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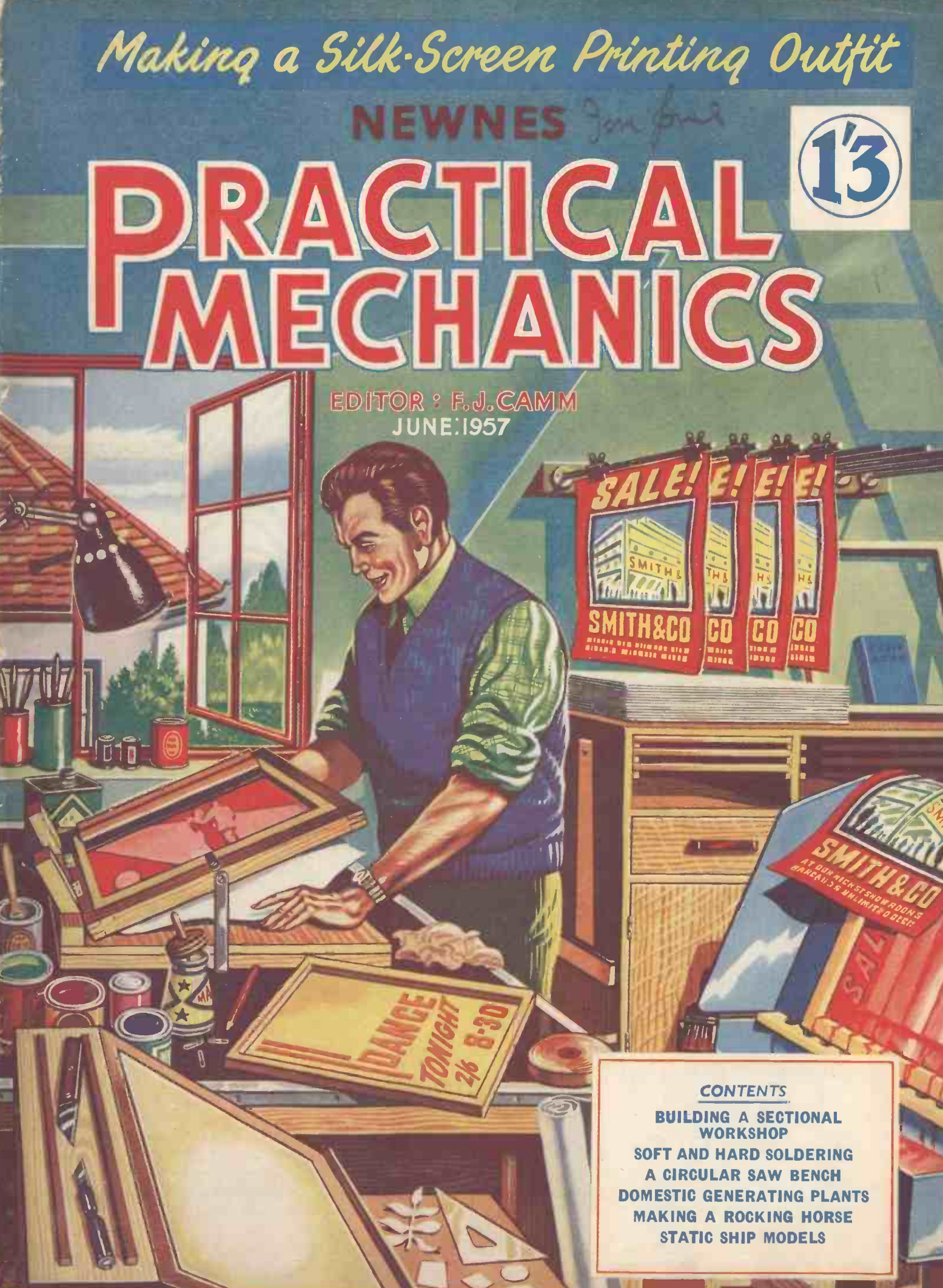
1/3

EDITOR : F.J.CAMM
JUNE: 1957



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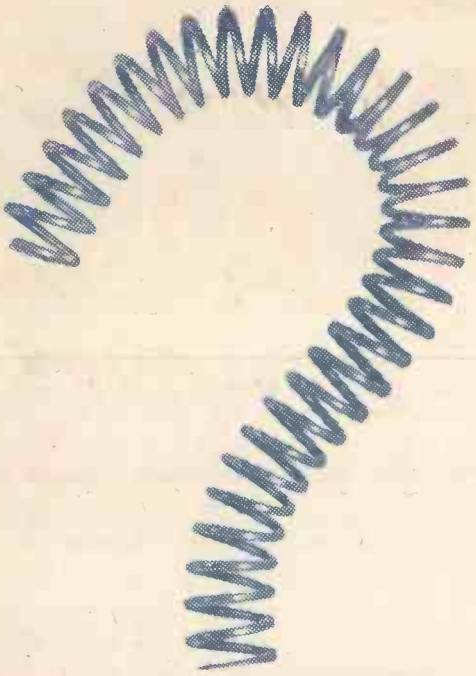

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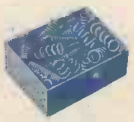

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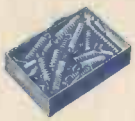

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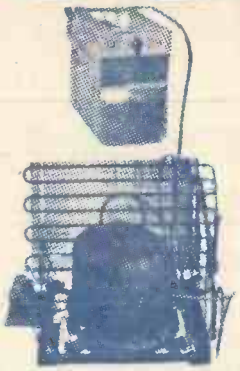

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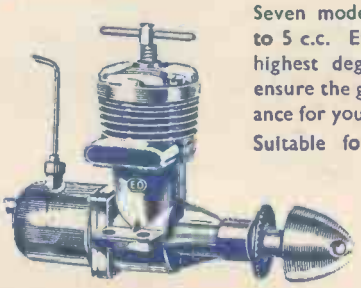

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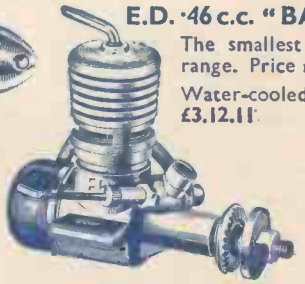

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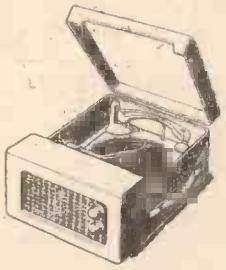

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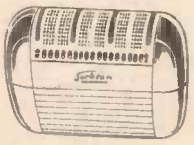

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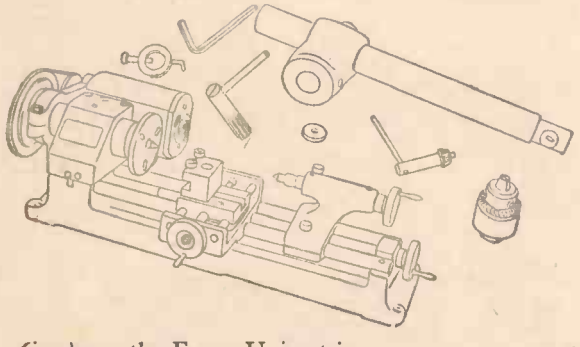

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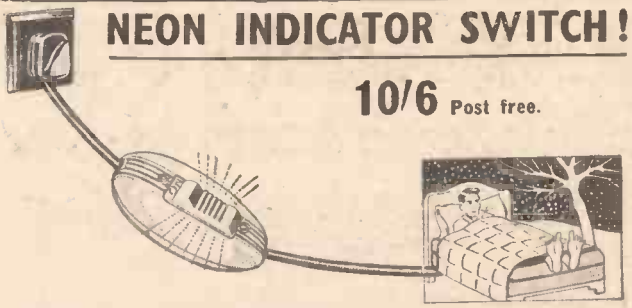

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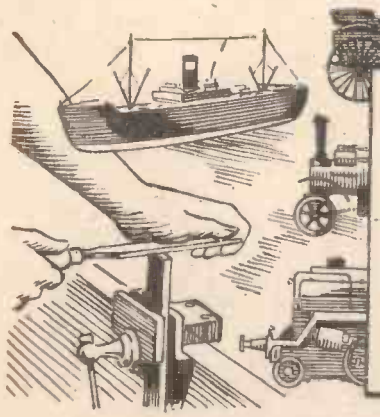

Practical Mechanics

Vol. XXIV. No. 280 JUNE, 1957

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

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FAIR COMMENT

TWENTY-FIVE YEARS

IN October of this year we shall commence the twenty-fifth year of continued existence and continued progress. Every year has seen a growth in circulation until today our sales exceed the combined circulations of comparable journals. This is a remarkable achievement in journalism, for notwithstanding the many competitive interests which have arisen in a quarter of a century, reader interest in the diversity of topics which we cover continues to expand. As new scientific discoveries have come along and new inventions have come into common use so have we dealt with them promptly in these pages and ahead of our competitors. In many cases we have been ahead of development, and in some cases promoted it. The editorial field is very wide indeed, and we are in touch with all countries and scour the earth for our information and facts. The competition of radio and television and other interests, the dwindling amount of leisure time which people have today have not attracted readers away from their main interest —to learn about things, to make things and to invent things.

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The reader service we provide is unexcelled and our readers all over the world freely take advantage of it. We shall, in due course, review our 25 years of activity for the benefit of those readers who have not been with us from our first issue. It is pleasant to be able to recall that several thousands have, to use a hackneyed phrase, been regular readers from No. 1.

"MODEL ENGINEERING PRACTICE"

DURING those 25 years I have myself contributed a large number of articles, including those on the construction of models, some of which have won international competitions. Readers have often kindly suggested that I should produce a book on model engineering practice which would deal with methods as distinct from making particular models. They may be interested to know therefore, that we have recently published "Model Engineering Practice," at 17s. 6d., by post 18s. In this book I have endeavoured to cover everything from tools to processes. The chapters include: The Model Maker's Workshop; Files and Filing; Miscellaneous Tools; Trammels, Squares and Calipers; The Protractor Vernier and the Micrometer; Micrometer Adjustment; Drills and Drilling; Taps and Dies; Marking Out for Machining; Soft Soldering, Silver Soldering and Brazing; Lathe Work; Centring the Work; Tool Types; Face-plates and Mandrels; Boring-bars; Screw-cutting in the Lathe; Scroll Chucks and Fixtures; Riveting; Painting Models; Prototype Models; Showcases for Models; Hollow- or Slush-casting; Casting in Soft Metals; Making Small Foundry Patterns; Making Wheels for Models.

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READERS will be interested to know that, at the time of going to press, my companion journal, *The Practical Householder*, has made Fleet Street history; for the first time in the history of technical periodicals a sale of over one million copies has been reached. Ever since the first issue was published the demand has increased month by month until this enormous and record-breaking total has been reached. I hope that you are among that vast family —F. J. C.

FLASH Photography

Flash Gun Details : Synchronising a Camera

By W. A. GRADWELL

THE author has a camera with a good lens but non-synchronised shutter. Since a commercial flash gun would require modification to suit the camera and since " open flash " technique was considered unsuitable for the type of work under consideration (i.e., child photography), it was decided to build a flash gun and adapt the camera.

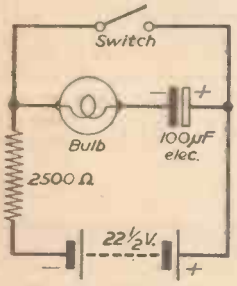


Fig. 1.—Theoretical circuit.

The Flash Gun

This is of the capacitor type and is extremely simple, using a 22½-volt hearing aid battery. The value of the condenser is not critical, one of 25 μF. capacity will fire one flash bulb, 50 μF. will fire two bulbs and 100 μF. three bulbs, simultaneously. The resistance may be of any value between 2,000 and 3,000Ω.

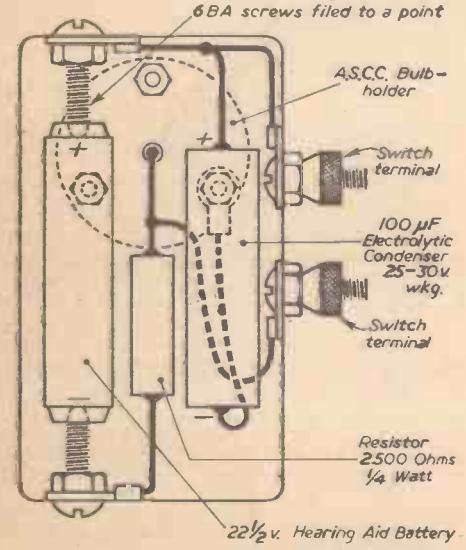


Fig. 2.—Wiring diagram for flash gun.

Flash bulbs require an A.S.C.C. (American Single Centre Contact) or B.S.C.C. (British Single Centre Contact) holder, and difficulty may be met in obtaining this. A car headlamp type, however, from any auto dealer is quite suitable, although the sides may require closing together slightly with pliers to hold the bulb firmly. Such a holder will also take an adaptor for the cheaper, capless flash bulb.

A suitable container may be made up from plastic, although the writer built his flash gun into the body of a plastic pin box, measuring approximately 3in. x 1½in. x ¾in., costing 7½d. from a well-known multiple store.

The battery is held in position by means of two 6 B.A. brass screws, the ends of which are filed to points to ensure a good contact with the holes in the ends of the battery. Wiring is completed by means of 20 g. tinned copper wire, plastic covered, with solder tags fitted beneath 6 B.A. screws at the battery and switch terminals A and B (terminals could be used from an old radio), as in Fig. 2. Care must be taken to connect the positive side of the electrolytic condenser to the positive side of the battery.

It will be seen from Fig. 1 that the circuit is not completed until the bulb is inserted. If the switch is left open with a bulb in position, the condenser is charged through the bulb. The charging current required, however, is not heavy enough to fire the bulb. Only a few seconds are required to charge the condenser and the closing of the switch then shorts the charging circuit, discharging the condenser through the bulb, so producing the flash.

The flash gun is completed by cutting slots

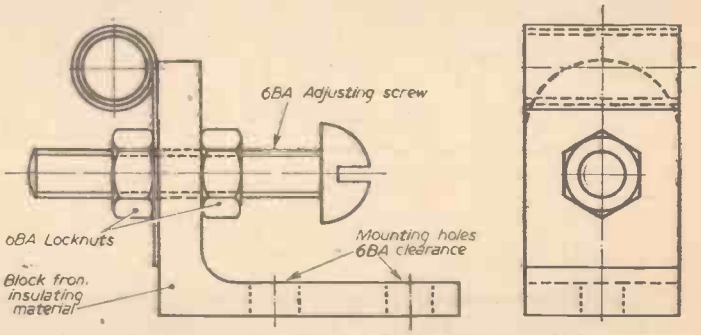
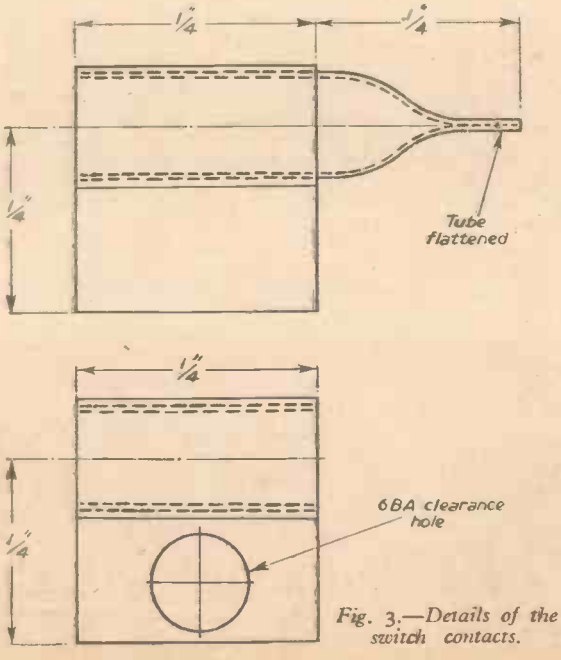


Fig. 4.—Details of the switch contact assembly.



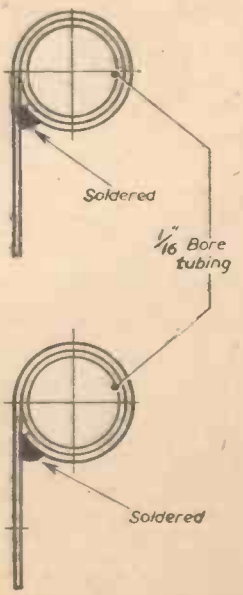


Fig. 3.—Details of the switch contacts.

in the lid of the container to clear the heads of the 6 B.A. screws and switch terminals.

Including the reflector (I used an aluminium pudding basin 4in. diam. x 2in. deep), battery and adaptor for capless flash bulbs, the total cost of the flash gun should be less than 10/-.

One or two different methods of synchronising the shutter to the flash gun were attempted, but the one described here has proved quite simple and successful. The dimensions quoted are those used on the author's own camera, but very little modification should be required to adapt the arrangement to almost any camera, including the most humble box type.

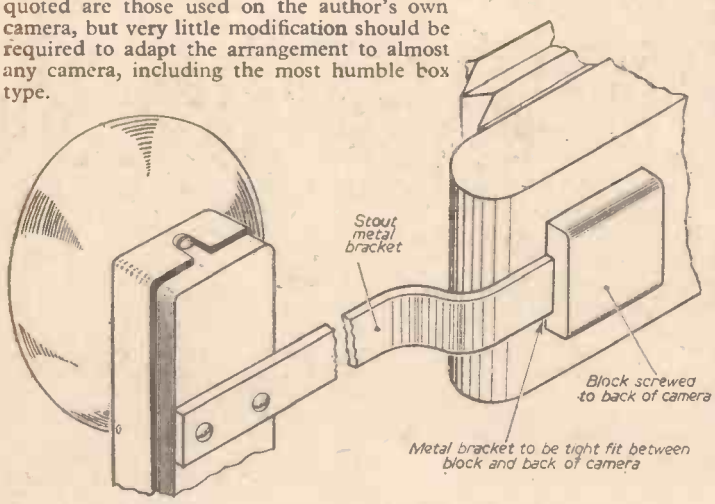


Fig. 5.—Suggested method of attaching flash gun to camera.

Making the Contacts

Two contacts are made up as shown in Fig. 3. The first consists of a piece of 1/16in. bore tubing about ½in. in length, flattened at one end. A piece of strip brass is bent round and soldered to the tube and the whole is then soldered, at the flattened end of the tube, to the shutter release trigger on the camera.

The second contact consists of another piece of brass strip in which is drilled a clearance hole for a 6 B.A. bolt, bent and soldered to a piece of 1/16in. bore tubing.

A piece of insulating material, such as Perspex, fibre or even wood, is made as shown in Fig. 4. A 6 B.A. hole is drilled and tapped in the shorter arm, positioned so that when in place on the camera body the hole is opposite the centre of the first contact. Two clearance holes for 6 B.A. bolts are drilled in the longer arm.

A 6 B.A. screw about ½in. long and locknut are fitted to the insulating block and adjusted about half-way along its length. The second contact is then attached by means of a 6 B.A. nut and washer.

Mounting the Second Contact on to the Camera Body

If the camera has variable speeds, set the shutter at 1/25th second. Move the first contact until the shutter operates and hold the lever at this position. Place the second contact on to the camera body so that the end of the adjusting screw "makes" with the first contact on the shutter lever. Mark off the positions of the 6 B.A. holes in the insulating block and drill the camera body. Care is required here, especially if a bellows is fitted to the camera, to ensure that no light traps are damaged. If the inside of the camera is accessible to the drill, the insulating block should be attached with 6 B.A. countersunk screws with the heads inside and nuts on the outside. If countersinking is difficult, round head bolts should be used. Check that there is clearance between the second contact adjusting screw and the nuts just fitted, to prevent shorting of the flash gun through the camera body and, if necessary, counterbore the insulating block for the nuts, or reduce their thickness with a file.

Synchronising the Camera

First check as far as possible by eye that the contacts "make" just as the shutter operates, making any adjustment necessary with the 6 B.A. screw.

