle to the sun and more from April to September in our latitude. This would be impossible from any latitude if the earth were a globe.

If the earth has two motions, axial and orbital, and the sun has another, making it three, we should have *confused* shadows on a sundial, instead of the one steady shadow.

These facts are so simple and plain that a child can understand them, and those of your readers who consider the above and can fearlessly think for themselves without bias, will begin to see that the globe theory is a doubtful proposition.—W. MILLS (London, N.4).

Imitation Coal Fire

SIR,—Re W. A. Hurford's query in the October issue regarding the making of imitation coal. I recently made an electric fire using a different method of construction for the coal than you describe. I obtained a piece of brass gauze from my local ironmongers, which I crumpled up to form coals. I then built it up with Purimachos plastic fire cement, which I painted with black enamel, gradually merging into white for the ash effect. The remaining surface I painted with clear opal varnish to diffuse the light from the bulb underneath, which was a 60 watt red lamp fitted into an ordinary batten holder screwed to the back of the fire.—S. HARRINGTON (Cumberland).

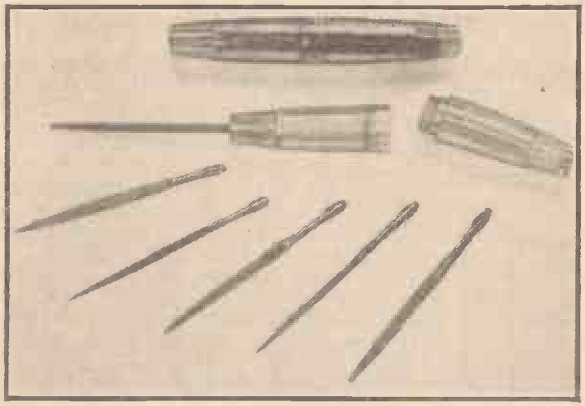


Mr. S. Harrington's electric fire.

A Review of New Tools, Equipment, etc.

"6 in One" Combination File Set

J. STEAD AND CO. LTD., of Manor Works, Sheffield, 2, are manufacturing a set of six assorted files which are contained in a translucent amber plastic handle. The handle screws in half, and the particular file required is selected and inserted in the brass socket at the end of the handle and is then ready for use. Obtainable from most ironmongers, garages, etc., the sets cost 10s. 9d. each. Files included in the set are: round; half-round, crossing; flat; square and three-square.



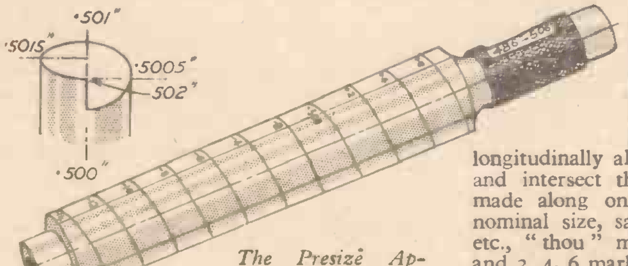
"6 in One" file set.

Infra-red Instant Heating Units

THE British Distributing Co., of 591, Green Lanes, London, N.8, are now marketing infra-red instant heating units. These units are lamps which provide heat in addition to light. The makers claim that they are much more effective than electric fires as well as supplying abundant light, no other illumination being required. Used as a lamp it is ideal for bathroom, dressing and changing rooms, etc. A 250-watt model, which is as effective as a 750-watt fire, costs 49s. 9d., and the 375-watt model costs 61s. 6d., being as effective as a 1,000-watt fire.

Infra-red heating lamp with swivel base for fixing to walls and ceilings.

"PRESIZE" APPROACH PLUG GAUGES



The Presize Approach plug gauge.

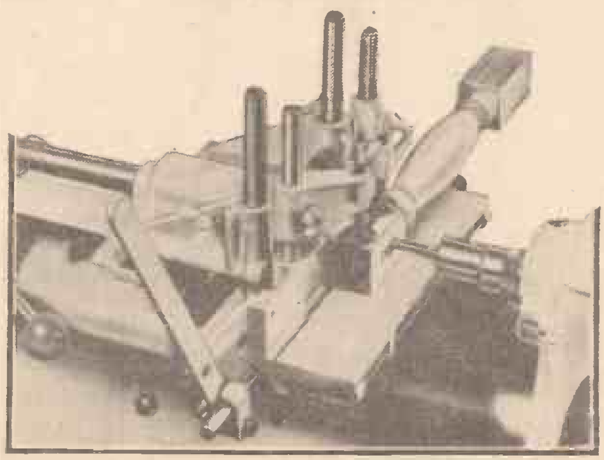
THIS gauge has been developed in order to assist an operator in obtaining hole dimensions accurately and quickly and to give an indication of the amount to be removed well in advance of the completion of the operation.