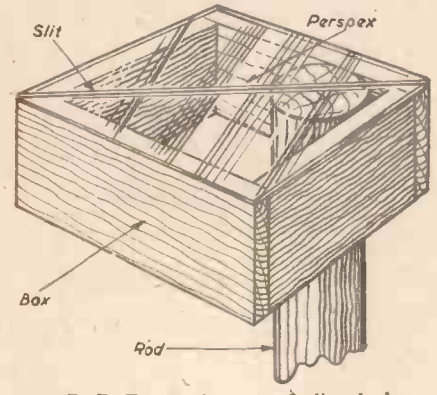
Make up a lead of low-voltage flex, using cable as light in weight as possible. Connect to terminals A and B at the flash gun and plug the other ends into the 1/16in. bore tubing of the shutter contacts. A test bulb may be purchased from most photographic dealers, or the reader may not object to burning a couple of flash bulbs instead. In either case fit the bulb to the flash gun, open the back of the camera and in a darkened room place the eye to the back of the camera. Operate the shutter and, if necessary, adjust the 6 B.A. screw until the flash is seen through the shutter. This test should be carried out with the shutter of a multi-speed camera set at 1/25 second. Once adjusted no further attention should be necessary and the adjusting screw may be locked in position by the lock nut.

The attachment of the flash gun to the camera should prove of little difficulty. If the camera is fitted with a tripod bush, a suitable strip of plywood or metal is bolted to the flash gun and attached to the camera with a bolt to suit the tripod bush. If the camera is not so fitted, an arrangement as shown in Fig. 5 is suggested, as used by the writer. In any case a second lead should be made up of about 9ft. in length to permit the use of the flash gun at a position other than at the camera. In such a case the gun could be mounted on a suitable stand or tripod or even held by an assistant.

Centre-finding Devices

Three Useful Gadgets for the Same Purpose

THE small gadget shown below is in the form of a small box, on one side of which is a square of Perspex or clear celluloid which has a diagonal cut from corner to corner, making an angle of 45 deg. (assuming that the box is perfectly square).



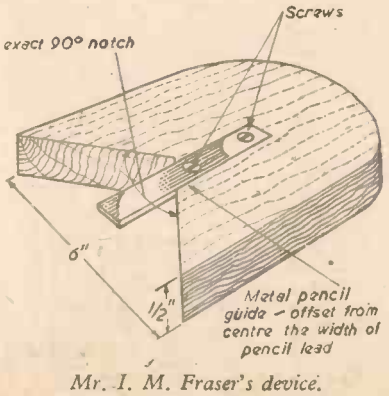
Mr. D. R. Freeman's centre-finding device.

The cut should be only just wide enough to allow the passage of a scriber or sharp pencil point.

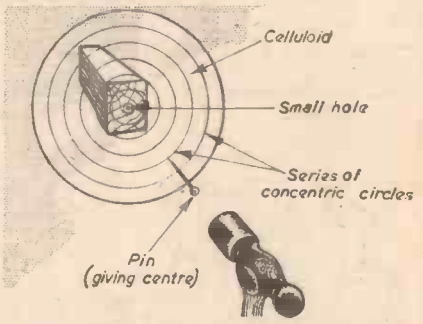
In use, the circular rod is pressed into the corner as shown and a mark made through the slit. The rod is then given a half turn and a similar mark made. The centre of the rod is then at the crossing of the two marks. Naturally, the more care taken in the making of this device, the more accurate will be the results, but it is easy to make and simple and quick in use.—D. R. FREEMAN (Chelmsford).

EXACTLY locating the centre of a circular dowel or any other piece of round wood like a wheel for a toy is often a difficult job and it is well worth while making a centre finder as shown in the sketch below.

In use place the finder across the circle and draw a line along the metal pencil guide. Place the finder at approximately 90 degs. across the circle and draw the second line, the intersection of these lines will be the centre of the circle.—I. M. FRASER (Ayrshire).



Mr. I. M. Fraser's device.



Mr. E. J. Leonard's centre finder.

THE device above is of great use in centring pieces of wood to be turned in a small lathe. It is a flat piece of celluloid or other transparent material having a series of concentric circles marked on it around a small central hole. The circles can be scribed on celluloid by a pair of dividers pivoting in this small hole.

Any piece of wood can then be quite accurately centred by eye, a small pin driven through the hole marking this centre.—E. J. LEONARD (Bristol).

An Evaporation Food Cupboard

A Device to Keep Food Cool in the Hot Weather

By W. A. HINTON

THE outside must be made of red cedar, which is the only wood which will withstand water and not rot. Six frames are made up from 3½in. x ⅞in. wood, mortised and tenoned together. When assembling, the front and back are screwed to the sides and the top and bottom screwed on afterwards. Brass screws must be used. Dimensions of the assembled framework may be seen in Fig. 1.

Panels

Perforated zinc is attached by means of copper tacks to the inside of the sides, back, bottom and door. A piece of 10G. aluminium, with a hole in the middle for the water pipe, is screwed on to the top.

Inner Box

The inside container is made like an aquarium. The frame is formed from 16G. ¾in. brass angle, the various pieces being soldered together. The front angle, as can be seen in Fig. 2, is positioned the other way round and, after being drilled for fixing screws, fixed to the front frame.

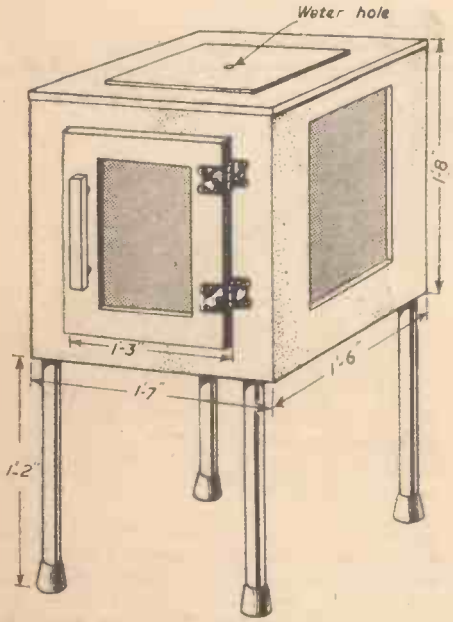


Fig. 1.—A perspective view of the completed food cupboard.

The Glass

When the complete framework is in position, glaze with 21oz. glass. Paint the back of the glass black before glazing. Put the top and bottom in first, then the back and sides (the back and sides support the top); bed in well with putty (water must be kept out). A shelf may be made from ⅛in. plate glass and positioned on a stand.

Insulation

The material used was vermiculite, sold under the trade name "Micafil." This is used for roof insulation and is obtainable from builders' merchants.

All the parts are cleaned off and screwed together, ready for painting; then unscrew bottom and fill with vermiculite. Replace the bottom panel, turn over, remove aluminium top and fill with vermiculite. Shake this down well but do not ram it in. Replace the top after fitting the pipes as shown in Fig. 3.

Remove beading round the door and glass, fill with vermiculite and replace. The door has a short water pipe.

The food cupboard works on the evaporation principle and must be kept where air freely circulates. Water is poured in the top and run down the back and sides by means of the pipes and percolates into the vermiculite. Water must be added gradually; very little is required for the door.

The inside must be wiped out twice a week with a little disinfectant to stop any mould growth.

The cupboard was finished in cream paint and a long red plastic handle and ball catch fitted.

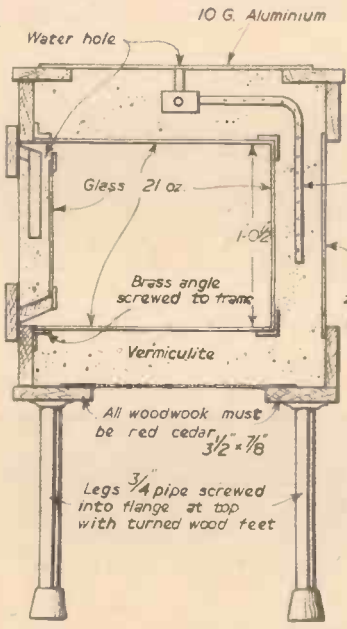


Fig. 2. (Left)—A sectional side view.

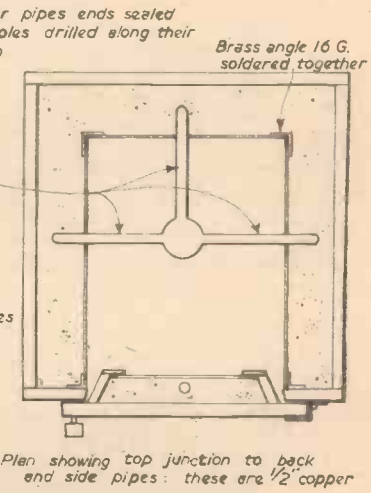


Fig. 3.—Plan view with top removed.

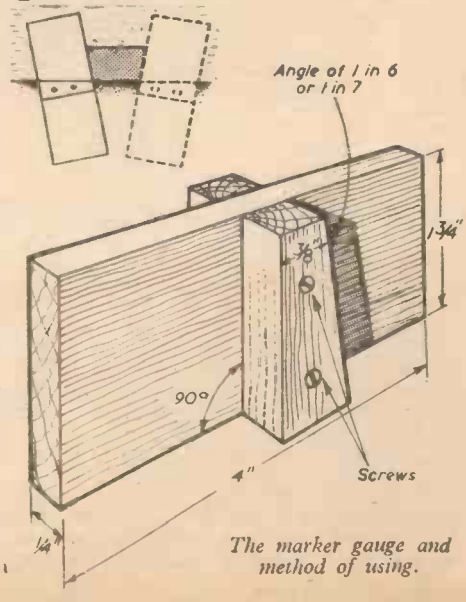
A Marker Gauge for Dovetail Joints

By S. SLOAN

BESIDES being the most professional-looking type of joint to use when making drawers and similar items, the dovetail is also the most efficient. It is often avoided by the amateur carpenter, however, because of the work involved, but the use of the marker gauge shown on the right should make the job considerably easier.

It can be made any size, although the dimensions given will be found convenient for most work; hardwood should be used for its construction. Both sides can be made the same with angles of 1 in 6 or 7 and 90 deg., or one side can be cut at 45 deg. for marking mitres. The 90 deg. angle will be found useful for squaring before sawing.

The small inset sketch shows the method of using the gauge. When the marking out is completed, the gauge is positioned on the edge of the wood, the side of the dovetail marked, the gauge turned over and the other side marked.



The marker gauge and method of using.

Soft and Hard Soldering

Equipment; Materials and Methods

Fig. 1—A complete brazing hearth.

HARD soldering the joints of such metals as brass, copper, silver, nickel and gold is a process quite distinct from the method of soldering in which the solder is a mixture of tin and lead and known as "soft soldering."

Both hard and soft soldering may be employed with equal facility for jointing all the metals mentioned above, gold having the advantage that no great amount of cleaning and no flux are required, but to the metals of low-melting point, like lead, zinc and the pewter alloys of tin, soft soldering only is applicable. The same remark can be made in respect to soldering tin-plate. This material is thin sheet-iron or steel coated with tin, and as this bright covering melts at about 450 deg. F., it is obviously impossible to employ a method of hard soldering which necessitates a temperature of at least 1,400 deg. F. Such can only be soft soldered, and although the basis of tin-plate is iron or steel, brazing is impracticable because of the coating.

Melting Points of Alloys

It is important to note, in dealing with alloys, that the melting point of a mixture is almost always lower than either of the two metals in their pure state. The lowest melting temperature of a mixture depends on the exact proportions of the alloy, and this particular temperature is called the eutectic point of the alloy. Brazing (Fig. 1) is another soldering process, but for the amateur it may be considered as applicable only to steel and iron, as the soldering medium is a brass; brazing spelter, it is called. This melts at a point not far below that of copper, and therefore a considerable degree of skill is necessary to make a joint at a brazing temperature without "burning" the work—as overheating a job is termed. Obviously it is impossible to braze brass, as the spelter is really a kind of brass. Therefore it is recommended that the amateur should braze only steel and iron objects. Non-ferrous metals, like copper, brass and nickel, which are required to be "hard soldered," should be worked up with one of the many grades of silver solder.

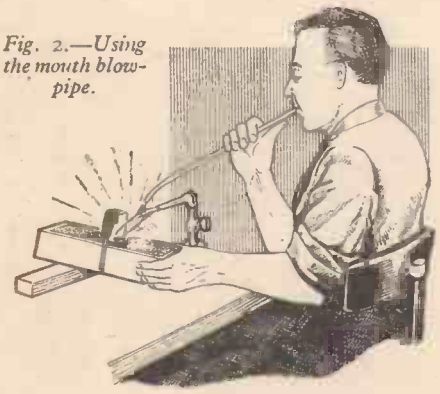


Fig. 2.—Using the mouth blowpipe.

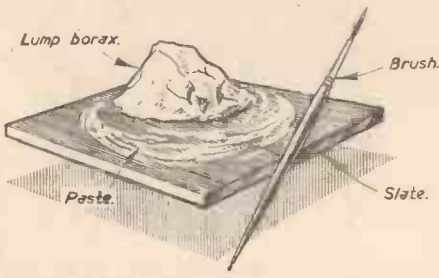


Fig. 6.—The slate and borax.

Grades of Silver Solder

The workshop method of making silver solder is to melt up with a glass blowpipe in a hollow formed in a block of charcoal some scraps of pure silver and brass pins, about three parts of silver to one of brass by weight. If brass pins are not obtainable (iron is commonly used nowadays in making pins) then employ brass cuttings instead. When a molten globule is obtained, using a little borax as a flux to make the metal run easily, tip it out on to a wooden bench and drop a flat-iron on it.

A thin sheet of silver solder will then be obtained without resort to hammering or rolling, and this can be cut into strips for future use.

A finer quality of solder, more near to pure silver, will be obtained by a mixture of 7 parts of silver to 2 of brass. The melting temperature of this mixture will be about 1,500 deg. F., and therefore no advantage will accrue except that the joint the solder makes will be whiter and more suited to work on silver and nickel objects. The same melting point will be obtained by using 6 parts silver to 4 of brass, and this mixture is cheaper. The 3:1 mixture gives the lowest melting point of about 1,435 degrees F.—i.e., it is nearer the eutectic mixture.

Silver soldering methods vary considerably with the size of the job to be tackled. For small work, like jointing brass fittings to ¼in. or 3/16in. copper pipes, as used in model engineering work, and soldering other objects of similar calibre, the heat to be obtained from a mouth blowpipe (Fig. 2) operating in a horizontal gas jet (not a Bunsen burner necessarily) will be ample. All that is required to conserve the heat around the part being soldered is a block of charcoal. These blocks are sold in the toolshops, built up, for convenience in handling, in a plaster mould or cast of the shape sketched in Fig. 3. Otherwise natural lumps of charcoal, chunks made up from split branches of small trees, as shown in Fig. 5, may be employed.

The other necessary tools may be enumerated as follows:—

(1) A scraper (Fig. 4) made out of a piece of a small three-cornered file ground to knife edge sharpness on an oilstone and stuck into a short handle. The whole thing should not measure more than 3½in. overall.

(2) A piece of slate (Fig. 6), with a small camel-hair brush for rubbing up lump borax and water into a paste as occasion may require. This paste is painted on to the part of the work to be soldered.

(3) A clip to hold strips of solder in the flame. One form is shown in Fig. 7. This is quite a home-made device, formed by sawing down a piece of 5/16in. diameter steel rod and slipping a metal ring of the same internal diameter over it to grip the strip of solder placed between the jaws formed by the sawcut. The other end of the rod may be filed down to a point and forced into a wooden file handle.

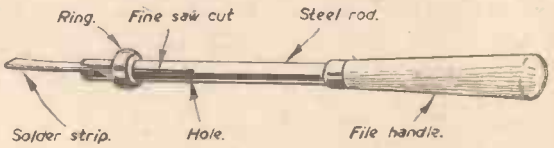


Fig. 7.—The clip to hold the strip solder.

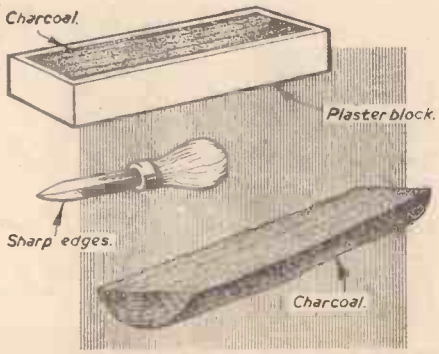


Fig. 3 (top).—Charcoal block mounted in plaster cast. Fig. 4.—The scraper. Fig. 5 (bottom).—A charcoal chunk.

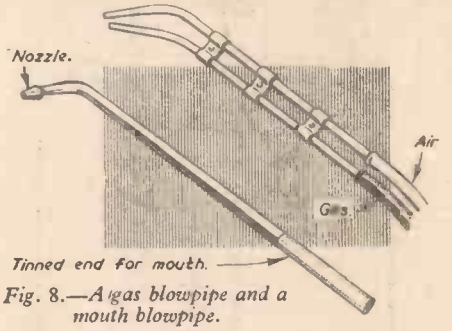


Fig. 8.—A gas blowpipe and a mouth blowpipe.

(4) A gas blowpipe. These can be obtained from any well-stocked ironmonger or tool shop (see Fig. 8).

The gas jet should be placed horizontally, and a made-up fitting is arranged so that when it lies across the front of the worker the gas is full on. When it is pushed away from him the gas jet is only just alight (see Fig. 9). This saves the trouble of handling a separate tap. These special jets

can also be obtained ready made from ironmongers.

A further requirement is a pot of "pickle," a mixture of 1 part of sulphuric acid (oil of vitriol) to 20 parts of water in an earthenware jug. In mixing this it must be remembered that it is dangerous to pour water on to the acid. Always add the sulphuric acid to the water and even do this slowly to allow the heat generated to disperse gradually and without ebullition. Sulphuric acid has a great affinity for water, and violently combines with it. The pickle is used in silver soldering to clean the metal being operated on, both in preparing it for soldering and to clean off the burnt-on borax after the job has been jointed up. The initial cleaning may be done by the pickling, but it is not quite sufficient to ensure that the grease and organic dirt are removed. All parts where the silver solder must be run in require to be scraped clean, or filed, as well as pickled.

In pickling metal not already soldered, the job can be thrown into the jar while it is red hot, taking care that one's person and clothes are not splashed in the process. Work that has just been soldered and is covered with the burnt-on flux (borax) should be allowed to cool to a black heat before it is put into the acid bath, otherwise the joint may be cracked by sudden cooling.

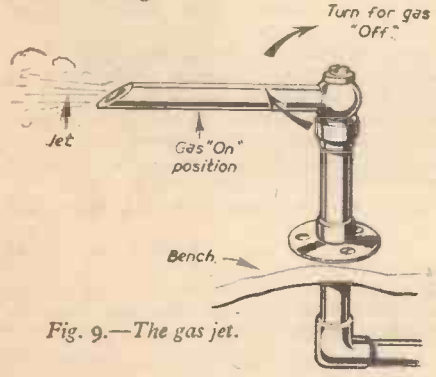


Fig. 9.—The gas jet.

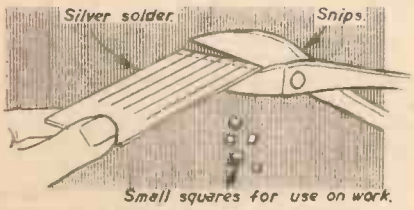


Fig. 10.—Cutting solder into squares.

Non-ferrous metals—brass, copper, nickel, German silver, etc.—are all annealed (made soft) by the heat of the hard-soldering and, of course, cannot be hardened again except by a hammering process, which may, of course, be physically impossible under certain circumstances. In addition, it must be clearly understood that no work which has been so soldered can afterwards be hard-soldered. The temperature of silver-soldering (a bright red heat) would destroy not only the soft-soldered joint, but would form an alloy between the soft solder and the copper or brass being worked upon, which would be entirely unstable and the metal would be made "rotten." Further, some common brasses, being alloys of tin, copper and zinc are, because of the large zinc content of the alloy, not good metals for silver soldering. The zinc portion of the alloy burns out if it is heated to anything greater than a dull red heat. Therefore, if brasses are to be hard soldered, use a silver solder of the lowest melting point; do not overheat the metal, i.e., bring it just to the temperature so that the solder runs freely, and if you have a choice in the material, obtain a good grade of brass. Ask for a metal of "brazing" quality, which means approximately that it has not too much zinc in it.

For small hard work, such as can be held in the hand on a charcoal block—jobs analogous to jewellers' work—the solder is best cut up into little squares about 1/16in. square. A sheet of silver solder, 1/32in. or thereabouts in thickness, is cut with the shears into "fingers," and then by cross cuts as shown in the sketch, Fig. 10, formed into little squares. If the job is to solder a disc of copper or other metal not more than ⅛in. thick on to the end of a short piece of tubing, the end of the tube and the surface of the disc are cleaned in the manner already described. The job is then painted with the borax paste and bound with iron binding wire on to the charcoal block (see Fig. 11). Light work must be bound, as the ebullition of the borax otherwise forces it out of position. Before blowing on the flame, little particles of solder are picked up from the slate, or bench, with the end of the brush and put all round the joint. As stated, the flame will make the wet borax paste boil up. Do not, therefore, be too fierce with the flame at the outset. When the borax dies down, increase the volume of the flame; at a bright red or white heat the solder should run. Remember that solder always runs into a crack, and also towards the part that is hottest. Further, the part of greatest bulk requires the most flame. The whole process is a matter of skill, and must be learnt by practical experiment. It is as well to practise on small objects before tackling larger jobs.

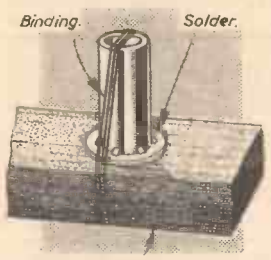


Fig. 11.—Parts to be soldered bound on to the charcoal block.

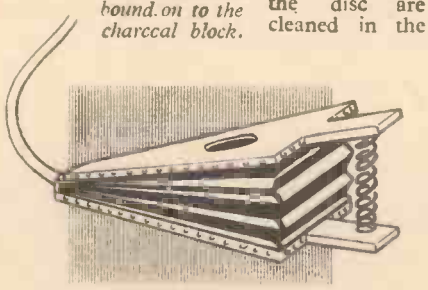


Fig. 12.—A simple type of foot bellows.

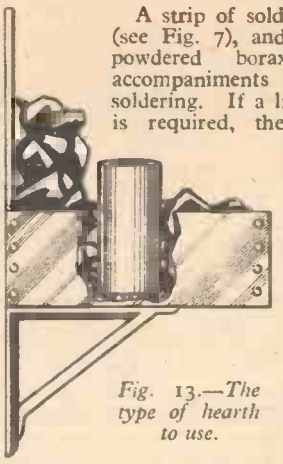


Fig. 13.—The type of hearth to use.

A strip of solder in the holder (see Fig. 7), and a small jar of powdered borax are useful accompaniments to the work of soldering. If a little more solder is required, the strip can be popped quickly into the flame, dipped into the borax, and then applied to the spot.

Larger work, such as soldering an end in a 3in. copper tube, requires a gas blowpipe in which the air is blown into the flame by a foot-bellows (see Fig. 12). In addition, the work must be done in a proper hearth (see Fig. 13). This may be made out of sheet iron, and should be at least 24in. square. The hearth is filled with lumps of broken firebrick which can be built round the work to conserve the heat.

The joint should be coated with paste borax, using a brush, before it is set up in the hearth. Afterwards, powdered borax may be put on as the work proceeds. The solder is not applied until the job is at a hard-soldering heat, when it should run into the joints quite freely.

It is important that joints should not be open. Silver solder will run into very tiny crevices, but it must be remembered it will not flow at all, or adhere to any surface that is dirty or oxidised by a previous heat. If two or more silver-soldered joints close together are needed, use a solder with the higher melting point for the first part of the job, and one of the easiest melting grades of silver solder for the final joint.

Soft Soldering

To become skilful with the soldering bit, get together the necessary equipment, and try jointing up scraps of tin-plate, brass, steel, and copper wires in various formations. You will soon be able to judge the right heat for the iron, the importance of working with a well-tinned bit, and also that main essential, perfect cleanliness, in the work being operated upon.

To be entirely successful in the process of soft soldering, there are many little devices, other than those that are to be purchased at a tool dealer's store, that can be made up by the amateur for his own use. In addition, there are numerous "dodges" known to the practical man which, if adapted to the job in hand, will speed up the work, produce sounder, cleaner and more workmanlike joints.

(To be continued)

Electric Soil Heating

Practical Details for the Gardening Enthusiast

By F. G. RAYER

METHODS of heating the soil direct by electricity convey several advantages. Installation of the equipment is relatively easy, and the heating grids can readily be moved to other locations, extended or disconnected, at will. Initial cost is small, operation is without special difficulty, and running costs are low. As a result, such methods are being used more extensively every year.

In all but very large installations the heat is generated by a low voltage passing current through bare wires buried a few inches deep in the bed or frame. The absence of high voltages in these wires avoids any possibility of shocks. It is easy to adjust the soil temperature by modifying the intensity of the current or by switching on for a certain number of hours in each twenty-four. It is also possible to calculate the expense of running very accurately, which will usually be about 1d. to 1½d. per 20 sq. ft. of hotbed per day.

Current is obtained from a transformer powered by ordinary A.C. mains, and the points that have to be observed to assure complete safety will become apparent from Fig. 1. The primary is connected to the mains supply at a socket power outlet, L indicating the Line or high-potential lead and N the Neutral or "earthed" lead. A main fuse will be present, but one of a suitable lower rating may with advantage be included for the transformer alone, as shown. The 13-amp. type of mains plug will have provision for this fuse. These primary connections must be made in such a way as to ensure that no danger arises from the mains voltage. Cables with tough rubber sheathing are suitable; failing this, the covering should be able to resist damp and abrasion. They should not be exposed to rain if avoidable, nor to excess heat, as might arise from allowing wiring to pass

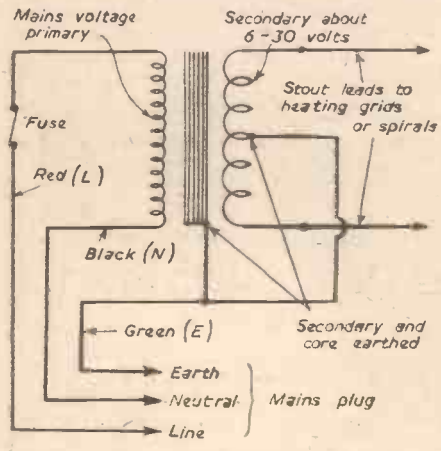


Fig. 1.—Heating transformer connections.

over heating pipes. There should be no bare joints or connections and all joints, connections or junctions should be made in moisture-proof connector boxes properly closed and sealed, or otherwise protected from damp.

The usual type of secondary has ratings from 6v. to 30v., and is earthed, preferably by a centre tap, together with the transformer core and any other metal parts. The mains circuit earth is used, and this ensures no high voltage can arise in the secondary or heating wires. Should transformer insulation break down (which is unlikely) or a similar fault develop, earthing in this manner causes the fuse to blow, thus safeguarding the user.

For secondary connections, insulated flexible cables of adequate current-carrying capacity are used, and can be moved about at will to suit the position of the heating wires or grids. The rating of the secondary can be determined when it is decided what area is to be heated and the temperature required.

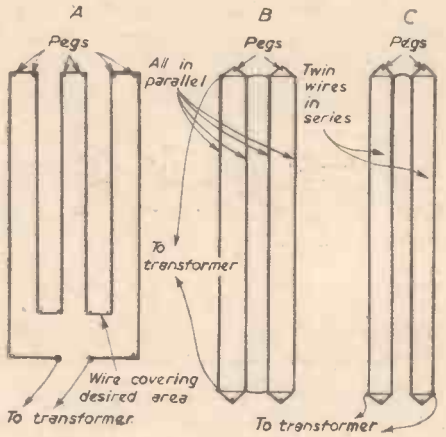


Fig. 2.—Arranging heating grids.

Heating Wires

Many methods are satisfactory, the one adopted depending largely upon the shape and area of the hotbeds, frames or cloche runs. The wire is laid about 4in. to 8in. below the surface of the soil, and each wire is about 5in. to 12in. from its neighbour. Very small beds may have a simple grid similar to that at "A" in Fig. 2, the wire being drawn round small pegs to keep it in position. This method can also be used in propagating frames, the wire being covered with 3in. to 5in. of sand. Pots or seed-boxes can then be sunk a little into this warmed layer and readily lifted out.

For long beds the wires can be strained in pairs, a small stake being used at each end to keep them taut. Normal cultivation will not disturb them. A single pair of wires with the plants between will suit a line of cloches. Two such twin wires are shown at "B," connected in parallel. This means that the full secondary voltage is applied to each grid. At "C" the two grids are in series, each thus receiving only one-half the secondary voltage. Either method may be used to suit the transformer or wire gauge. For example, for a given degree of heating "C" would require twice the voltage, but only half the current, as would "B." "B" could thus do for a 12v. 8-amp. transformer, for example, while "C" would suit a 24v. 4-amp. transformer. It is also possible to change connections, to increase or reduce the current if more or less heating is required.

Galvanised steel wire is best, between about 10 and 14 SWG. With grids having wires in parallel, the breakage of a single wire will not stop all heating, as would happen with a grid laid out with one wire as at "A." However, breakages should not normally arise with reasonable care. When fairly high temperatures are wanted, the wires should be sufficiently near each other—say not more than 6in. apart. If the spacing is excessive, a thermometer inserted in the soil will show this by the extent to which temperature falls away from the wires.

Maintaining Temperature

Either thermostatic or manual control is satisfactory. With the former, the thermostat is set at the desired temperature and switches off the current when this is exceeded, completing the circuit once again when soil temperature falls. The temperature thus fluctuates a little each side of the set figure.

With manual control, the heating grids are switched on for a number of hours each day. If the average temperature grows a little low, the heating period is increased. Conversely, when the temperature needs reducing, the grids are left on for a shorter period daily. Heating is best during the night (normally colder than day time) and can be for eight to 10 hours or more. There is no reason why the grids should not be on for 18 to 20 hours in the 24. The daily rise and fall of soil temperature caused by manual control has no apparent harmful result on plants.

The heating grids, however controlled, should be able to keep up the desired temperature when operating less than the full 24 hours each day. If 24 hours daily is required, the system is working at maximum capacity, with nothing in hand to compensate for frost or cold winds. On the other hand, if only 12 hours' heating per 24 are required, a large safety factor is present, avoiding danger in even severe weather.

Stray heat losses considerably influence temperature and thus the power consumed to maintain a given warmth. Strong, cold winds are particularly chilling.

Opinion as to most suitable temperatures are a little variable, but about 45 deg. C. is a sound basis for propagation. For tomatoes, 52 deg. C. will usually be considered satisfactory. Naturally, higher temperatures will be required for exotic plants in particular. With a large installation, or where exact working is in view, it is feasible to calculate the heat loss per hour from the glasshouse, when the area and type of walls, floor and roof are known. This can be avoided by assuming average figures, and by providing a heating grid of ample rating, keeping the temperature down by shorter periods of running if necessary.

The heating wires do not reach a high temperature—seldom over 75 deg. C.—and should be switched on 24 to 48 hours before the bed is required so that it may grow warm.

Power Necessary

The heat produced by a grid will depend upon the wattage dissipated in it. The wattage is readily found by multiplying the

voltage applied by the current flowing, in amps. For example, a 12v. grid passing 4 amps. would dissipate 48 watts. If the voltage remained at 12, but the current were reduced to 3 amps., the result would be 36 watts, and so on.

Between 3 and 6 watts per square foot of bed per hour will normally be required according to purpose and heat losses. A 4ft. by 6ft. bed would thus require between 72 and 144 w./hour. With the smaller ratings, it would be necessary to operate the grids for a large part of the 24 hours unless heat losses were very small.

The cost of running is easily ascertained. A unit, normally costing 1d., is 1kw/H, or 1,000 watts used for one hour or equivalent. A heating system using 100 watts per hour would thus run for 10 hours for 1d. If 12 hours' use daily were necessary, the running cost would be 1.2d. per day. This well illustrates the economy of direct soil heating by such means.

Another example will ensure calculation is understood. Suppose two grids consume 12 amps. at 18v. Wattage = 12 x 18, or 216w. Suppose 14 hours' use daily is required. Consumption is 216 x 14 watt hours daily, or 3,024w.H. Current at 1d. per unit or 1d. per 1,000w.H. shows the cost to be 3.024d. daily.

If an exact calculation should be made for an installation, and consumption then noted on the mains circuit meter, it will be found that the two figures do not exactly agree. This arises because the transformer is not 100 per cent. efficient, but loses a little of the current, as it were, in doing its job. But this need not be kept in mind unless an attempt is being made to combine practical and calculated operational costs exactly.

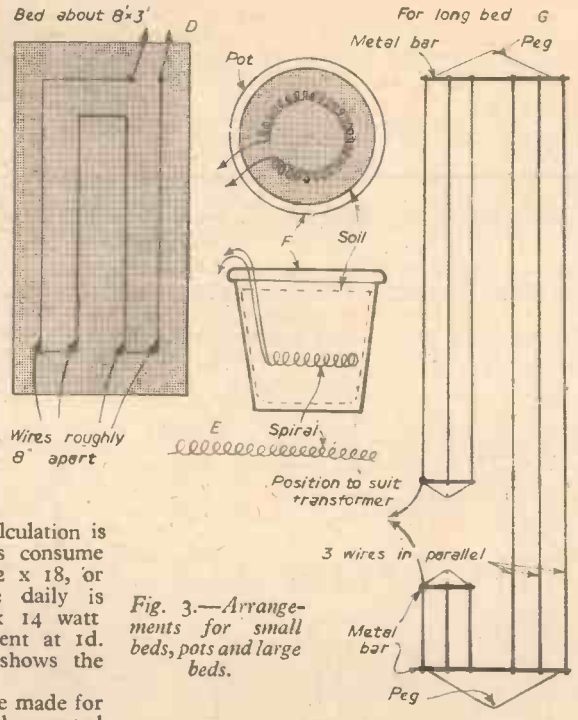


Fig. 3.—Arrangements for small beds, pots and large beds.

Resistance Wire Grids

Resistance wire is most suitable for small beds, frames or boxes, and gives relatively low currents. The following will allow a grid of this type to be prepared, using 16 SWG (.064in. dia.) nickel chrome resistance wire of about .45 ohms per yard:

Heating Wire	Voltage	Current Amps.	Dissipat'n Watts
10 yds.	9	2	18
10 yds. plus 10 yds. in parallel	9	4	36
10 yds.	18	4	72
10 yds. plus 10 yds. in parallel	18	8	144
3 of 10 yds. in parallel	18	12	216

The 30ft. of wire for a single circuit can be placed as shown at "D" in Fig. 3, for a bed about 3ft. by 8ft. Exact measurement of length is, of course, unnecessary, and the average temperature can be raised or lowered by increasing or reducing the heating period as explained.

When space is exceedingly limited, as in pots to be heated directly, a few feet of wire can be made into a spiral, as shown at "E," by winding round a wooden rod or other object about ¼in. in dia. The spiral is removed from the object, pulled out to separate turns and curved round as shown at "F." It is covered with soil about half-way down the pot. Only small voltages and currents will be necessary, the method particularly suiting isolated pots or experiments relating soil temperature to growth.

With large beds, a convenient method of having wires in parallel is shown at "G," considerable length being possible. This also gives a centre connection for the transformer which may sometimes prove handy.

Single Pictures With a Roll-film Camera

An Economical and Useful Method

By T. HURLEY

IT is often desirable to take a single picture with a roll-film camera so that it may be individually processed as with a plate. This can be achieved quite successfully and easily with a minimum of equipment.

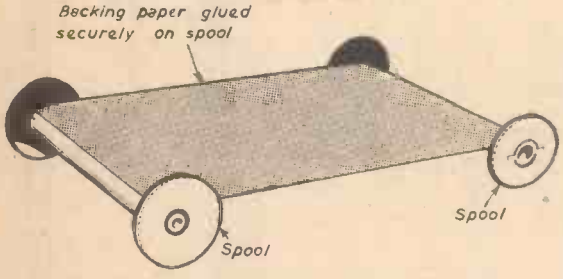


Fig. 1.—(Left) How the backing paper is secured to the spools.

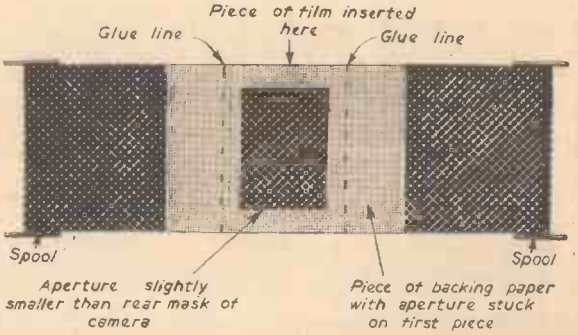


Fig. 2.—(Right) The frame into which pieces of cut film are slipped.

The Method

A length of film backing paper, some gum, and two empty film spools are all that is required.

Cut a piece of backing paper and secure it to the spools as is shown in Fig. 1. This paper should be of sufficient length so that the spools can be inserted in the camera in their normal places and the paper tightened by the winding key. When the paper is fully tightened it will not loosen because the winding key has a ratchet device on it which prevents loosening movement of the key. This can be done equally well in a box camera as in a folding camera.

With the paper fully tightened, mark on it the position of the rear mask of the camera. Then remove the spools from the camera.

In another piece of backing paper cut an aperture slightly smaller than the dimensions of the rear mask of the camera. Glue this to the first piece of backing paper so that the aperture that has been cut is placed centrally on the markings made on the first piece. This now makes a frame into which can be slipped a piece of cut film. (Fig. 2.)

When the piece of film has been inserted the device can then be put in a camera and the winding key tightened. This will bring the film to its correct position in the camera, and the tightening of the key will ensure that the film is held flat.

The cutting of the film and the loading of the camera must be carried out in a dark-room, and care must be taken to make sure that the emulsion side of the film faces the camera lens.

After the exposure has been made the camera is unloaded in the dark-room and the piece of film developed in the normal way.

Building a Sectional WORKSHOP

A Building Which May Serve as a Gardening Shed, Cycle Store or Workshop

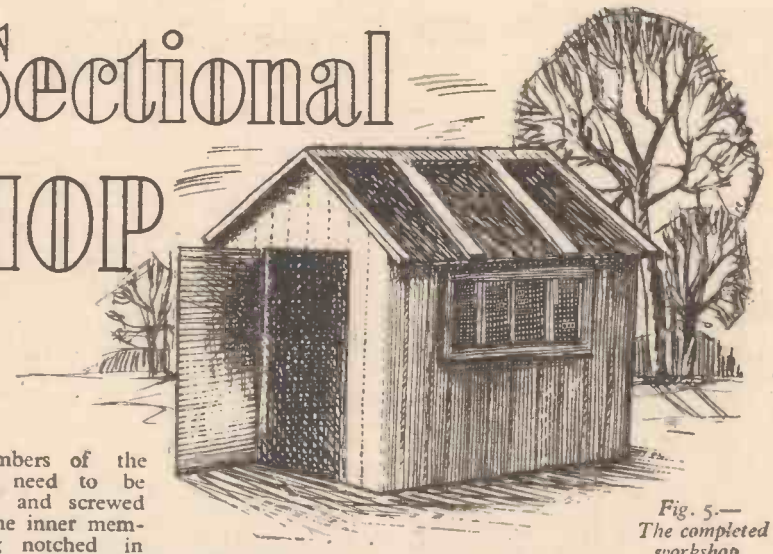


Fig. 5.—The completed workshop.

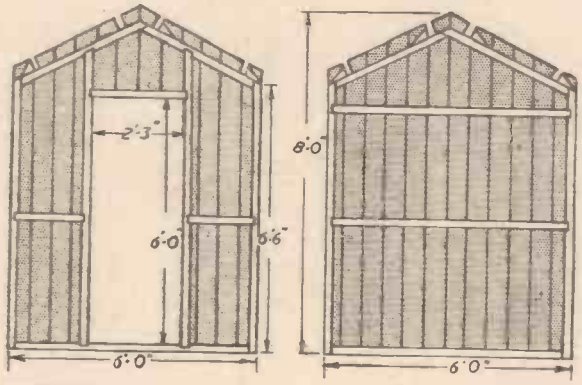
A BUILDING of this kind is best made in sections, both for simplicity of construction and so that it may be easily taken down if it is ever necessary to move it. The completed workshop shown in Fig. 5 is 8ft. 6in. long and 6ft. wide, but the dimensions may be altered if necessary. The framework should be of not less than 2in. square deal and both the sides and roof are covered with ⅜in. grooved and tongued boards. Four sections are required; the two ends are shown in Figs. 1 and 2 and the two sides in Figs. 3 and 4.