As will be seen from the illustration these gauges have a screw cut helix running around a plug of 0.020in. taper over a length of roughly 2in. Four lines placed at 90° intervals run longitudinally along the length of the gauge and intersect this helix. Engravings are made along one of these giving the true nominal size, say, 0.500in. with 2, 4, 6, 8, etc., "thou" markings on the minus side and 2, 4, 6 markings on the plus dimension.

Set "A" at present available which comprises six plugs measuring from 3/16in. to ½in. inclusive in 1/16in. steps, costs approximately £15 10s., from Optical-Mechanical (Instruments) Ltd., of 17, Station Rd., Egham, Surrey. Set "B" which is not yet available measures from 9/16in. to 1in. and comprises eight plugs.

MORTISING ATTACHMENT

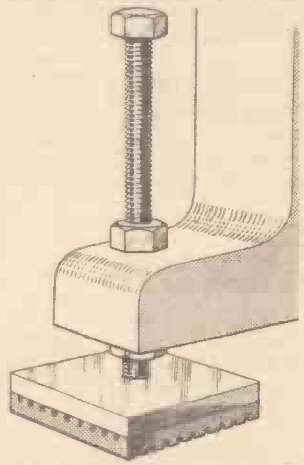
A NEW 25/001 mortising attachment for use with the ML8 Multi-Purpose Woodworker has been introduced by Myford Engineering Co. Ltd., of Beeston, Nottingham. This quick and easy to mount attachment now enables routing, chisel mortising and horizontal drilling and other square cavity joints to be carried out with accuracy and ease. No preliminary roughing-out with a slot mortise miller bit is necessary as square mortice slots can be pierced directly. This attachment helps to eliminate tedious handwork and also speeds up the job in hand. It costs £15 17s. 6d.



The Myford mortising attachment.

Vulcascot Level Mounts

VULCASCOT (Great Britain) Ltd., of 87/89, Abbey Road, London, N.W.8, have developed a new type of machine mounting,



The level mount incorporating a ribbed Vulcascot Anti-Vibration Pad which grips the floor powerfully.

which will enable engineers to adjust finely the level of precision machines and machines generally without the use of bolts. Called the Vulcascot Level Mount it incorporates the Vulcascot Anti-Vibration Pad which is moulded in a special synthetic oil-resistant rubber compound and which is securely bonded to the base of the mounts ensuring the absorption of noise, vibration and shock. Prices range from 14s. 6d. each to 55s., according to the size required.

Photographic Year Book

WE have received a copy of The Johnson Photographic Year Book for 1959, which consists of two sections. One section is a diary and exposures record and the other contains technical data and exposure calculators. Amongst much interesting and useful photographic data, there are also two calculators for negative materials and reversal materials. The year book contains eight photographic plates and costs 6s. 6d. from Johnsons of Hendon, Ltd., Hendon Way, Hendon, London, N.W.4.

READERS' SALES AND WANTS

The pre-paid charge for small advertisements is 6d. per word, with box number 1/6 extra (minimum order 6/-). Advertisements, together with remittance, should be sent to the Advertisement Director, PRACTICAL MECHANICS, Tower House, Southampton Street, London, W.C.2, for insertion in the next available issue.

FOR SALE

HOUSE SERVICE METERS, credit and prepayment; available from stock. Universal Electrical, 221, City Road, London, E.C.1.

COMPRESSORS FOR SALE.—Twin Piston with tank, 2½ c.f.p.m., £4. Single Cyl., £2. All types Motors. S.A.E. for list. Wheelhouse, 13, Bell Road, Hounslow. (HOU 3501.)

HALF PRICE ELECTRIC DRILL KITS. Lambswool Bonnet, Rubber Backing Pad, 12 Sanding Discs, Grinding Wheel, Buffing Wheel, Wire Brush Wheel and Wheel Arbor, 18/- (usually 36/-).
BARKERS, 70, West Street, Leeds, 1.

"ASTRO TELESCOPE MAKING." Standard Ramsden Push-in Eyepieces, ¼in., ⅓in., ⅔in. focus, 35/-; s.a.e. list. Object Glasses from 10/6; Eyepieces from 15/6; Newtonian Mirrors, Focusing Mounts, Tripods, also complete Terrestrial Telescopes and Microscopes. W. Burnet, Grand Sluice, Boston, Lincs.

2½IN. REFRACTOR ALTG. STAND, £20; also Mirrors, Object Glasses and Accessories. G. Mackett & Co., Mfg. Opticians and Engineers, 51, Millers Road, Brighton.