The Frames

As shown in Fig. 1, the door end is made with two uprights, two top rails and a bottom rail. The two top rails are half-lapped together in the middle, as shown in Fig. 6 (top left), and both the top and bottom rails are half-lapped and screwed to the uprights as shown at top right. Two uprights are framed between the top and bottom rails to form the doorway, a rail is framed between the uprights to form the head of the door, and two middle rails are framed between the uprights. Only the outer members of the framework need to be half-lapped and screwed together, the inner members being notched in and nailed as shown at bottom left in Fig. 6.

The other end, shown in Fig. 2, is made in exactly the same way, except that instead of the door framing two horizontal rails are framed across between the uprights.

The side shown in Fig. 3 is made with two uprights and top and bottom rails, half-lapped and screwed together. A middle rail is notched horizontally across between the two uprights and a vertical upright made in two parts and notched in position as shown.



Figs. 1 and 2 (Above).—The door end and back respectively.

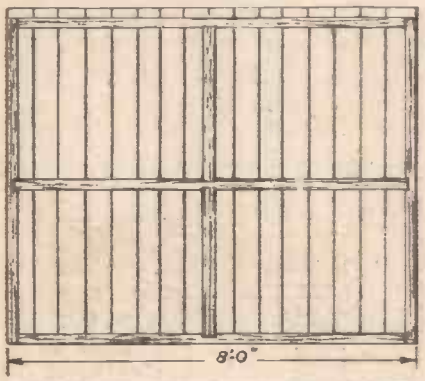


Fig. 3 (Left).—The blank side.

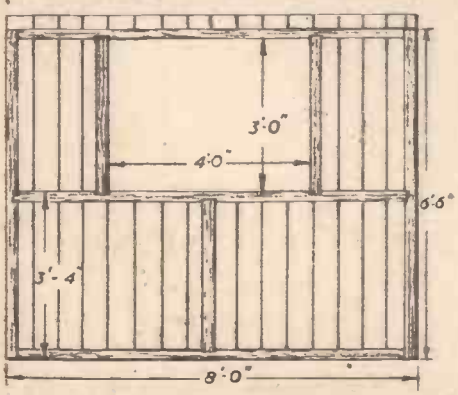


Fig. 4.—The window side.

Exactly the same method is used for making the window side, but instead of the top half of the vertical upright in the centre two short uprights are positioned as shown in Fig. 4 to accommodate the window. All the interior framing is notched into place as shown in Fig. 6, bottom left.

The Site

When the framework is completed the site on which it is to be erected should be levelled and a concrete bed, or rows of bricks, prepared for the framework to rest upon. The shed should be orientated so that the door and window are most conveniently placed for entrance and light. The side sections are positioned between the end sections and secured together by means of carriage bolts and nuts.

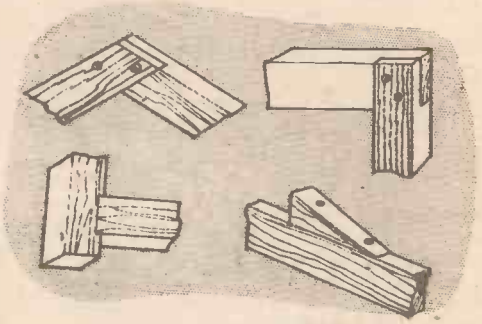


Fig. 6.—The various joints used.

The Roof

The roof is carried on four purlins laid from end to end across the top rails. The purlins should be 4in. wide by 2in. thick and should overhang about 6in. at the ends. They are positioned 6in. down from the ridge and 6in. up from the eaves and are held in place by wedge-shaped blocks, as shown in Fig. 7 and bottom right in Fig. 6. The blocks are nailed to the top rails, and bolts or long screws could be driven through the top rails into the purlins to hold them in position. The roof boards are laid across the purlins, and are nailed to them, the boards are fitted together at the ridge, and overhang

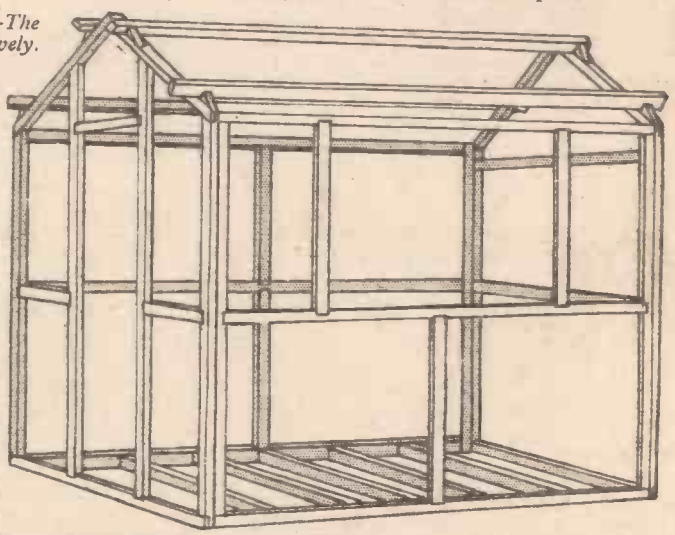


Fig. 7 (Right). — The framework of the shed.

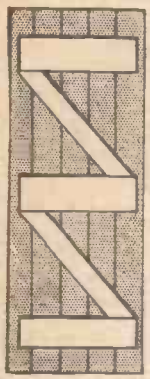


Fig. 8.—Details of the door.

about 6in. at the ends and the eaves.

Covering the Framework

The ends and sides are covered with grooved and tongued boards, fixed with the joints running from top to bottom. The door is made from similar boards held together with three 6in. cross battens, and stiffened with two diagonal 4in. braces as shown by Fig. 8. Fairly long T-hinges should be used to hang the door and a lock and key should be fitted.

The Window

This is the most difficult part of the whole construction and if any trouble is anticipated a frame could be ordered through a local joinery. The careful worker will, however, be able successfully to accomplish the task if thought is given to setting out. The frame is shown in Fig. 9 and is made with two stiles 2in. wide and 1½in. thick; two rails 2½in. wide by 1½in. thick; and three bars 1½in. square. The stiles, rails and bars are chamfered and rebated ½in. square, as shown in Fig. 10. The rails are tenoned into the stiles and the bars are tenoned into the rails as shown in Fig. 10, the joints being mitred into the depth of the rebates. The window frame fits in the opening in the framework, being nailed or screwed into place. It is finally glazed in the usual way.

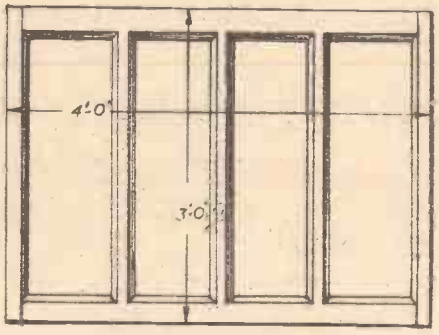


Fig. 9.—The window frame.

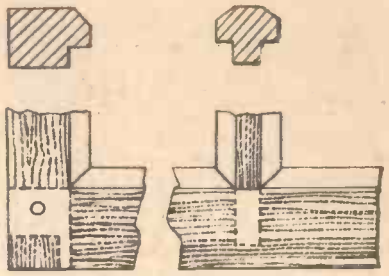


Fig. 10.—The window joints.

If a concrete bed has not been prepared it may, perhaps, be thought unnecessary to lay a wood floor. If a floor is desired small joists should be fitted between the sides, as shown in Fig. 7, and the floorboards laid on them.

On completion the building should be painted two or three coats, and the roof finished with an outer covering of roofing felt, or some similar material, wood battens being nailed at the ridge and over the joints in the felt.

Aquarium Pests

Some Common Types and How to Get Rid of Them

By I. W. BRASSINGTON

Fig. 1.—The Hydra.

THE growth of Algae in fish tanks can be a very mixed blessing. It can most certainly provide nourishment for the herbivorous types of fish, such as Guppies and Mollies, but it may also become a nuisance. The presence of a certain amount of the right type of Algae is one of the characteristics of a healthy tank, but there are other types which are definitely not wanted.

It is difficult to give a brief picture of the Algae family, for the classification is continually changing, and whereas the members were originally put into four classes—according to their colour-pigment—there are now more than twice that number. I think, however, that the old method is sufficiently accurate to be of most help to the aquarist.

First, then, are the Red Algae (Rhodophyceae), which are almost exclusively marine (seaweeds) and not met with in the aquarium. Secondly, the Green Algae (Chlorophyceae) is the largest class. In the aquarium it is represented by the light green varieties which cling to the glass and on which some fish love to browse. This plant is a welcome one and the only consideration which should limit its growth is an aesthetic one, since its presence on the front glass does spoil the appearance of the tank. Another member of the class, also seen in aquaria, is that known as "blanket weed," because of its thread-like appearance. This genus should be removed by hand, as it is unsightly. The other two classes are blue-green (Cyanophyceae) and Brown (Phaeophyceae). Both may be found occasionally in aquaria, but I have noticed that they seldom appear when the tank is well furnished with healthy, growing plants. All Algae respond to the stimulus of light and an alkaline water. A slightly acid water, then, will help to prevent an excessive growth of Algae, as also will a reduction in the amount of light. In the event of a bad attack of "green water," which is really the visual effect of the free-swimming stage of some Algae, one way of getting it under control is to remove the fish to another tank, while Daphnia (water fleas) are introduced. These will feed on the Algae and quickly clear up the condition, when the fish may be put back and they, in turn, will get rid of the fleas. Usually, it is only necessary to clean the Algae from the front glass about once a month, by wiping with a clean cloth or cotton-wool.

Snails

There is very little to be said for keeping snails in the aquarium. It was thought at one time that they were a great asset in keeping the glass clean, by eating the Algae from it, but their efforts in this direction are very inadequate and, moreover, their own deposits become unsightly. The only item in their favour is that their eggs make good fish food. From time to time snails have appeared in my tanks through the addition of fresh plants and I have had to remove them because of the holes which they have eaten in the leaves. They must on no account be allowed in a breeding tank as they will eat the fishes' eggs as they are spawned. For those who will put up with their drawbacks, on the grounds that their presence makes an aquarium more natural to look at, the species commonly used is the Ramshorn (Planorbis corneus) which has a red shell and body, or the Isadorella (I. pyramidata) with a yellowish body and a red shell. An example is shown in Fig. 2.

Hydra

The Hydra is a pest which may well find its way into the tank if the fish are being fed with Daphnia. It is a small aquatic animal with a stem-like body, at the end of which are numerous tentacles equipped with stinging cells, used for paralysing its prey. It will attach itself to the side of a fish and may be something of a nuisance to large fish and possibly fatal to any fish under ½in. or so in length—certainly to fry. If a tank becomes badly infested with Hydra, it is best to remove the fish and add a tablespoonful of ammonia to the water. After a few days, clean out the tank and set up once more. It is not sufficient merely to empty the tank, dry it, and start again, as the Hydra are capable of producing fertilised eggs which can withstand drought conditions. Hydra are shown in Fig. 1.

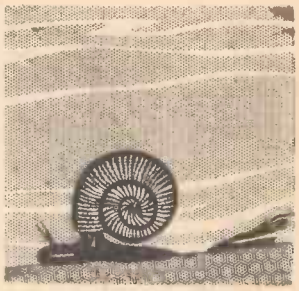
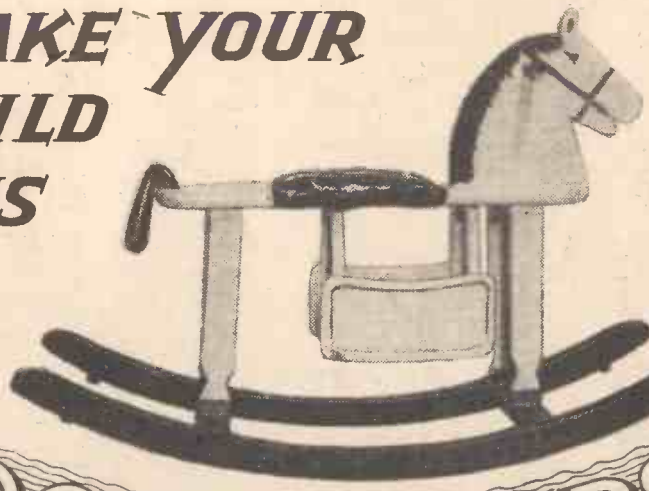


Fig. 2.—A snail.

MAKE YOUR CHILD THIS ROCKING HORSE



A Toy That Will Provide Endless Amusement in the Nursery

By E. J. WILKINSON

THE rocking horse shown in the heading photograph and in Fig. 3 was designed for a child of two years, allowing, of course, for rapid growth. All the work involved is straightforward and well within the ability of the average handyman, while the finished horse is as attractive as a good many to be seen in the shops, yet represents a large cash saving.

Cutting Out the Pieces

Figs. 1, 2, 4 and 5 give all the necessary measurements for the horse's back, head, tail and rockers. These were cut with a bow saw from ⅞in. thick oak, paper patterns having been pasted on to the wood and allowed to dry out first. The pattern for the rockers was marked out by using a length of string to which a pencil was attached at one end. Radii of 49½in. and 47½in. on the string enabled the chords in Fig. 5 to be drawn. The pieces of wood for both rockers were screwed together where the joints to take the cross-members were later to be cut away, and the two rockers sawn out together.

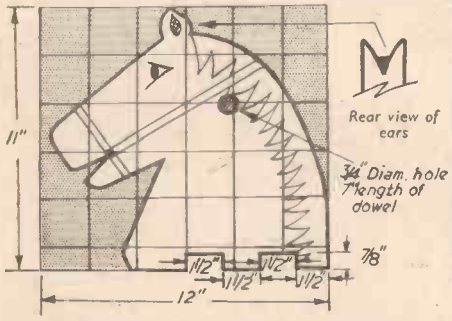


Fig. 1.—Details for cutting out the head and neck.

Fig. 3.—The completed rocking horse.

All these roughly cut shapes were then finished off using spokeshave, rasp and glasspaper. The mortises to take head and leg tenons were cut right through the back of the horse by first boring out as much waste wood as possible and then making the final cuts to size with chisel and mallet.

Fig. 6 shows all dimensions for the crossbars which unite the rockers and the legs, the mortises in the former also being taken right through the wood.

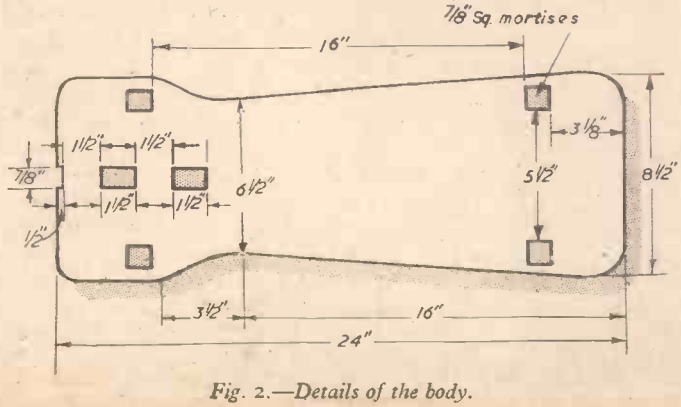


Fig. 2.—Details of the body.

Glueing

After drilling and countersinking the cross-member tenons and rockers to take suitably sized woodscrews, these joints were glued and screwed together, a try-square being used to ensure correct set. The head joints were glued and pressed together, no screws being necessary here. The tail was simply glued flush on the back and a countersunk woodscrew driven home from underneath the back in previously drilled holes. Cramps were used when the legs were glued into position so as to ensure that the tenons were forced completely home in their mortises. Finally a 7in. length of ¾in. dowel, rounded at each end, was glued into the hole bored through the horse's head (Fig. 1). The whole assembly was then set aside to dry.

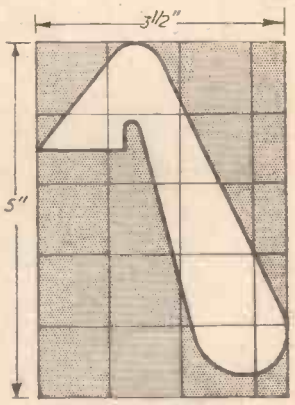


Fig. 4.—The tail.

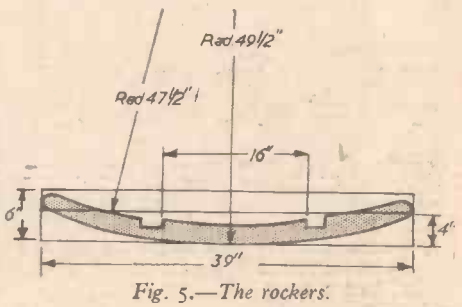


Fig. 5.—The rockers.

Footrests

The two parts of each footrest were shaped from odd pieces of ½in. thick beech, drilled, glued and screwed together as shown in Fig. 7. These have stood up to some very rough usage. Two lengths of ½in. x ⅛in. mild steel strip, shaped and drilled as shown in Fig. 7, were used to attach the footrests to the underside of

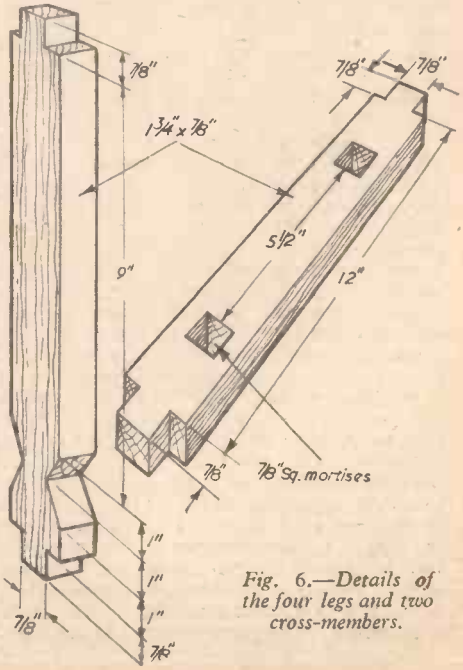


Fig. 6.—Details of the four legs and two cross-members.

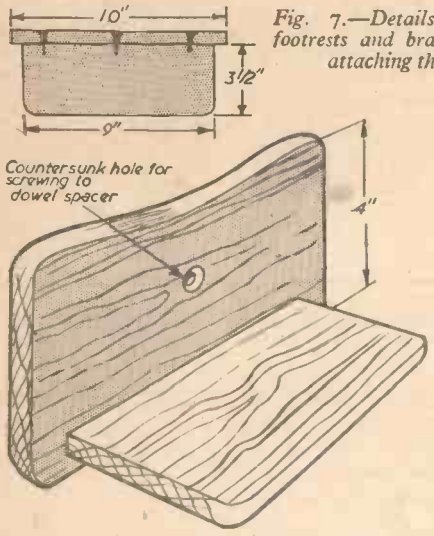
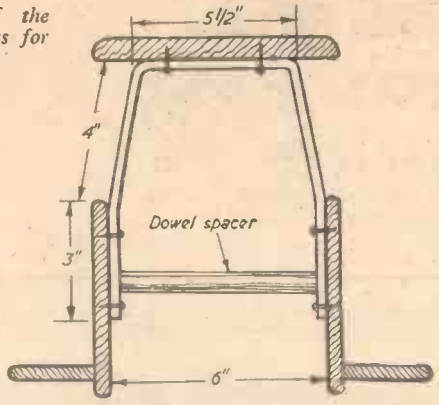


Fig. 7.—Details of the footrests and brackets for attaching them.



the horse. It was found necessary, owing to the springy nature of steel brackets, to secure a spacer, consisting of a 6in. length of ¾in. dowel, between the two rests. The whole unit was then secured to the horse with its centre line 6in. behind the back edge of the front legs.

After stopping up a few defects in the wood, the whole was rubbed down to a smooth finish, primed, undercoated and enamelled in bright colours.

The Seat

Using a square of leather-cloth, some upholstery nails and stuffing out of an old pillow, a small padded seat was fitted. A spare piece of wood, 8½in. wide x ½in. thick, was used as a "former" (Fig. 8). This was placed across the horse's back, 1in. behind the head, and the cloth placed over it, overlapping on all four sides. Back and front edges were turned under and fastened down with the dome-headed nails to make a taut fit over the former. The same was done at the edge of the seat where the former finished flush with the edge of the horse's back, but was nailed down on the underside. With three sides of the cloth secured, the former was withdrawn and the ½in. deep pocket filled with stuffing, making sure that the seat was uniformly padded. The pocket was then closed by nailing down the remaining edge of the cloth on the underside of the horse's body.

It was subsequently found that in use the rocking horse tended to work its way backwards. This was remedied by screwing rubber cushions to the undersides of the rockers, about 4in. from each end.

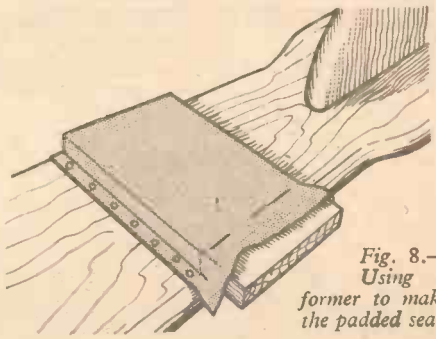


Fig. 8.—Using a former to make the padded seat.

The Britannia Trident

An Intriguing Wire Puzzle Sent in by R. B. Garnish

THE materials required to make this puzzle are a little more than 2ft. of 16 g. brass wire, one brass curtain ring, 1in. in dia., and a brass curtain-pole ring, 1½in. in dia., with a small loop attached.

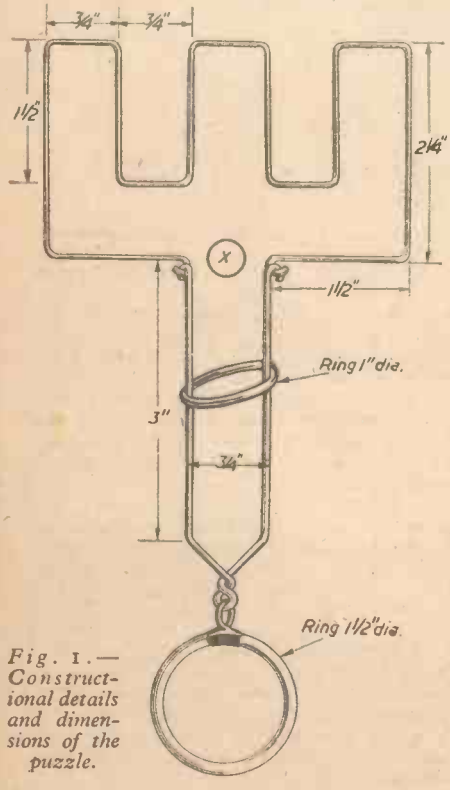


Fig. 1.—Constructional details and dimensions of the puzzle.

Commence construction by bending a small hook in the end of the wire and then bend the rest of the trident part of the puzzle to the dimensions given in Fig. 1. The stem is made in the same way, the 1½in. dia. ring being added at an appropriate stage in the bending process. The 1in. ring is slid into place and finally the two parts are hooked together. The completed puzzle should appear as shown in Fig. 1.

To solve the puzzle, of course, the smaller 1in. dia. ring must be removed.

The Solution

Fold the puzzle as shown in Fig. 2 and slide the 1in. ring to the closed end of the stem. Now slide it back down again, but also over the right-hand arm of the trident, until it reaches the point marked X in Fig. 2 and comes free of one of the hook joints. Move the stem until it is in line with the centre arm of the trident and slide the ring round this centre arm and finally round the left arm, when it will be found to be free. The trident may be a little distorted during the process of removing the ring, but if accurately made, distortion will be kept to a minimum.

The process is reversed to replace the ring. Some constructors may prefer to use larger rings, say 1½in. and 2in., to make actual working easier and to lessen distortion of the wires. Solving the puzzle is a simple operation—when you know how it is done—but can be mystifying to the uninitiated.

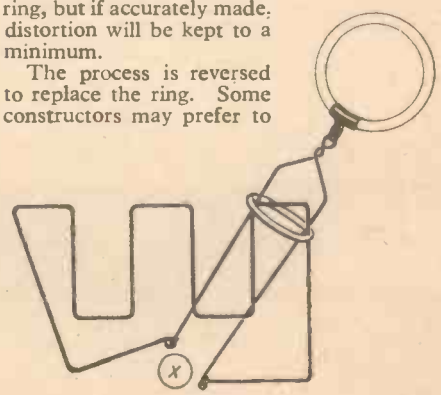


Fig. 2.—The puzzle must be folded into this position for solving.

AN INTRIGUING CONJURING TRICK

CHING CHOPPER CHINAMAN

Constructional Details

By E. HAWKSWORTH

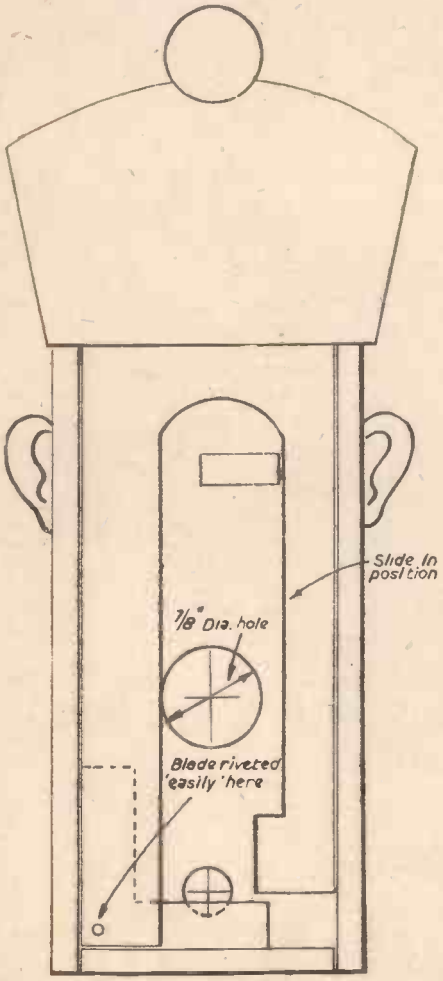
THIS is the effect of the miniature illusion: The Chinaman is shown to be a sliding knife within an outer case. Pulling the Chinaman's hat results in the blade being lifted to its highest position above the top finger hole. Anyone can insert their finger into the Chinaman's mouth and by pressing the knife blade downwards feel the sharpness of the steel blade. Take care not to press too hard because the blade really cuts!

The conjurer now places two slivers of raw carrot or potato into the mouth and bottom hole of the chopper and depresses the blade. Both pieces of vegetable are cut clean in half.

Once again the blade of the chopper is raised and another sliver of potato is placed in the bottom hole only. The conjurer pushes his finger through the mouth hole then, saying the magic word, slams the chopper blade smartly down.

Mysteriously, the blade appears to pass right through the conjurer's finger but cuts the bottom piece of potato in half as before!

Briefly, the trick is brought about by using an "L"-shaped knife blade, pivoted to the bottom of the slide as shown in Fig. 1. If the apparatus is made up as described, the method of working will be easily understood.



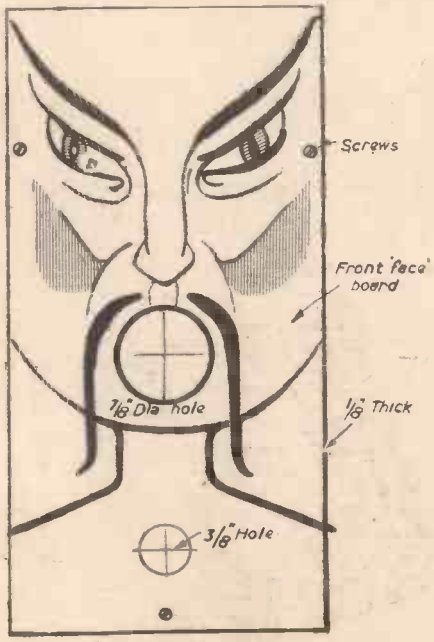


Fig. 1.—General arrangement of the trick and face board.

Construction

Make the case from 2 pieces of ⅛in. thick plywood measuring 2½in. wide by 5¼in. long.

On the centre line, ⅜in. from one end, saw out a ⅜in. diameter hole. Do this on both pieces.

On the centre line again, 2¼in. from the same end, saw out a ⅞in. dia. hole. This is the finger or mouth hole. Repeat with both pieces as before.

Sandwiched between these two pieces are two side and one bottom strip to make the hollow case which is open at the top end only. Make these from 3/16in. thick plywood and cut out after marking out the Chinaman's ears as shown. Tack and glue these three spacer strips to the bottom hole board.

The Slide

Mark out the slide on a piece of ⅛in. thick ply, 8in. long by 3½in. wide. Neatly fretsaw out.

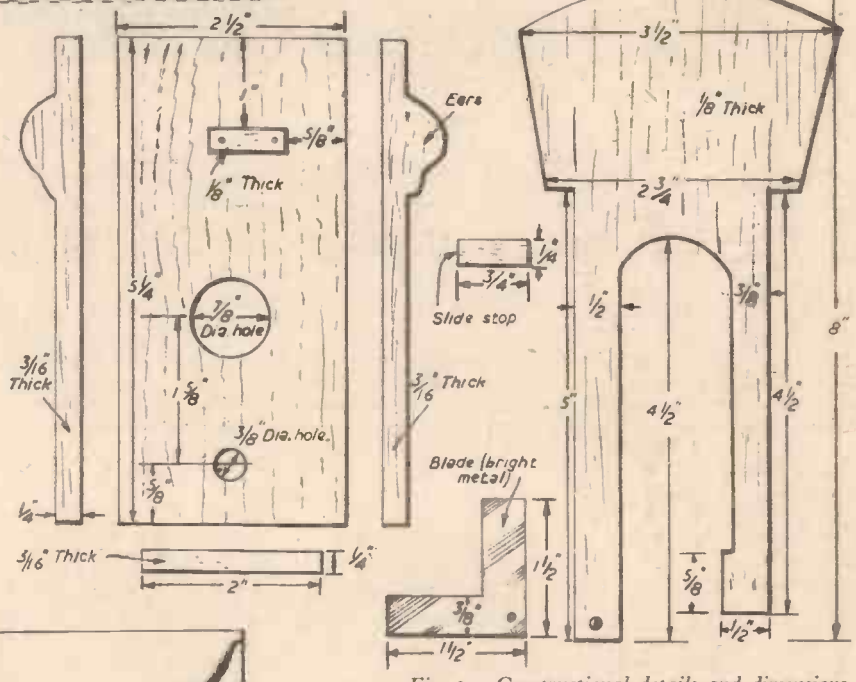


Fig. 2.—Constructional details and dimensions.

Cut the actual blade from a piece of thin bright metal. It is "L"-shaped with two equal legs each 1½in. long and ⅜in. wide. Drill a 1/16in. hole in the corner of the "L" and then fasten the blade with a rivet to a similar hole drilled in the end of the slide. Hammer the rivet heads flush but permit the blade to pivot easily—but not slackly.

Fit the slide to the case as shown. To prevent the slide being withdrawn from the case by the curious a stop block is fixed inside. This is simply a block of ply wood 3/16in. square by ¾in. long, tacked and glued to the case as shown.

The Action of the Chopper

When the blade is in the up position as shown in Fig. 1, it will actually cut just as though the metal blade were fixed solidly.

It is in this position that you let your friends feel the blade's sharpness and then really cut the bits of potato.

To bring about the illusion this is the secret move you must make: After chop-

ping the potato and with the blade at the bottom of its stroke secretly slip your finger into the mouth hole and withdraw the blade to the top of its travel. As your finger meets the blade from above the blade will pivot round it and hang like a letter "L" upside down.

Now, show the slide as before—it will look exactly the same—and put some more potato in the lower hole. Slip your finger in the Chinaman's mouth then slam the slide home.

As the blade descends and meets your finger it will pivot round to its upright "L" position thus enabling it to apparently cut through your finger and really slice the bottom bit of potato in half again. A perfect illusion.

Screw on the face-board to complete the trick and decorate in red and gold and black, painting the front of the case to resemble a Chinaman's face as shown.

When presenting the trick, tell the story of how Mai Big To, the Chinese conjurer, escaped the executioner's knife by saying his magic word at the right moment. It was: "No-Wantee-Shavee!"

A Sports Viewfinder

Designed for Photographing Fast Moving Objects and Fitting in the Accessory Shoe

By A. IVES

THE reason for making this viewfinder is that the author's miniature camera viewfinder, like those on the majority of 35 mm. cameras, is too small and gives an insufficient field of view for sports subjects. As a result, when developing the film, it was often found that only half the object was on the negative. The viewfinder to be described was so successful that it is used for almost every type of work as it assists composition.

Print Shape Frame

The 35 mm. negative has a much greater length-to-breadth ratio than have the standard printing papers and consequently when photographing a person or object and filling the negative completely in order to get maximum print detail, it was found that either the head or feet must be cut off when making a print or a long narrow print made, with a consequent waste of printing paper. In the finder described the stepped corners have only to be lined up with the extremities of the subject to enable a normal-shaped print to be obtained.

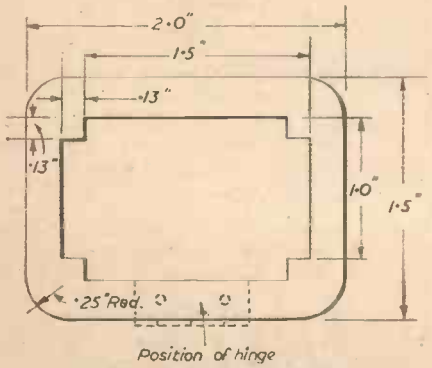


Fig. 1.—The front frame.

It can be used without trouble from parallax down to about 6-8ft. and is much easier to use than the conventional finder owing to its extended field of view. It was made for about 6d. (the cost of the hinges), enough scrap brass being available to make the rest.

Construction

The front frame is constructed to the dimensions in Fig. 1 from 18 s.w.g. brass; up to 24 s.w.g. could be used, but not below as the frame would not be rigid enough. Mark out the shape of the frame and then drill 3/32in. dia. holes in each corner of inside of frame, just clearing the marked out line. A line of 3/32in. holes is then drilled all round the inside of the frame. The metal between the holes is then filed out and the centre square of metal removed. Swiss needle files are ideal for this type of work. When the centre is filed accurately to shape, cut and file the outside profile. Accurately mark out the position of the hinge.

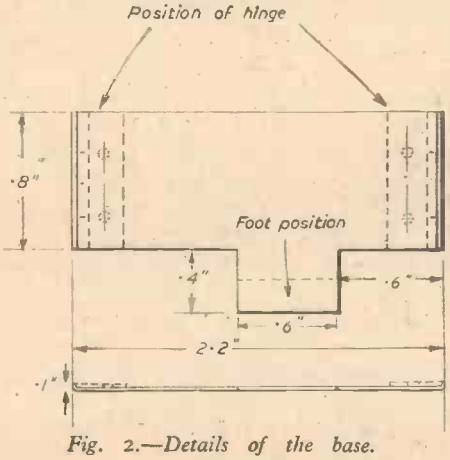


Fig. 2.—Details of the base.

The Rear Frame

Details and dimensions of this are shown in Fig. 3 and it is made in a similar way to the front frame. The metal used is 18 s.w.g. brass. The central hole is made by drilling two 3/16in. dia. holes, each just clearing the marked sides. Centre pop the positions before drilling as the drill may wander and spoil the job. Finish with needle files and again mark the position of the hinge.

The Base

Make this from 18 s.w.g. or thicker brass and mark out to the shape shown in Fig. 3. The 2.2in. dimension can be made 2.5in. or more to make bending easier. Cut out and file to shape and then bend ends up at right angles. Mark .1in. from bottom of plate and cut off so that dimensions are again exactly as in Fig. 2. Mark the position of the hinge, making sure that the end of the hinge lines up with the inside of the bend. Also mark the position of the foot.

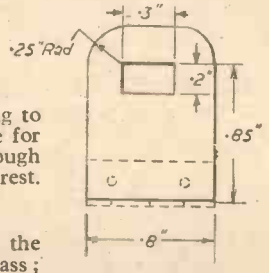


Fig. 3.—The rear frame.

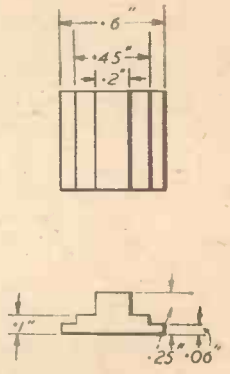


Fig. 4.—The foot.

Although this frame is designed for the Retina 1a, it can be modified to fit any miniature camera of normal negative size, by measuring from centre of camera accessory shoe to centre line of camera lens and modifying base of finder to suit camera.

The Foot

This is made from ⅛in. thick brass and should be filed to the shape and dimensions shown in Fig. 4. Make sure it will slide into and remain firmly fixed in the accessory shoe on the camera.

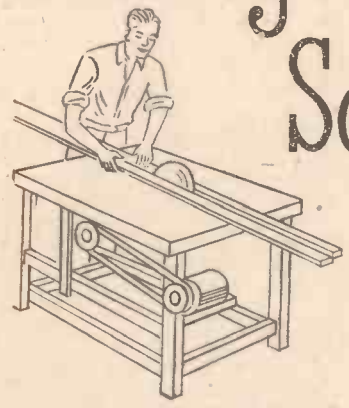
Assembly

The parts may be assembled either by riveting or soldering, but soldering is the neater method. Clean the parts to be soldered thoroughly, tin them and then sweat them together.

When assembled, file bent up ends of base, until frames will fold up at right angles to it. If the hinge is too loose, crimp the hinge pins with long-nosed pliers until the frames will remain rigidly in position when opened up. The hinges, which can be bought at any tool stores are .8in. long.

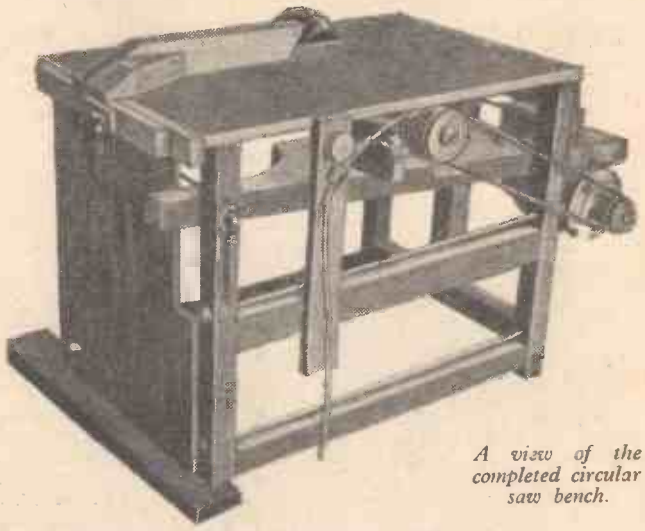
To use the sports finder place eye up to rear frame and superimpose rear frame on front frame. Keep the object to be photographed in the centre of the frame by following it with the camera, squeezing the release when ready.

Making a Circular Saw Bench



A Useful Design With a Rise and Fall Spindle

By JAMES VOSE



A view of the completed circular saw bench.

THE amateur's workshop is, as a rule, too small to hold a saw bench in addition to the normal workbench, but the design obviates this drawback. Although the rise and fall spindle was not fitted primarily with this purpose in mind, it does, in fact, enable the spindle and saw to be lowered out of the way in a moment, when the bench can be used as an ordinary workbench. A vice can be fitted, secured by a single wing nut, and this will be found adequate for most jobs tackled in the home workshop.

The machine has been in use for many years, and is capable of ripping and cross-cutting up to 3in. deep (even more in emergency by double cutting), as well as grooving and rebating. By the addition of a drill chuck and a grinding arbor, boring, drilling and grinding can be accomplished. Its versatility is shown by the fact that it has cut many tons of rough logs for firewood, whilst at the other extreme it has been used for extremely fine work on camera and scientific instrument construction.

Some modifications have been made in the drawings, on the original design shown in the photographs, partly to make the machine more compact, and to allow the motor and belt to be totally enclosed, and partly to enable a spindle assembly to be used, which can be purchased ready built. A ½ h.p. motor is recommended, and this will drive a 12in. diameter saw provided the saw is kept sharp and with the minimum set. The biggest fault with most of the small sawbenches offered for sale is that the table is too small to support the work adequately. In this machine the table is of generous size—3ft. by 2ft. This makes sawing very much easier and safer, especially when handling thin sheet materials like hardboard or plywood.