ELASTIC, catapult, models, etc., 3/16in. round, 9d. yard, post 3d. C. Blundell, 472, Alcester Road South, Birmingham, 14.

MAINS FROM 12v. CAR BATTERY. American Dynamotor Unit, runs 200/250 AC/DC radios, televisions, tape recorders, etc., from 12v. car battery, continuous duty, perfect, cost £25, 80/-; s.a.e. full details. Scientific Products, Cleveleys, Lancs.

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CROMPTON PARKINSON.—24 v. ⅓ h.p. D.C. Motors. Suitable factory trucks, invalid carriage, etc. £6 ea.
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(Continued on next page)

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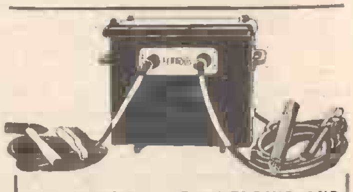

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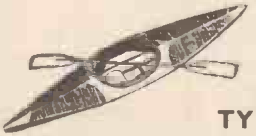
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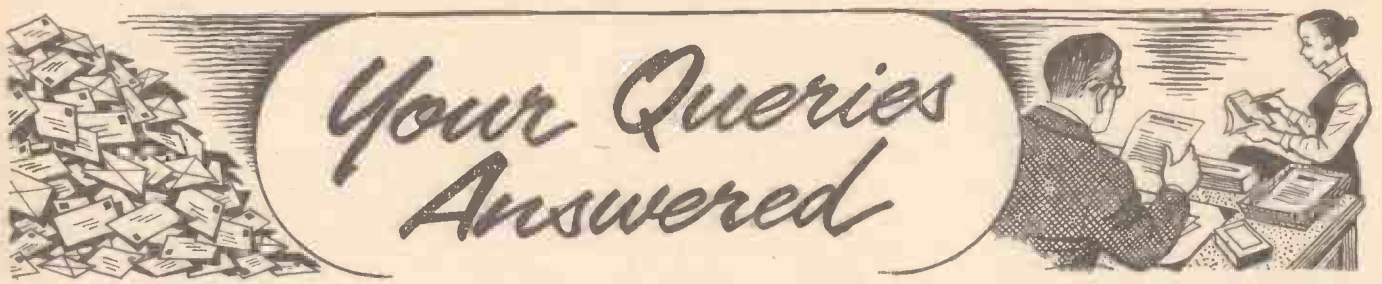


Extracting Hydrogen Gas From Water

I AM interested in the extraction of hydrogen gas from water and I have been experimenting on a small scale with salt water and using an accumulator for electrolysing it. What voltage and amperage do I need to extract the hydrogen and oxygen of, say, one gallon of water and how long would it take? Am I right in thinking it would not be practical to use a battery charger off the mains except at a prohibitive cost of units of electricity used?—H. Garland (Yorkshire).

TWO to four volts should be adequate for your purpose. Calculations show that 1 amp. would have to be passed for about 85,000 hours, or 10 amps. for 8,500 hours, to complete the electrolysis of one gallon water.

A battery charger comprising a transformer and metal rectifier can be used for economical charging of batteries from A.C. mains, but there is a considerable waste of power in charging a low-voltage battery from D.C. mains.

Measurement of Force

I WISH to make accurate observations of forces exerted at several points of a model placed in a small wind tunnel, and shall be glad to have your advice regarding a suitable instrument. The forces will range from a fraction of an ounce to approximately 2lb. and accuracy is essential.

I thought of using metallic bellows, each connected to a manometer, leading the tubes though the walls of the tunnel to the manometers outside where they can be seen more easily. This method might work but the small bellows, even rectangular ones, might be difficult to make and possibly expensive to buy. Can you suggest a better solution?—R. J. Harrington Hudson (Devon).

BY far the most accurate and reliable means of measuring a force is by balancing it with a weight. We therefore recommend that a fine thread be run from the point of application of the force through a small hole in the wall of the tunnel and over a pulley to support a scale pan. To give stability the pan may carry a vertical wire lying within a fixed tube with a film of thick oil separating them. This will damp vibrations without imposing any restraint on slow vertical movement. In running a test, repeated trial would show what is the smallest weight that will hold the loaded point in the required position.

If this scheme is impracticable, the scale pan may be replaced by a carefully calibrated spring balance of appropriate stiffness.

Making Bait

I WISH to attempt covering natural minnows, prawns, etc., with a plastic skin to make them into a semi-permanent bait. Can you tell me if there might be a plastic material suitable for this?