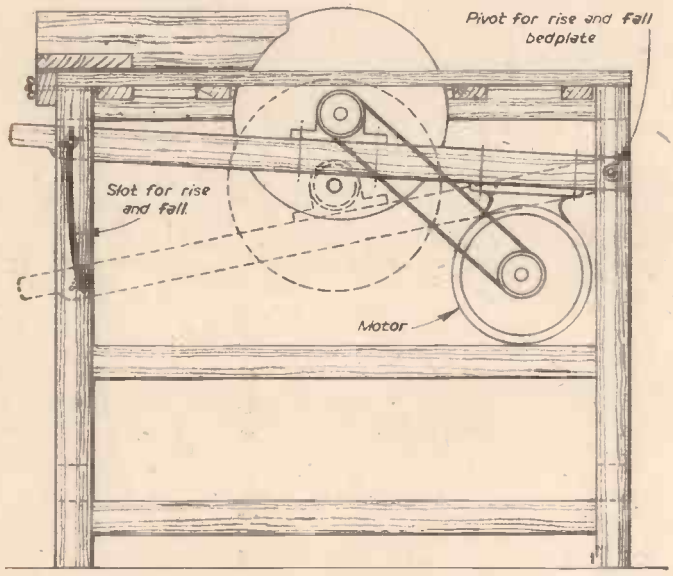


Fig. 1.—General layout and constructional details.

LIST OF MATERIALS

Bench

4 Legs 2ft. 9in. × 2½in. × 2½in. Hardwood.
4 Rails 3ft. × 2½in. × 2½in. Hardwood.
4 Rails 2ft. × 2½in. × 2½in. Hardwood.
1 Extra Leg 2ft. 6in. × 2½in. × 2½in.
1 Bedplate 3ft. 6in. × 10in. × 3in.

Table Top

Boards to make 3ft. × 2ft. × 1in. thick.
4 Battens 1ft. 9in. × 3in. × 1in.

Fence Assembly

1 Fence 1 ft. 8in. × 4in. × 1in.
1 Slide 1ft. × 2in. × 1in. slotted.
1 Gusset 10in. × 5in. × 1in. triangular.

Spindle Assembly

1 Spindle 15in. × 1in. dia. Mild Steel.
2 Collars 3in. dia × ¼in. thick Mild Steel.
1 Nut ⅞in. Whitworth.
1 Pulley 2½in. dia. Vee pulley for ½in. belt.
2 Plummer blocks for 1in. dia. spindle (one locating type) or complete assembly can be purchased from S. & G. Sergent, Old Costessey, Norwich, Norfolk. Price £4.15.0.

Motor

½ or ¾ h.p. motor with suitable Vee pulley. Vee belt (endless) of required length. S. & G. Sergent.

Various

Bolts and nuts, wing nuts, tie rods, screws, etc.

Construction of the Sawbench

The general construction of the machine is shown in Fig. 1, and in Fig. 2 a cut-away view of the framework shows the rise and fall action. Fig. 3 is a plan underneath the table top. The framework is built up from 2½in. by 2½in. hardwood—oak, beech or ash—and this should be well seasoned to prevent the possibility of warping after assembly. The rails are tenoned into the legs, glued and wedged. The original machine also has ⅝in. diameter screwed tie-rods passing through the legs from side to side and from end to end, alongside the rails, and fitted with nuts and washers to enable the joints to be pulled up tightly and to assist in maintaining rigidity. These are not shown on the drawings, but it is recommended that they should be fitted.

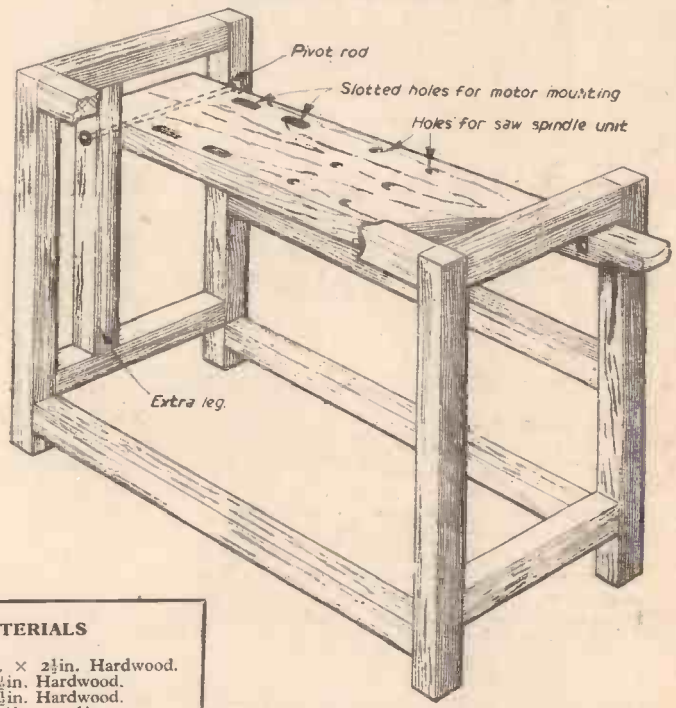


Fig. 2.—A cut-away view showing the rise and fall action.

There is no top rail at the back as this would interfere with the rise and fall spindle. Instead, a rail is fitted lower down, just below the motor pulley. An extra leg must also be tenoned in between the top and bottom rails at the "take off" end of the machine. This must be accurately positioned so that the 10in. wide rise and fall bedplate will slide in tightly. No play can be permitted at this point.

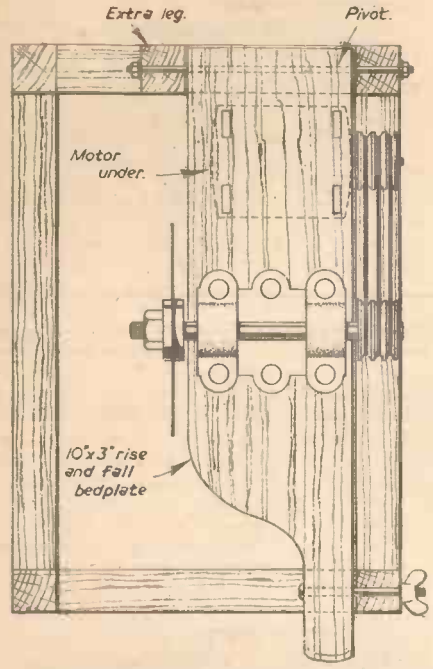


Fig. 3.—A plan view underneath the table top.

The rise and fall bedplate, to which the motor and the spindle assembly are bolted, is 3ft. 6in. long, 10in. wide and 3in. thick. During use it is subject to a certain amount of twisting, due to the downward cut of the saw, causing an uplift at the spindle end, so it is essential that the wood be sound and dry. It will be seen in the photographs that in the original model this bedplate was extended at the "take off" end of the machine, and the motor mounted on the extended portion. The advantage of this is that the motor counterbalances the weight of the spindle, but as the extension is sometimes found a bit of a nuisance the motor is shown on the drawings enclosed within the bench framework. The extra weight on the rise and fall bedplate will not be a serious disadvantage. One end of the bedplate is pivoted on a ¾in. dia. steel rod, which passes right through the 10in. width of the bedplate, and through the two bench legs, and is threaded at each end for nuts. These nuts must be tightened, against washers, until the necessary pivoting movement is fairly stiff and completely free from play of any kind. The holes in the wood must, of course, be a close fit for the ¾in. rod. They may be bushed, if desired, though this is not really necessary as the movement is only slight and occasional.

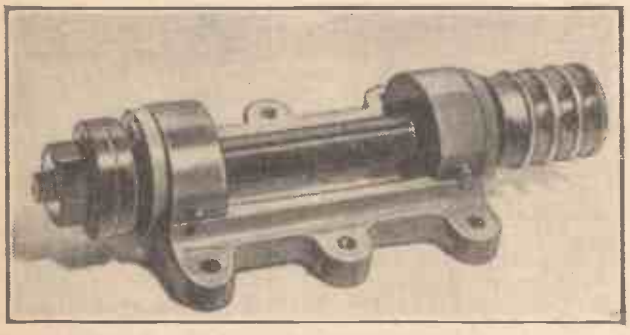


Fig. 4.—The spindle assembly as purchased.

The other end of the bedplate is reduced in width to 3in. and shaped as shown in Fig. 3. The projecting 3in. piece is the handle for adjusting the height of the spindle, and should have its edges rounded off for comfort in handling. A ½in. bolt through the handle works in a curved slot in the bench leg, and has a large washer and wing nut on the outside of the leg. To adjust the height of the saw above the table, for such operations as grooving or rebating, the wing nut is slackened, the bedplate adjusted to the required height by hand, and the wing nut retightened.

No fine adjustment has been provided for the rise and fall, and in practice this has not been found to be any disadvantage, but a long screw adjuster could easily be fitted if desired. From the safety point of view it will be noted that, if by some mischance the rise and fall adjustment should slip, the saw will drop out of the cut, out of danger, and not in to the cut, as is the case with a rise and fall table.

The motor is mounted upside down, bolted through slotted holes to allow for adjustment of belt tension. As the motor and the spindle are both mounted on the same bedplate and both rise and fall together, the belt tension remains constant, no matter what height the spindle may be fixed. Note that to enable the saw to have the maximum projection, so giving the biggest depth of cut, the pivoted bedplate must be so fitted that, when it is in its highest position, the spindle bearings are tight up against the underside of the table.

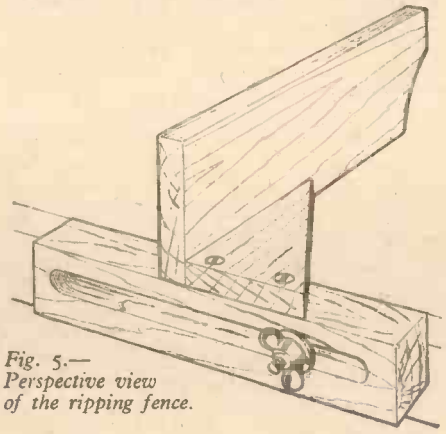


Fig. 5.—Perspective view of the ripping fence.

The Table

The table top is of 1in. thick hardwood, built up from narrow boards to the size 3ft. by 2ft. glued together, dressed off true, and fitted with battens glued and screwed on underneath. Maple floor boards were used in the original, and these have given excellent service. There is a big advantage in having a wooden top instead of a metal one, and that is that jigs and stops and special fences can easily be screwed down when required. The table does get worn in time, and for very precise work it is then necessary to fit a false table of thick plywood, screwed down over the worn top. A slot must be cut in the table top for the saw blade. This should be just wide enough to allow the saw to revolve without rubbing on the sides. A wide gap allows small pieces of the wood to get trapped between the saw and the side of the gap, causing buckling of the saw. It is not necessary to cut out a pocket for changing saws, because this can be done from underneath the table, when the spindle is lowered to its full extent. The top is screwed down to the top rails of the bench, and it is an advantage to sink the heads well down into counterbored holes, and cover them over with hardwood pellets glued in.

The Fence

Fig. 5 shows a simple fence which is required for straight ripping. It is made from a piece of hardwood 20in. long x 4in. x 1in., secured by means of a triangular gusset piece to a slotted slide about 12in. long x 2in. x 1in. This is secured in the required position by a ½in. dia. bolt, through the top rail, with a large washer and wing nut. The fence, for straightforward ripping, should not extend beyond the roots of the saw teeth, but for rebating and grooving the fence should extend right across the saw to enable the work to be supported for its full length. This can be arranged by screwing an auxiliary fence on to the main fence, when required.

The Guard

A guard for the saw is very necessary. If a risk is taken by not fitting a guard, sooner or later something, a short end of wood, or perhaps a tool, will drop on to the saw whilst it is revolving and be flung back violently, perhaps into the face of the user. A good guard can be made very easily by cutting a section from the bottom of a strong steel drum, as shown in Fig. 6. This is riveted to the flattened end of a length of ½in. steel rod, which is bent to the shape shown, and dropped through holes bored in the table top and in the back rail. If the end of this rod is threaded it can be secured to the rail with two nuts. This method of fixing enables the fence to be swivelled out of the way when it is not required for such operations as rebating or grooving.

A Riving Knife

This should be fitted to the guard. Its purpose is to keep the cut open at the back of the saw. Certain kinds of wood are liable to close in on the back of the saw due to locked-up stresses being relieved by the cut, causing the wood to lift and sometimes to be flung back violently. This riving knife should be cut from tool steel to a radius as shown. A suitable piece can be cut from an old, thick carving knife or from an old saw blade. It should be tapered so that the front edge is thin enough to guide itself into the cut, but the back edge should be slightly thicker than the saw blade, including the set. The riving knife is fixed to the guard with two small bolts and nuts, with a packing piece behind it to bring it into alignment with the saw blade. The lower

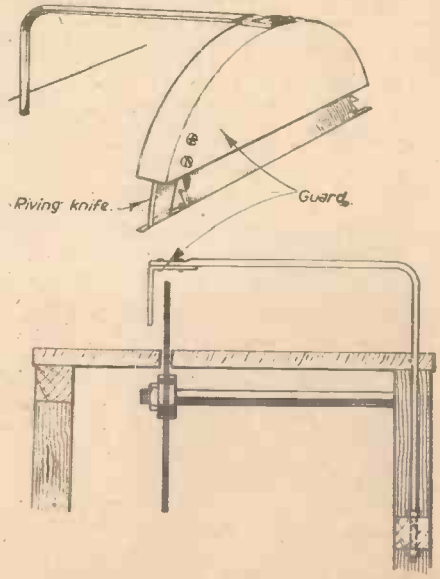


Fig. 6.—Details of the guard and riving knife.

end of the riving knife fits into the slot in the table top.

The Spindle

The spindle assembly shown in Fig. 4 can be purchased ready for use, but if machining facilities are available one can be built up as shown in Fig. 8. The 15in. long by 1in. dia. turned steel shaft is reduced at one end to ⅞in. dia. to form a shoulder 2in. from the end, against which the fixed collar is butted. This collar is 3in. dia. x ½in. thick, and is shrunk, brazed or welded into position. This collar should be faced true whilst on the shaft, and a 2in. dia. recess formed in the face about 1/16in. deep, so that the saw will be clamped around the edge only. A ¼in. silver steel pin is screwed into a hole in the collar, in a position to suit the driving hole in the saw blade. A similar collar, but bored a sliding fit on the shaft, and having a clearance hole for the driving pin, clamps the saw. The end of the shaft is further turned down 1in. in length, to ¾in. dia. and screw-cut ⅜in. Whitworth, for the clamping nut. The shaft is fitted into two double row self-aligning ball-bearing plummer blocks, one of which must be fitted with a clamping sleeve and ring nut to secure the spindle against end play. A suitable Vee pulley is keyed, or secured by a grub screw, to the drive end of the shaft. A 3-groove pulley is shown on the drawing, because this is the pulley fitted to the commercial spindle assembly, but, in fact, a single pulley has been in use on the original machine for years, and has never given any trouble.

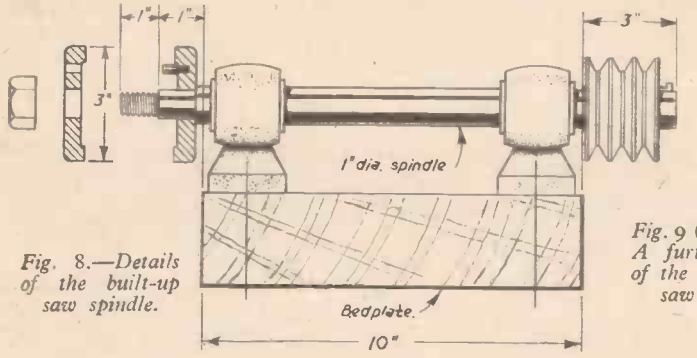


Fig. 8.—Details of the built-up saw spindle.

The Motor

A ½ h.p. motor was fitted to the original machine, and this has given good service. It is, however, a little underpowered for cutting thick materials, and, if the machine is required to do much heavy cutting, it would be advisable to fit a ¾ h.p. motor. A suitable diameter pulley must be fitted to the motor to give a circumferential speed of 8,000ft. or 9,000ft. per minute. With a 12in. dia. saw this means a speed of about 2,700 r.p.m. at the spindle, and this can be obtained with a 3,000 r.p.m. motor with a 2½in. motor pulley and a 2½in. spindle pulley. The spindle pulley must not be much bigger than this or it will foul the work when cross-cutting, or when cutting wide panels of plywood or hardboard.

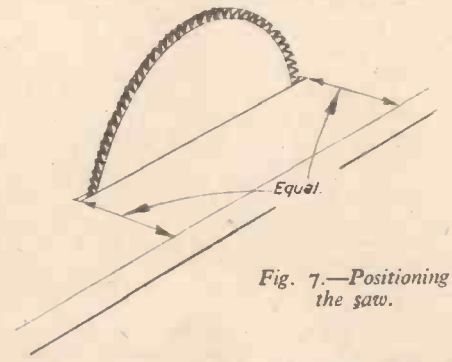


Fig. 7.—Positioning the saw.

A control switch should be mounted in a convenient position on the machine, so that it can be immediately switched off in emergency. An ordinary 5-amp. tumbler switch was used on the machine illustrated, and this has never given any trouble. It is, however, a bit fragile, and a substantial rotary or ironclad type of switch would be more suitable for this type of equipment.

The bench may be enclosed with boards, or with plywood or hardboard panels. The back and end panels can be fixed permanently but the front panel should be made removable by means of turnbuttons or similar simple fastenings, to enable access to be obtained for changing saws and removing sawdust.

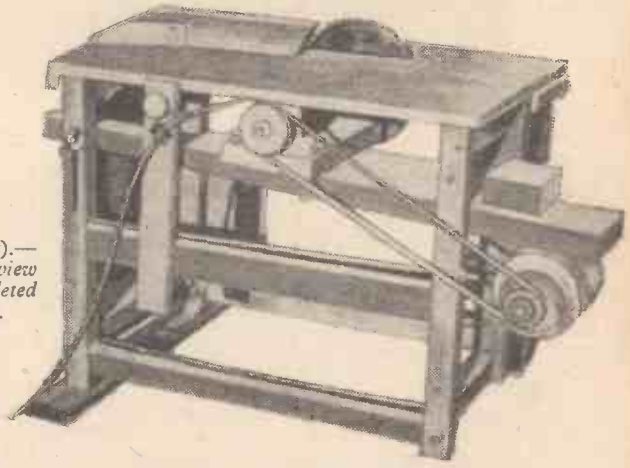


Fig. 9 (Right).—A further view of the completed saw bench.

Using the Machine

Before attempting to use the machine the following checks should be made. See that the motor and switch wiring is properly insulated and that the motor is earthed. Check with a straight edge that the pulleys are in alignment. Try the tension of the Vee belt. This should not be tight, but just sufficient to stop "whipping" when in use. Check the rise and fall through its whole range to ensure that the saw is clear of the table in all positions. The saw should be parallel with the table top. This can be checked by chalking one tooth and measuring from this tooth to the edge of the table in two positions, that is when the saw is turned, by hand, to bring the marked tooth first to the front, and then to the back of the table. (See Fig. 7.) Test, with a set square, that the saw is at right angles to the table. See that the fence is parallel with saw blade in every position. This can be checked by placing a straight edge against the fence and measuring from it to the edge of the table. See that the fence is vertical by trying with the set-square. A further view of the completed saw bench is shown in Fig. 9.

For the ordinary run of work a combination type of blade will do both ripping and cross-cutting, but where a quantity of either ripping or cross-cutting is to be undertaken, the proper rip or cross-cut blades should be used as they cut cleaner and quicker. The saws must be kept sharp at all times. Sharpening does not take long, and it saves a lot of time wasted in cleaning up rough work. Too much set should not be put on the saws as this wastes wood, takes more power to drive, and causes rough edges. With a saw in tip-top condition the edges of the sawn work should be almost as smooth as planed wood.

Making a Silk-Scr

THE silk-screen printing process, in its simplest form, is one which can easily be carried out by anyone having a moderate amount of skill in the formation of designs and lettering and the ability to cut simple stencils. As a hobby the process lends itself to many applications, enabling one to produce posters, showcards, signs, etc., on almost any material from paper to glass, in one or more colours.

Compared with other printing processes, the equipment needed to carry out silk-screen printing in the form here described is exceedingly simple and can all be made by the average handyman.

The Process

A brief explanation of the process will enable the builder to understand better the use of the various equipment and also help the reader to decide whether he has the necessary skill and patience to use the equipment successfully.

Silk-screen printing is widely used to-day in the production of all manner of displays and can be instantly recognised by its intense brightness and depth of colour and on closer scrutiny by the tell-tale pattern on the colour imparted by the silk. The brightest colours are fluorescent to some extent and are obtained by using paints of the Day-Glo variety. These, however, by reason of their cost, are a little beyond those practising the process as a hobby, but quite bright colours can be obtained by using standard paints.