QUERY SERVICE
RULES

A stamped, addressed envelope, a sixpenny crossed postal order, and the query coupon from the current issue which appears on the inside of back cover, must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

I would also like to make artificial plastic spinning baits from Perspex and Perspex rod and would like to know if there is any way of making this material pliant, so that it can be shaped to a certain degree. What should I use for a fixative for sticking this material to itself?—P. M. O'Brady-Jones (Northumberland).

THE only practicable means of investing a natural minnow with a plastic skin appears to be by dipping, so that you would probably do best to use an ordinary transparent cellulose lacquer, applying four or five coats. Celluloid clippings dissolved in amyl acetate would yield a suitable lacquer, the viscosity of which should be about the same as that of nail varnish.

Perspex can be rendered pliant by dipping in very hot water, and is then easily bent to shape though it cannot be formed under pressure. Alternatively, for shaping small details a jet of hot air can be played upon the area being worked. The edges of the parts to be joined can be painted with chloroform, and then pressed together, or a cement can be made by dissolving Perspex chips in chloroform.

Colouring Water

WHAT is the composition of the liquid which used to be seen in the large bottles in chemist shops which were, I believe, the sign of the old Apothecary. I have made several table lamps out of bottles and wish to fill them with a clear coloured liquid such as this which will not cloud. Water has been tried but after a time it becomes cloudy when mixed with coloured ink.—S. W. M. Hooton (Gloucester).

IT is possible to obtain decorative effects using the normal textile dyes which are freely obtainable in most hardware stores. We would, however, suggest that the dye is dissolved in a small amount of boiling water and then filtered through fine linen. Distilled water such as used for filling car batteries is free of chemicals and, therefore, if a small amount of the prepared solution of dye is added to the distilled water, you should get a stable solution. Having filled the bottle to within 1in. of the top, we suggest that a little hot candle fat is poured on to seal the fluid from the oxidising effect of the air, and further prevent evaporation.

We urge care in the design of the top electrical fitting to ensure that the fluid cannot cause a short circuit.

Phase Difference for Fluorescent Lights

I WISH to install fluorescent lighting in my house but object to the stroboscopic effect. This, I am told, is eliminated by twin tubes wired on separate phases. But in a house wired with single phase only is it possible by electronic or mechanical means to run one tube out of phase?—John H. Jillings (Nottingham).

A PHASE difference could be provided by means of choke coils and condensers connected in series with the lamps. However, such additional apparatus would reduce the voltage at the lamps and present difficulties in initiating the discharge.

A possible solution to your problem would be to use a 3-phase squirrel-cage induction motor with two terminals connected to the single-phase supply, the fluorescent lamps being connected between different stator terminals. The motor should be of the same voltage as your supply if a transformer is not to be used. With this method special arrangements would have to be made to start the motor either by hand or by means of a phase-splitting device.

If you wish to supply a large number of lamps at once a possible solution to your problem would be to use a static phase converter, as supplied by the Westinghouse Brake & Signal Co. Ltd., of 82, York Way, London, W.1.

Cleaning Tombstones

PLEASE give me the name of any chemicals that I can use to clean marble and granite tombstones.—L. Martin (Exeter).

IT is usually inadvisable to use any chemicals whatever for the surface cleaning of stoneware or brickwork, the reason being that the chemical salts are absorbed by the stonework and subsequently bring about its deterioration. It is our usual practice not to advise anything other than the use of hot water and steam. An applied steam jet is very satisfactory for the purpose. So, too, is boiling hot water applied to the stone surface with a stiff bristle brush or even a wire brush. Chemicals such as soda and other potent agents are closely absorbed by the stonework and bring about its slow deterioration and crumbling.

Button Polish

PLEASE provide a recipe for making pure Button Polish, as used for woodwork.—A. Lambert (Romford).

A GOOD button polish is usually made by dissolving one part of shellac in about three parts of warm methylated spirit, the solution subsequently being run through a coarse mesh in order to remove from it suspended impurities.

Chemical Resistant Paint

I WISH to paint a ladies' hairdressing salon in any of the three shades, lemon, primrose or sunshine.

Last year I used a well known and expensive brand of high-gloss paint, but after washing down a few months later the surface turned black. Was this due to the sulphur and ammonia fumes given off during the hairdressing process attacking the lead contents of the paint?

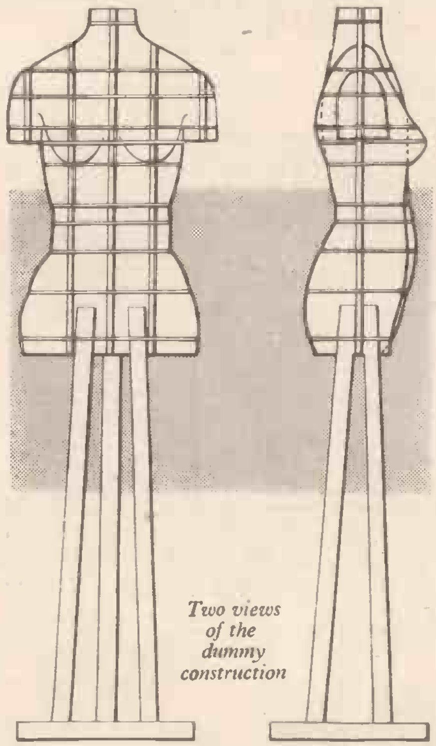
Could you please advise me what type of gloss paint will avoid this discoloration or whether to use a water paint with varnish on top.—A. Blackburn (Yorks).

UNDOUBTEDLY, the traces of sulphur and ammonia of which you speak, have caused the blackening of the paint. The paint was possibly one of the popular lead paints, containing, probably, white lead carbonate as a base in addition to a strong yellow pigment such as lead chromate. Under the influence of ammonia and particularly in the presence of traces of sulphur compounds, the paint pigment and base has slowly become converted into lead sulphide, which is black in colour. Here, therefore, is the explanation not only of your own individual trouble, but, also of all the cases of the well-known blackening and browning of paints containing any lead compounds. A protective varnish over fresh paint may, or may not prevent a recurrence of the trouble. It all depends on the nature and thickness of the varnish layer. In our opinion, the chances are, on an average, against the success of the varnish treatment. The radical cure for the trouble is to use a paint based on cadmium yellow or cadmium orange as a pigment. These pigments are composed of cadmium sulphide itself, so that exposure to ammonia or sulphur fumes cannot possibly change the composition of the pigment. The various cadmium pigments are full yellows, and range through various shades of orange even to a light crimson. You will be able to obtain guaranteed cadmium yellow or orange paints from a firm of reputable manufacturers such as Messrs. Lewis Berger and Co., Ltd., Berger House, Berkely Sq., W.1. If not, apply for the addresses of specific cadmium paint manufacturers to, The Secretary, The National Paint Federation, Paint Industry House, 79-80, High Holborn, London, W.C.1.

A Dressmaker's Judy

I WISH to make a tailor's dummy for my wife to help her with dressmaking. Can you help?—J. P. Selby (Bucks).

THE construction of a mould of the human body for dressmaking purposes would involve taking plaster casts, in sections, of the trunk, from the top of the legs up to the shoulders and we think that it will suit



Two views of the dummy construction

your purpose if you make templates and cut them out of plywood. The foundation template will be a flat plane representing the outline of the body as seen from the front. See sketch. This can be supported on three legs which are carried by a baseboard. To get the form of the figure, other templates, about 10 of them are fixed to the front and to the back. Obviously, the more pieces put in, the better the cloth of the dress will be supported. Support can be added by putting 10 or 12 bands (made of ½in. wide strip metal) around the figure, each of these following the contours perfectly. The whole thing is then covered with newspaper, applied in small pieces, each moistened to soften, and then glued. About five thicknesses should be put on. Finally give the paper a couple of coats of flat white paint and Shellac varnish the wood.

Trufits, of 52, Station Road, New Southgate, N.11, market a kit for making a dressmaker's dummy. First, a tubular piece of mutton cloth is pulled over the normal foundation garment and on to this is stuck gummed strips of brown paper according to the instructions provided with the kit. On removal of the cast, by slitting down the centre of the back, a second covering of gummed paper is applied. A paste is then made from powders included in the kit and applied to the inside of the cast and allowed to harden. To complete the dummy, the kit includes a length of tubular grey jersey cloth, which is pulled over the dummy, and ribbon, also included, pinned into position to mark the centre line and waist. The price is £1 9s.

Gold Paint

PLEASE tell me where I can obtain or how I can make gold paint suitable for use on glass or china.—R. Minor (Walsall).

AN effective gold paint may be made by stirring a gold pigment thoroughly into a varnish-like medium such as a solution of shellac in methylated spirit or a solution of cellulose in an organic solvent. We suggest that you obtain a quantity of pale gold bronze powder from Messrs. Johnson & Bloy Ltd., Metana House, Hind Court, Fleet Street, London, E.C.4. This material will prove an excellent pigment for glass or china decoration, it being mixed with a shellac or a cellulose varnish.

Rejuvenating Silica Gel

I HAVE been given a small quantity of "Silica Gel." How can I tell if it is still active? If not can I rejuvenate it again?—H. Dickason (Haggerston, E.8).