As the term implies, the process involves the use of a screen of silk which serves to carry a cut paper stencil. When this screen with its stencil attached is placed over a sheet of material to be printed upon and paint forced through the silk by the use of a squeegee a pattern is formed which is an exact replica to that of the stencil. The cut-out portions of the stencil leave the silk mesh clear whilst the paper acts as a barrier thus preventing paint from contacting the surface of the material being worked. This material could be paper, card, wood, metal, plastic or even glass or cloth. This, then, is the basic principle of the process.

Silk-screen Holding Frame

The purpose of this is to hold the silk taut. The joints of this frame need to be well-made as it must lay perfectly flat and be free from any winding. Wood, 2in. by 2in. should be used as the frame must be quite strong and rigid. Fig. 1 shows the formation of the frame, the dimensions given being suitable for the production of posters, which are usually based on Crown paper size (15in. by 20in.). If the work contemplated calls for a different size, the frame must be made slightly larger all round than the size of the printed sheet. The underside of the frame must be grooved as shown and strips of wood cut to fit tightly into these grooves. The inside edges of the grooves, where indicated in Fig. 1, must be smooth and slightly rounded to prevent tearing of the silk. The wood strips should be drilled to take screws—about 5 on the long strips and 3 on the short.

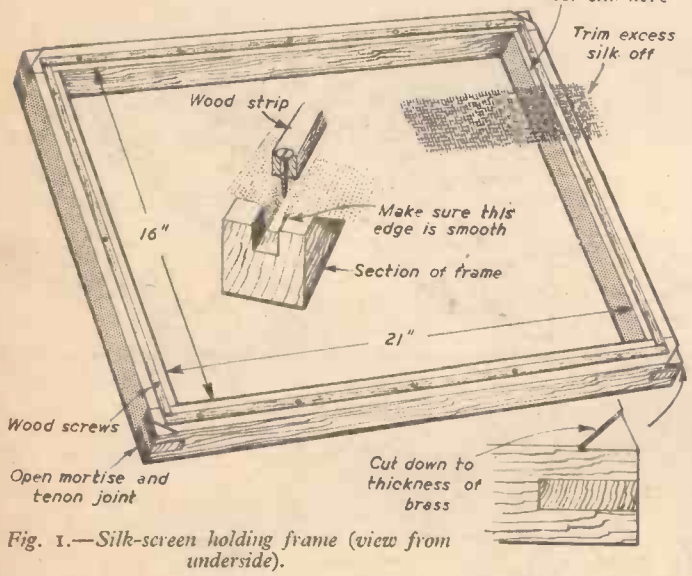


Fig. 1.—Silk-screen holding frame (view from underside).

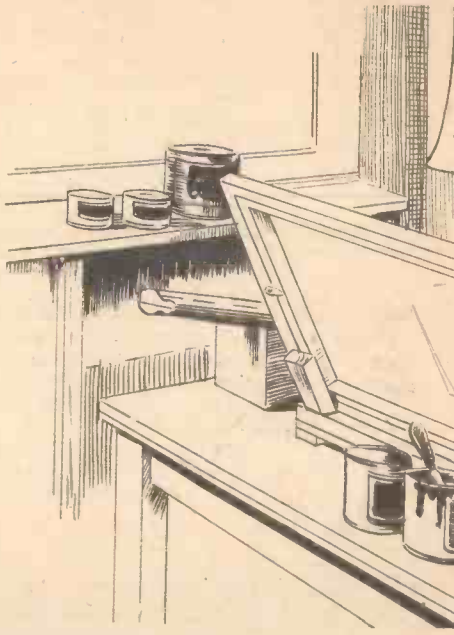
The Main Frame

This must now be made in the same manner as the one already described, but without grooves. The dimensions of this frame must be such that it fits round the silk-screen holding frame (see Fig. 5). Four strips of metal are screwed at the corners of the underside as shown in Fig. 2, and are let in flush with the surface of the wood. When the smaller frame is placed in the larger frame it is held by these strips and the wood should be cut away to the thickness of the metal to allow each frame to be perfectly level. Turnbuttons on the main frame hold the screens together. A prop of about 5in. in length is screwed to the side of the main frame and should be drilled to allow it to swing freely. A strip of 2in. by 2in. is now cut the length of the long side of the main frame, and is hinged to the main frame with two hinges as shown in Fig. 3. The back stops shown in Fig. 5 should also be fixed at this stage.

The Baseboard

This must be made from a perfectly flat piece of plywood, ½in. thick or more. Two strips of 1in. by 1½in. wood are fastened along either side of the underside to raise the base clear of the worktable. The back edge of the base is drilled to take two coach bolts which pass through the strip of wood hinged to the main frame. Wing-nuts should be employed with these bolts to enable the user to undo this fastening quickly. By inserting a strip of the material being printed on between the base and the wood strip (A, Fig. 3), varying thicknesses can be worked

To position material being printed upon on the base some form of guide or lay must be provided. In the case of two or more colour printing it will be realised that the sheet must occupy exactly the same position each time it is worked. Lays of a fixed kind cannot be used as these would prevent the silk from laying perfectly flat in contact with the base. This problem is overcome by the use of the lays indicated in Fig. 4, these being fastened underneath the base at the points indicated, the base being drilled to allow wire pins to move freely up and down. These pins, which must be perfectly smooth on the upper end, are pushed down by the silk when the frame is lowered and pop up again immediately it is raised to position the next sheet. A blob of solder is used to act as a counter weight. Six such lays should be made so as to provide for two sheet sizes to be accommodated. Simply remove the pins of the lays not being used.



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The Squeegee

This is the next item of equipment to be made and one will be sufficient at first. It should be the length of the inside measurement of the short side of the silk-screen

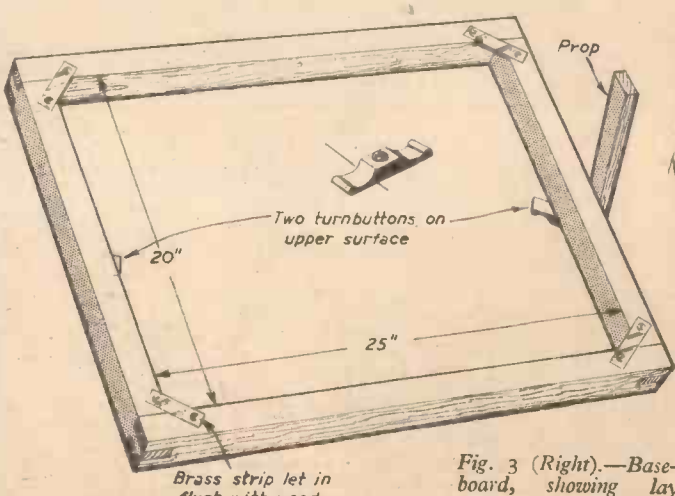

Fig. 2.—Main frame (underside view).

Fig. 3 (Right).—Baseboard, showing lay positions for two sizes of sheet.

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C. WILKINSON

holding frame. Later it will be found that shorter squeegees are useful when printing a smaller area. They are used in conjunction with a piece of wood, as in Fig. 9, which serves to reduce the silk frame.

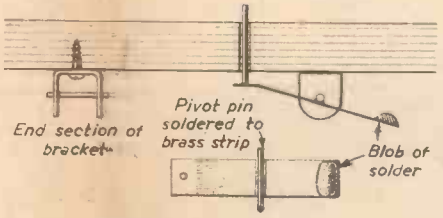
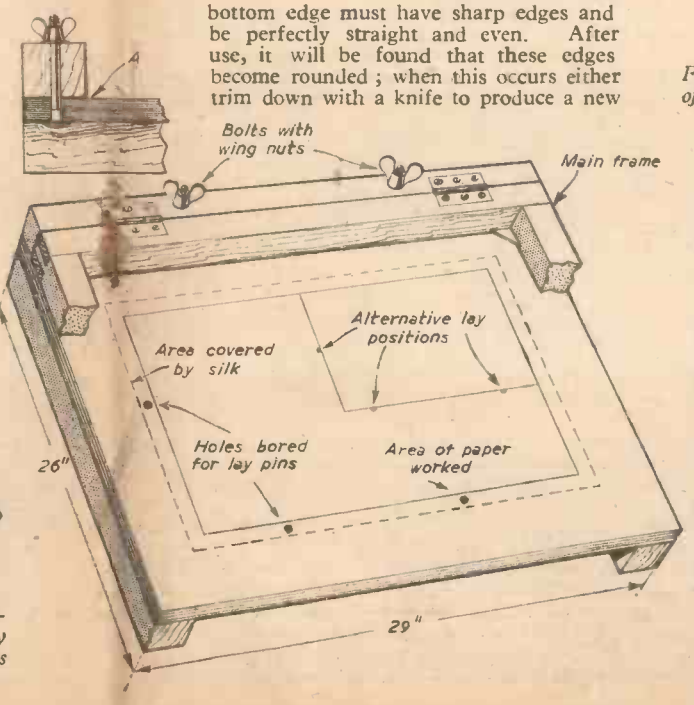


Fig. 4.—The brass lays.

Fig. 6 shows how the squeegee is formed. The rubber used should be about ¼in. thick and 3in. wide as used in rubber floor scrapers. It should be quite stiff and hard. The bottom edge must have sharp edges and be perfectly straight and even. After use, it will be found that these edges become rounded; when this occurs either trim down with a knife to produce a new edge or rub on a flat piece of coarse sandpaper. Two screweyes are positioned as shown to slip over nails positioned at either end of the silk frame and hold the squeegee when not being worked so that it cannot fall over into the paint.



The Silk Used

The main essentials for this are that it must have an even and open mesh and great tensile strength to resist the drag of the squeegee as it is passed over. The most suitable material possessing these qualities is silk bolting cloth, as used by millers to sift flour. Various grades of mesh sizes are made, 70 meshes to the inch being about the best for general use. However, as this is not readily obtainable and is apt to prove a little expensive, two other alternatives are taffeta silk and organdie. These are not quite as strong and may have to be renewed more often.

Having obtained the silk or organdie (a piece about 20in. by 25in. would be required for the frame dimensions given) this must be stretched very tightly over the frame. The best method of doing this is to position the silk frame, groove side up, on a table and lay the material evenly over it. Place a strip of wood over the silk on the long side and hammer this evenly home, finally fixing with wood screws. Now stretch the silk across to the opposite side and pin temporarily with drawing pins. Place another strip of wood over the silk and repeat the action. The silk should be stretched now in one direction. Repeat this procedure with the short edges and the result should be a silk screen which is as tight as a drum. Great care must be taken from now on as, in this stretched state, the silk is very easily torn. To further fix the silk and also to act as a seal, the inside edge of the frame where the silk passes over (Fig. 1) is painted liberally with either varnish or rubber solution. The actual printing unit is now ready.

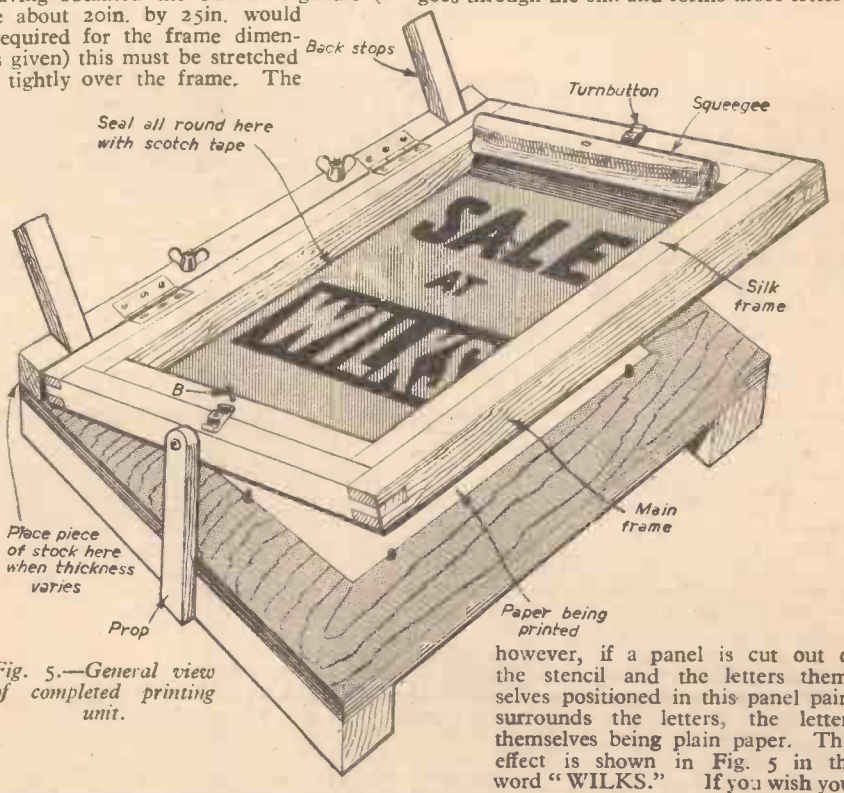


Fig. 5.—General view of completed printing unit.

The Master Drawing

The next step is to prepare the design or lettering you wish to reproduce and make a master drawing. For a first attempt it will be best to keep a simple design and large lettering: more ambitious work coming with increased proficiency and practice. If your ability as an artist is limited, the lettering can all be traced from newspapers or magazines. For the stencil a piece of bank paper or any thin, strong paper should be used (your local printer will supply this at moderate cost). It should be considerably larger than the frame itself. Place it centrally over the master drawing and trace the details. This is made far easier if an illuminated glass-topped table is used as shown in Fig. 8, but this can be an added luxury, as no doubt the reader at this stage will be eager to try his hand at the actual printing. The stencil now requires cutting. Remember that only the parts where the paint is required to print are cut away. With such letters as O's and A's it will be found that the centres are loose when cut, these pieces must be carefully saved for positioning on the silk later. When the actual letters are cut out, paint goes through the silk and forms those letters, however, if a panel is cut out of the stencil and the letters themselves positioned in this panel paint surrounds the letters, the letters themselves being plain paper. This effect is shown in Fig. 5 in the word "WILKS." If you wish your printing to appear in two colours, a stencil must be made for each colour and printed in two separate workings.

Having cut the stencil, place the master drawing on to the lays on the base, the frame resting on the back stops. Place the stencil over this, positioning the cut-out portions exactly over the drawing. Lower the frame carefully and dab glue through the silk at points all over the stencil, avoiding those parts where the stencil is cut away. Any glue which accidentally falls on the open parts must be wiped away as it would clog the mesh if it were allowed to set. When fast, raise the frame and fasten down the edges of the stencil with scotch tape. The loose parts of the odd letters must now be fixed to the silk. This is done either by positioning them on the master drawing or on the actual silk. Care should be taken to see that they are firmly glued as it is very exasperating if these small pieces come loose when one has

started printing. It only remains now to seal the corners on the upper surface of the frame all round where the silk and frame meet. This is to prevent paint from seeping under the edge of the stencil. The unit is now ready for printing.

Printing Preparations

Check that everything is ready to hand and make sure that there is plenty of room to lay the wet sheets out. Racks are very handy for this as the sheets must not be placed one on the other in the wet state. Once the printing is started it must be continued until all the sheets you require to be printed are finished. If one leaves the paint in the screen for anything more than a few minutes there is a tendency for the paint to clog the mesh, resulting in a patchy print.

Types of Paint

The paints used in the process, and which

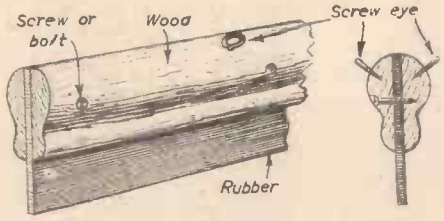


Fig. 6.—Squeegee.

are within the scope of the hobbyist, fall into three classes. They are oil colours, cellulose lacquers and water colours. Oil colours are suitable for use on paper, card and wood, as also are water colours. Cellulose lacquers are suitable for working on metals and glass. Water colours are little used to-day but are quite workable if care is taken in keeping an even consistency. They must not dry in less than about half an hour; the addition of a small quantity of glycerine, molasses, glucose or honey will retard the drying. Clogging of the silk is more likely with these water colours than with oils or lacquers.

The most commonly used paints are oil colours, thinned with turps to a creamy consistency. The drying is retarded by the addition of boiled linseed oil. If oil colours are used for outside work they should be protected by a coating of varnish (easily applied by screening) although gloss oil colours are obtainable. Due to the varnish content these are rather slow drying and do not require to be retarded.

Cellulose lacquers give a more permanent finish and are most suitable for metal signs, etc., which are likely to be hung outside. By the nature of their composition they are very quick drying and must be worked as quickly as possible. It is, however, possible to retard the drying by adding a little non-

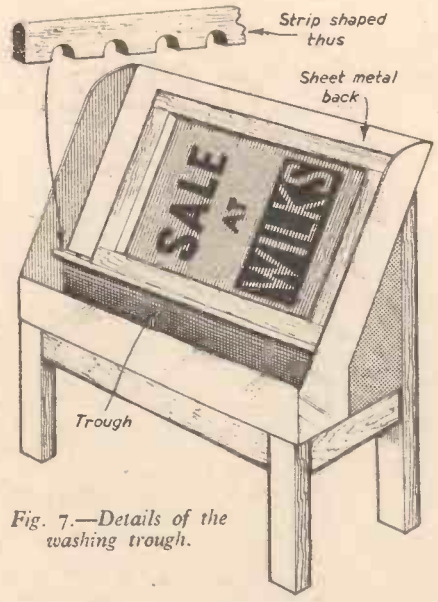


Fig. 7.—Details of the washing trough.

drying castor oil or rape-seed. Cellulose thinners are used with these paints and also to wash the screen when the printing is finished. Paints specially prepared for silk screen printing are obtainable from your local art dealer or from Messrs. Coates Bros. (Inks) Ltd., Easton Street, Rosebery Avenue, London, W.C.1.

Printing

Having chosen the paint you are to use it must now be mixed to a consistency of cream. If it is applied too

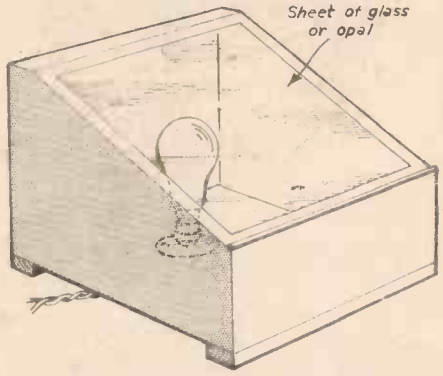


Fig. 8.—Illuminated tracing table.

thin there will be a tendency for it to run under the stencil, and if too thick, to clog the silk. Pour a little paint at one end of the silk with the frame lowered, having positioned a sheet in the lays. Take the squeegee firmly in both hands and draw the paint over the silk to the other end making sure that the paint spreads over all the surface. The first one or two prints may not be very clear but once the silk is well soaked, clear prints will result. It is most important when drawing the squeegee across the silk to maintain a firm downward pressure in order to hold the stencil in close contact with the sheet and to force the paint through the silk. The sequence of printing is a steady one. Place a sheet in the lays, release the prop with the fingers, lower the frame gently and draw across the squeegee, keeping a fair amount of paint in the frame. Lift the frame when the prop will fall into position. The sheet will be found to be stuck to the underside of the stencil; gently pull this away and place carefully aside to dry, place the next sheet in position and repeat. On releasing the squeegee, slip the screweye over the nail on the frame so as to prevent it falling into the paint.

Do not be disappointed if your first attempt is not too successful as a certain amount of practice will be necessary. When the teething stages have been passed first-class work on all manner of materials can be produced.

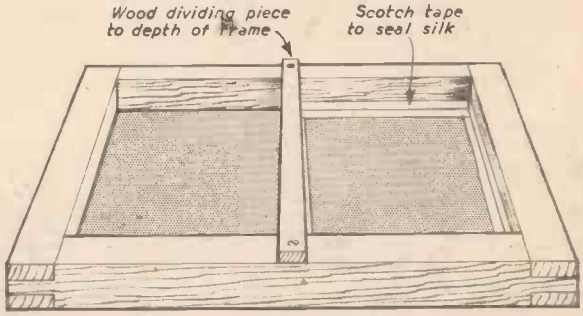


Fig. 9—Dividing frame to take smaller sheet to enable two colours to be worked at once.