THERE is no simple, rule-of-thumb means for ascertaining the degree to which a quantity of silica gel has absorbed water. The best way is to weigh the gel when it is fresh and after it has absorbed moisture. The increase in weight will represent the amount of water absorbed.

If your silica gel is some years old, it will very probably be well saturated with water vapour, and, in this condition, it will not absorb more. But the water may be driven off from the gel and the latter "rejuvenated" merely by placing it in a very hot oven for a day or two, or, in an urgent case, by heating the material to 400°C. for several hours.

Copper-etching Steel

PLEASE tell me the method for etching on hardened steel, using copper sulphate and salt.—H. L. V. (Norwich).

THERE are many methods of copper-etching steel. The requisite method usually depends on the type and purpose of the etching desired and the particular nature and composition of the steel. For all-round purposes, however, the following etch is very effective. It is, perhaps, slow, but it has the advantage of being well controllable:—

Dissolve 1oz. copper sulphate, 4oz. alum and ¼oz. common salt in ¼ pint of strong vinegar. To the solution add about 20 minims (drops) of strong nitric acid. The nitric acid is not essential, but the speed of etching will be very slow indeed if the acid is omitted.

Etching in this fluid is completed at any time after about 50 minutes, depending on the exact depth of the etch required.

Information Sought

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

Circuit for Soldering Machine

CAN you supply me with a circuit and details for an electric soldering machine for small jewellery and metal spectacle repairs?—R. COLEMAN (Yorks).

Time Signal

WE require a clock, preferably battery operated, which will ring a siren or bell at various pre-set periods throughout the day. Can you help?—C. J. WRIGHT (Secretary, Bermuda Technical Institute).

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Input 200/250 volts A.C., 50 cycles. Output 10 amps., 22 volts D.C. Controlled by two 4-position switches for fine and coarse control which enables 6 to 24 volts batteries to be charged. Made by G.E.C. Brand new with 0/12 ammeter. Fused A.C. and D.C. £17.10s.0, carriage, 15/-.

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BULKHEAD FITTING. 9in. diam., flat tripod type, suitable for lamps up to 100 watts, complete with pushbar switch lampholder. Ideal for farm buildings, garages, greenhouses, etc. Brand new. 17/6, post 2/6.

TELEPHONE HANDSET with Sound powered earpiece and Carbon Mike. Press to talk. Brand New. Complete with cord. 12/6, post 2/6.

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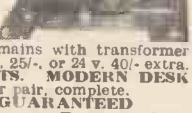

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15 ,,	2in.	MC/FR	10/6
25 ,,	2½in.	MI/FR D.C.	7/6
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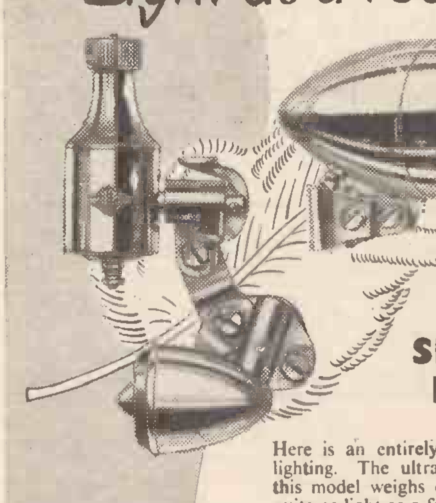

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THE Cyclist
Editor : F. J. CAMM
VOL. XXVII DECEMBER, 1958 No. 437

All letters should be addressed to the Editor, "THE CYCLIST," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

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WHAT I THINK By F. J. C.

Raleigh Enter the Moped Market

THE Raleigh Company announce that they are entering the moped market with the Raleigh Moped. It is of all-British design, whereas most of the mopeds on the market are of continental origin. Some of these are handled only by agents in this country and the spares position as well as service instructions have given rise to complaints. The public is now to have a machine launched by the largest manufacturer of bicycles in this country and there will thus be no difficulty regarding spares nor of service. There are thousands of Raleigh agencies throughout the country.

This move may be the forerunner of many similar changes in policy on the part of bicycle manufacturers. Hitherto, they have presumed that this market is a post-war flash in the pan, and they were no doubt invited to hold this view by the opposition of the CTC and others. The entry of British manufacturers into this ever-expanding field must adversely affect the sale of imported or British-sponsored mopeds of foreign origin. It is surprising that British manufacturers who have been concerned for some time with the decline in the sale of bicycles should have neglected this obvious market.

Training Child Cyclists

THE Minister of Transport has invited over 1,000 local authorities in England and Wales and also youth organisations to give their help in establishing a national scheme for the training and testing of child cyclists, as recommended by the departmental committee on road safety. The Minister's agent for the scheme is the Royal Society for the Prevention of Accidents, who have attached to them a national organiser, who in turn will be assisted by regional organisers. These organisers will help local authorities and other bodies by providing information and arranging training classes for instructors and examiners, and endeavour to ensure a uniform standard of testing throughout the country.

I hope that these organisers will be quite independent of any of the national organisations. It is hoped that the scheme will not be used as a means for distributing commercial literature, nor as a means of expanding membership of any of the organisations.

Will the Minister, in furtherance of this scheme, insist upon all bicycles being submitted to a test of roadworthiness, as will be the case with cars and motor cycles?

Amalgamation

THE BLRC and the NCU have agreed upon the inevitable amalgamation. Thus ends a 16-years battle for recognition on the part of the BLRC. It is significant that the fiercest opponents of the BLRC are now loudest in their acclaim of the new accord; this is in keeping with the antics and gyrations of the boneless wonders of the cycling world, who continually vary their tactics according to the direction of the wind. The threatened legislation controlling road racing would never have been contemplated but for the bitter and sometimes underhand opposition of these scribes and Pharisees, whose views, in any case, were never altruistic.

BLRC chairman, E. L. S. Lawton, stated that the two bodies would cease to exist as from a given date, and a British Cycling Federation would assume the duties of the two bodies. It was also decided, and wisely, that the new organisation should become a limited liability company. It will probably come into force in February, 1959. An interim measure is that the BCF should take over as a caretaker organisation. Ratification at the annual general meetings of the two bodies is awaited. I hope that in the amalgamation great care will be exercised in the selection of personnel. The past history of each candidate should be examined with great care if further internal dissension is to be avoided. The firebrands should be purged, and a golden opportunity now presents itself for doing this. Otherwise there will merely be a repetition of present strife and a split in the ranks. Old traditions must be thrown overboard, and this can only be done by an entirely new personnel whose minds are untrammelled by past hates and past preferences. I hope that those scribes associated with the press who have done their best to throw a spanner in the works and have, indeed, caused and fomented much of the trouble in the cycling movement will heed my remarks.

I naturally am gratified at the turn of events, for in the early days of the League I was the only journalistic supporter, and I threw myself into the battle against biased journalists and irresponsible officials of the national bodies and fought the cause of the League by representing them at meetings with the Minister of Transport. I like to feel that I played a useful part in causing the Ministry of Transport to adopt a different view. No one had hitherto placed before it the facts. I prepared on behalf of the League the famous memorandum putting the League's case and was one of the delegates who presented it to the Minister. The main opponents were the CTC and the NCU. I am glad to see that they are more chastened nowadays. I have often pointed out that the CTC is not a competent body to interest itself in road racing.

Coverack, Cornwall. Looking down on the little harbour.

Road Racing Regulations

IF the proposed regulations for road racing become law, it may mean the end of mass start racing, for massed start is racing, and time trials are racing. There is a ludicrous attempt on the part of some to call massed start "in line" racing. It is a term which will never be generally adopted. The League has now formed a fighting fund to combat any regulation which will affect massed start. Various organisations have, however, been asked to express their opinions on the draft regulations, and no doubt the League will be able to have its say by that means. I have no doubt that the League enemies in the various organisations will still be able to inject their venom and any views expressed by them should be accepted by the Minister with the greatest reserve. They should be read in conjunction with their earlier comments, which are undoubtedly on file at the Ministry. The decline in the fortunes of the NCU has undoubtedly been a result of their opposition to mass start racing. It is hardly likely that they will now support what they have hitherto so bitterly opposed.

A Cyclist's Tool Roll

Fig. 4.—The roll with tools in position.

You Can Make This Yourself in an Evening

CANVAS is the material used for making this tool roll. If no odd scraps of canvas are available in the home (from an old shopping bag, holdall, etc.), a small piece can be purchased from an art needlework supplies shop. Start by cutting the main shape of the roll 12in. long by 7in. wide and then two flaps $7\frac{1}{4}$in. × $2\frac{1}{4}$in.

Fig. 1.—Two views of the completed tool roll.

These flaps are next trimmed as shown in Fig. 2, the edge which is to be folded inside the roll being $\frac{1}{2}$in. less in length than the outside edge.

To stop the edges of the canvas from fraying they are bound with leatherette material which is available from a local walk-around store. Cut the leatherette into long

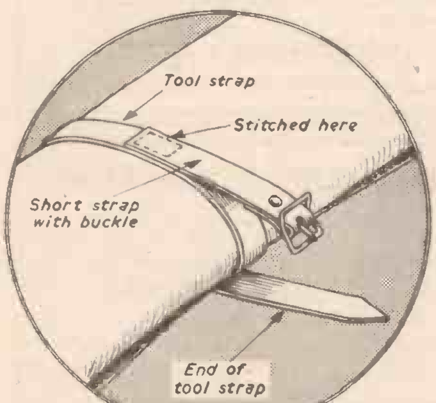

Fig. 3.—The fastening arrangement.

strips $\frac{5}{8}$in. wide and fold each down the centre of the whole of the length. Use the sewing machine to stitch it in place or persuade one of the lady members of the family to do it for you. Stitch a piece along one end of the tool roof first—this is the edge that is folded in to form the pocket for the puncture outfit. Next bind the inside and end edges of the flaps, and finally fold over the puncture outfit flap, pin the other two flaps in position and bind right round the three sides of the complete tool roll as shown in Figs. 1 and 2.

Cutting the Leather

The leather centrepiece is cut from an old saddlebag, handbag or something similar, or can be obtained as a scrap from the local leathercraft shop. From the latter source it should be possible to obtain a strip of soft flexible leather, $\frac{1}{2}$in. wide and 18in. long.

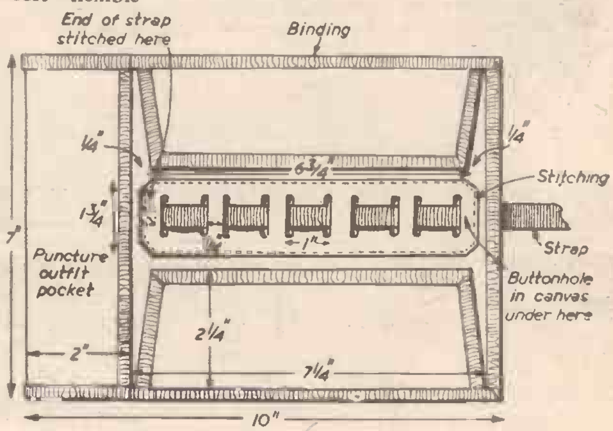

Fig. 2 (Right).—Details of the tool roll.

The centrepiece is marked out with pencil on the back to the dimensions shown in Fig. 2, $6\frac{3}{4}$in. × $1\frac{3}{4}$in. and a series of $\frac{3}{8}$in. long slots cut where shown. Each pair of slots is shown spaced regularly at 1in. apart, but this distance can be varied to suit the tools it is proposed to keep in the roll. For instance, a pair of pliers may require a slightly wider slot. Normally this is not necessary as the flexibility of the strap will accommodate most tools. Use an awl with a fine point to make holes for the stitches all around the edge; these can be about 1/16in. apart. Taper the thickness of one end of the strap and sew it to the leather centrepiece as shown and then using the holes made with the awl, and good stout thread, sew the leather centrepiece into position in the centre of the tool roll. Before finally sewing down the end of the centrepiece, cut the canvas under the last slot and bind the edges of the canvas with thread in the same way as a buttonhole is formed. This is for the leather strap to pass through.

The Fastening Arrangement

Thread the strap under the slots and put the tools in position, with the puncture outfit in the appropriate pocket. Roll up and wrap the strap round.

Obtain a $\frac{1}{2}$in. strap with a buckle attached and shorten it to some 3in. in length. This strap is sewn to the tool strap as shown in Fig. 3 so that the tool strap may be passed through the buckle and secured in the usual way. The rolled tool roll is shown in Fig. 1 and with tools in position in Fig. 4.

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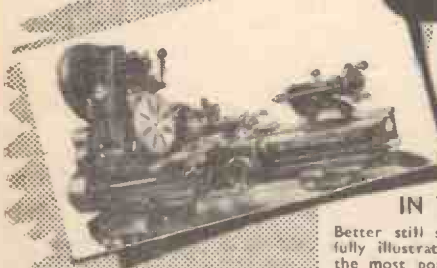

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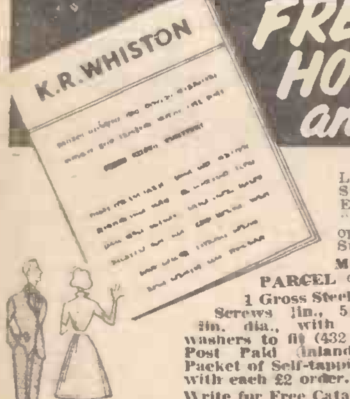

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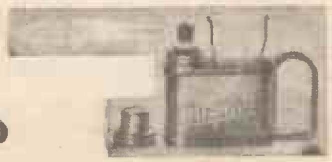

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