When the complete stock of sheets has been printed, remove the silk frame from the main frame. Lay this in a convenient place and carefully remove the surplus paint. A paint scraper is best for this but care must be taken to see that all sharp edges are removed or torn silk will result. Now proceed to wash all traces of paint out of the screen with turps. The stencil and scotch tape are removed by washing with warm soapy water. This will serve to further clean the silk. A useful accessory for the washing of the screen is the trough assembly shown in Fig. 7. Do not forget to clean the squeegee as any paint drying on this will be difficult to remove.

When one has become proficient it will be found that by masking off the frame as shown in Fig. 9, two colours may be worked at once by using two short squeegees, one for each colour.

Hæmophilia Antidote

AN effective blood clotting agent has been produced by research workers at the Lister Institute of Preventive Medicine. This will provide an effective antidote to the blood disorder, hæmophilia.

Bridge Mountings in Rubber

INCREASED interest is being shown in the use of rubber for preventing vibration in bridges and several designs incorporating this development have been recently passed by the Ministry of Transport.

Electronic Eye for Colour Printing

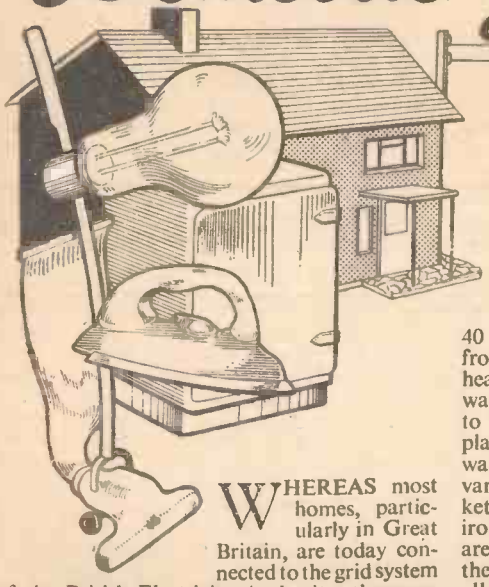
COLOUR printing processes will be greatly simplified by a new electronic device known as the H.P.K. Autoscan. This is a reproduction camera with electronically-controlled light output for scanning coloured copy and producing colour and tone corrected separation negatives. A great advantage is that no attempt is made to record unsuitable densities and then correct them electronically, but a highly sensitive beam scans the coloured original and the impulses are recorded directly on to a photographic plate. Details are available from Hadley Telephone and Sound Systems, Ltd., 72, Cape Hill, Smethwick, Birmingham.

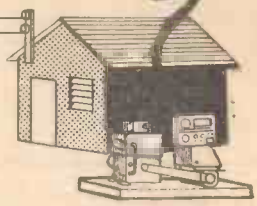
Diffusion Alloys

TECHNOLOGISTS at the Battelle Institute Ltd. have turned metal sandwiches, formed by electroplating differing metals on top of one another, into evenly blended metal alloys. These diffusion alloys can be used for metal products which must be exposed to corrosive environments, such as very hot gases. The alloys serve as coatings to protect the underlying metal which may possess the required strength, but lack high temperature corrosion resistance. The electroplated layers of metals are heated at a temperature below the melting point of both metals when a homogeneous alloy is formed.

The metals are not melted during this process.

Domestic Generating Plants





A Reliable and Economical Method of Supplying Electricity in Your Own Home

By ROLT HAMMOND, A.C.G.I., A.M.I.C.E.

WHEREAS most homes, particularly in Great Britain, are today connected to the grid system of the British Electricity Authority, there are many isolated homes abroad and some in this country which have their own generating plant.

In the past many country houses have been supplied with electricity by automatic sets, using an engine of petrol or diesel type in conjunction with storage accumulators, but this equipment is now obsolete and has been replaced by fully automatic engine-driven plant, which starts when any domestic light or power point is switched on and stops when the last light or power point is switched off; this kind of plant has completely eliminated storage accumulators, and experience has proved that it is reliable and economical.

Any householder who contemplates installing a private generating plant should consult his local electrical contractor, who will be able to give him sound advice on the most suitable size for his own particular needs. As an approximate guide, electrical appliances and lights consume power which is expressed in watts; one watt being one volt multiplied by one ampere and 1,000 watts being 1 kilowatt. It is convenient to express power requirements in kilowatts, because generating sets are always rated in kilowatts. It should be quite simple to calculate your own needs, with due allowance for possible extra power demand at peak periods.

Here it is important to remember that all lights and appliances will never be on at the same time, and it is reasonable to assume that it will be necessary to cater for about two-thirds of the estimated total load. With modern equipment, it is impossible to overload the plant to a point which could damage it, because a circuit breaker will trip and cut off the current at a predetermined overload. The machine only runs when light or power is being used, normal wiring is installed, and this is equally suitable for use when a mains supply becomes available.

Moreover, it is only necessary to attend the plant for refuelling and lubrication, and these visits can be arranged to suit the householder; they need not be more frequent than after 100 hours of use, say every three weeks, and then only for a few minutes. The equipment will adjust itself to the load within the rated capacity, both instantly and automatically.

Alternating current at standard voltage is available, so that radio sets, vacuum cleaners and all other appliances can be used, which normally run on a mains supply. The consumption of electric lights will range from 40 to 100 watts, and a radio set consumes from 50 to 350 watts; electric fires make a heavier power demand, from 500 to 1,500 watts. A vacuum cleaner consumes from 150 to 750 watts and a small electric cooker, hot plate or grill will require from 500 to 2,000 watts. Consumption of a washing machine varies from 100 to 250 watts and an electric kettle will need from 350 to 1,000 watts; an iron requires from 250 to 750 watts. These are the main types of equipment installed in the average home, but full information about all this can be obtained from the local electrical contractor.

Fig. 1.—Twin-cylinder petrol engine driving generator.

Installing the Plant

Those who live in a remote place may have to instal the plant themselves, and the first essential is to provide a good foundation of rich concrete, in which holes are left for the holding-down bolts; it is a good plan to make a jig for these bolts, and cast them in place into the block. It is vitally important that the plant should be perfectly level on its foundation; as soon as the concrete has set, the holding-down bolts should be tightened again after the plant has been running for a few days. A few days should be allowed to elapse before the plant is started up, in order to allow the concrete to set firmly; it is a good plan to keep the concrete wet during this period.

The engine room should be well ventilated, clean and free from dust, and the exhaust pipe must on no account be allowed to exhaust inside the engine room. After the plant has run for about twelve hours, all cylinder head bolts should be tightened, and all nuts and studs should be tightened when the engine is warm, where necessary. Successful operation depends on regular attention, and the plant should be kept clean. Starting batteries, when fitted, must be topped up with distilled water.

Care of Batteries

For export, batteries are shipped uncharged and sealed; they must be charged at a battery service station or garage. Although they need very little attention, such attention is important, and the battery should rest on strips of wood, clear of any moisture on the floor. Dust or dirt should not be allowed to accumulate, as this may cause a short circuit between the cells and discharge the battery. Either pure distilled water or clean rainwater may be used for topping up, but neither hard water nor any water which has come into contact with metal should be used.

Under normal service, the starting battery is kept automatically charged, but the condition of its solution should be checked periodically with an hydrometer, a simple device for measuring specific gravity. This should never be done just after adding distilled water, and the specific gravity of a fully charged battery must be between 1.270 and 1.290; specific gravity below 1.200 indicates a discharged condition. Gravity readings of all cells should be about the same, and a difference of more than 25 points reveals a partial short circuit in that cell and prompt attention from an expert is necessary.

If a battery is allowed to stand in a discharged or semi-discharged state, sulphate will form on the plates and

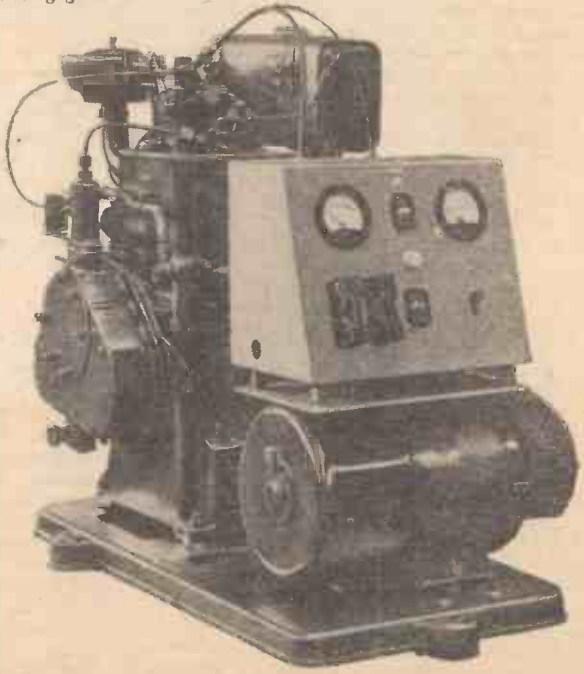


Fig. 2.—An Alco diesel-driven alternator set.

the battery will soon be useless. If the plant must stand idle for a week or longer—as when the householder is away on holiday, for example—the battery should be fully charged and the terminals disconnected from the plant to prevent it running down because of leakage through the wiring. There is no danger of the battery solution freezing, even in the coldest weather.

If the battery should be run down through lack of use, the plant can be started without it, although from the time that the battery is disconnected the plant will cease to be automatic and must be started each time by the hand crank. If the engine is cold, it may be necessary to prime it by moving the fuel lever up and down a few times.

Care of Generator and Brushes

Care of generator and brushes is extremely important ; the inside of the generator should always be free from dirt or grease, and the brushes must fit well in their holders, free to move without sticking and yet not so loose that they will vibrate or get out of alignment. If brushes are worn and the commutator is blackened, the latter should be cleaned with fine sandpaper. A gummy material may collect on the brushes after a period of service, when the brushes should be taken from their holders and cleaned with petrol or carbon tetrachloride. The springs should press each brush against the commutator with equal pressure.

Commutator and brushes are the only components of a generator subject to wear ; a clean well-adjusted commutator has a polish of mahogany colour. It cannot be emphasised too often that dirt, oil and water are highly injurious to any electrical machinery, and that it is very important to keep the commutator clean. Never put oil or other lubricant upon it, give it an occasional wipe with a clean cloth, and if it gets sticky then clean it with a cloth dipped in petrol or in carbon tetrachloride. The set should not be operated until the brushes are dry, because a spark may ignite the volatile gas. Slip-rings should be kept as clean and bright as the commutator, grease cups should be filled with grease of good quality and screwed down every six or twelve months, depending upon the time for which the plant operates.

Twin-cylinder Petrol Engine

Let us now consider some representative generating plants available today, of various sizes and outputs. In Fig. 1 we have a compact plant manufactured by Auto Diesels Ltd., Uxbridge, in which the prime mover is an air-cooled horizontally opposed twin-cylinder petrol engine, rated at 6 brake horsepower when running at 1,500 r.p.m. Fuel consumption is 4½ pints per hour at full load. Overall length is 55in., the height is 31in., the width is 24in. and the weight is 400lb. It is mounted on a substantial steel bedplate suitable for bolting down to a foundation block.

Sets made by this firm incorporate a control panel of special design equipped with relays, motoring switch and circuit breakers, or rotary main switch to start the generator within six seconds of switching on any light or electric appliance. A safety device is fitted to allow for failure to start if there is no fuel in the tank, in that after ten seconds has elapsed without the engine starting, the starting circuit is automatically switched off. When the last light is switched off, the control panel automatically stops the set either by earthing the magneto or cutting off the fuel. A manual switch is also provided, so that the automatic equipment can be isolated and the set started by hand.

Diesel Driven Alternator

The set shown in Fig. 2 is an Alco diesel driven alternator, manufactured by Arthur Lyon and Co. (Engineers), Ltd., Stamford, incorporating a Petters diesel engine with an output of 2½ horsepower giving 1¼ kilowatts of electrical energy. This set operates at 230 volts, but other voltages can be supplied if required. The control panel above the alternator rests on a special anti-vibration mounting, the engine is air-cooled and starts quickly by hand even in a low temperature.

The fuel tank takes a gallon, sufficient for eight hours running on full load, but a wall-mounted tank of greater capacity can be supplied if required. A substantial cast iron base-plate is suitable for foundation block mounting. The set is fully equipped for completely automatic operation ; it is 42in. long, 34in. wide and 24¾in. high. The robust nature of the equipment is clearly visible from the illustration.

Typical Engine House

A typical engine house of good design is shown in Fig. 3, as recommended by A. C. Morrison (Engineers), Ltd., Loughborough, who have kindly supplied the author both with this information and with several practical hints of considerable value to householders.

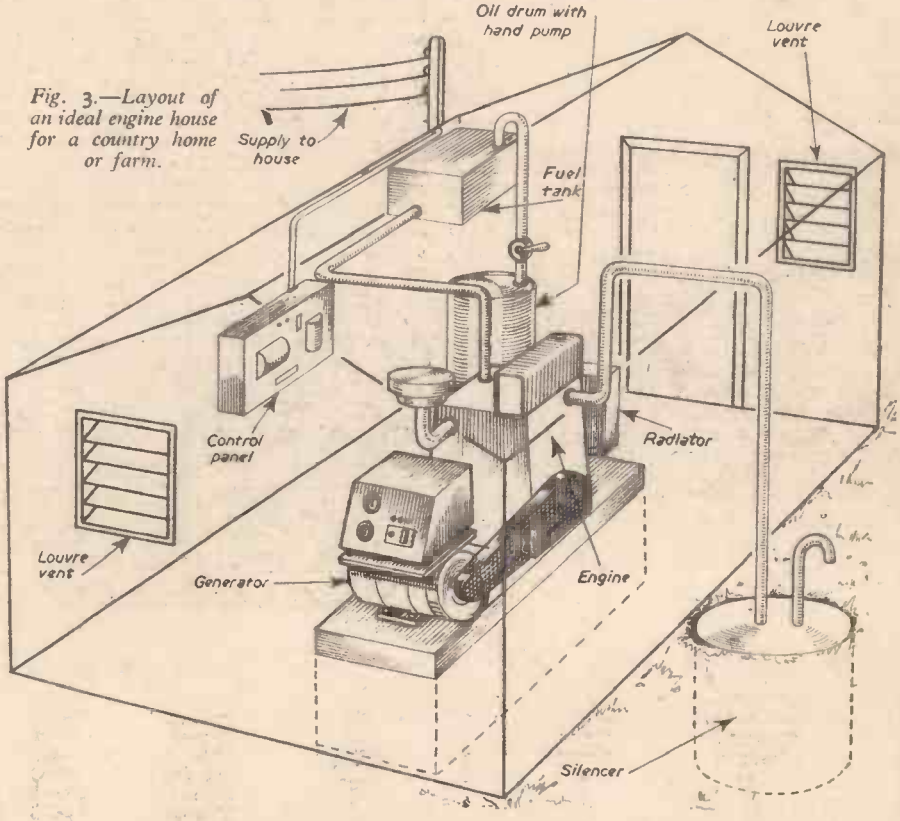


Fig. 3.—Layout of an ideal engine house for a country home or farm.

The generating set should be mounted on a heavy concrete foundation to eliminate vibration and reduce noise to a minimum. If the silencer is buried in the ground as shown, this will also help to reduce noise. The engine radiator should face the door or ventilator, the fuel tank and automatic control panel should be mounted on the wall, and space should be provided so that the operator can have full access to the plant. A drum of fuel may be placed in the engine house, the wall-mounted tank being filled by the semi-rotary hand pump, a very convenient arrangement.

Refrigerators

Household refrigerators and deep freezers—the latter are now becoming very popular, especially with farmers—can be operated from alternating current plants equipped with automatic starting controls, but a word of warning is necessary. Because of the many additional hours of operation, which means increased fuel consumption and running time, use of such refrigeration equipment may be costly. Modern washing machines are almost invariably provided with split-phase motors which draw heavy current from the line during starting, so that if you intend to use a washing machine driven by a split-phase motor (the manufacturer of the washing machine should be consulted), no attempt should be made to operate it with a plant of less than 3 kilowatts output.

Motor Driven Appliances

It is useful to bear in mind that motors and motor driven appliances use about twice as much power when starting as while running ; thus, in order to ensure that you have adequate power for starting, provide for double the watt rating of the motor. To operate two or more motors at the same time, multiply the watt rating of the largest motor by two and add to this the watts required by the smaller motors whilst running. A split-phase motor needs about three times more power when starting than while running, and a capacitor motor about twice the power for starting as it needs when running. Universal motors, as their name implies, run equally well on alternating or direct current.

It is a good idea to mount the engine on vibration controlled mountings, of which several makes are available. Cushyfoot mountings made by Metalastik, Ltd., Leicester, have been specially designed and developed for generating sets and are suitable for nearly all such sets powered by engines running at 1,000 r.p.m. or more.

The Cushyfoot mountings, like all vibration-controlled mountings, allow the machine supported to absorb its own vibration by moving freely, instead of transmitting this vibration as a pulsating load to floor or foundation. All engines having no primary unbalance may have these mountings directly beneath the base and there will be no danger of excessive movement. Secondary unbalance is of small consequence.

Plumbing and electrical connections to the engine should be flexible enough to accommodate movement of the mountings without danger of fracture or transmitted vibration.

Finally, let us emphasise once more the importance of good maintenance, because attention to this will pay a rich dividend in a continuous supply of dependable power.

Static Ship Models

Designs, Hints and Tips for Making Small Scale Waterline Models

THE kind of model to be dealt with is that known as a waterline model, i.e., built up solid above the load water line, and stuck down to a surface representing the sea and made to quite a miniature scale, say, either 100ft. to 1in. or twice that size (50ft. to 1in.). Any scale larger than the 50ft. would not be worth while until either a showcase size or a working model was reached, in both of which cases the vessel would have a complete hull and no longer be a waterline model. The advantage if modelling above the waterline only and mounting on a "sea," is that an "all around" picture of what a vessel looks like as you normally see it afloat is obtained and, moreover, a number of vessels can be shown on the same sheet of water.

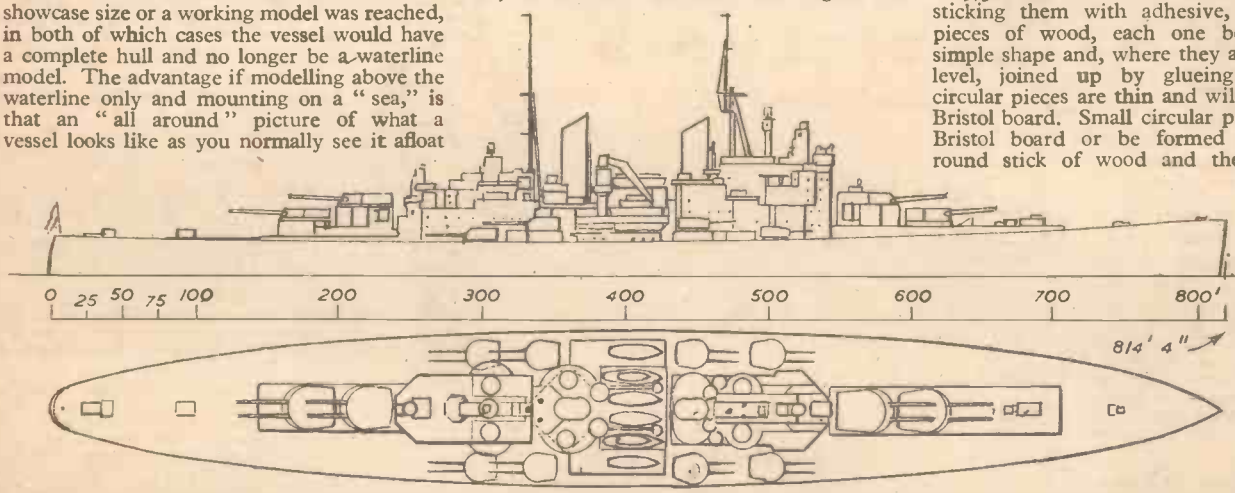


Fig. 1.—H.M.S. Vanguard *drawn to a scale of 100ft. to ¾in. (For modelling 100ft. to 1in., redraw ⅓rd larger.)*

Materials

The materials required for construction of models to either 100ft. or 50ft. scale will be both alike in their nature, though generally the latter will call for twice the thickness of the 100ft. scale. These materials are wood and Bristol board, some good quality paper, such as writing paper, cartridge paper, wire of different kinds and gauges. In addition there will be paints, of which artists' tube colours will be the best.

A lathe will not be necessary, so that this is one of the few kinds of model which can be made with just a few hand tools, consisting of a ½in. bevel-edged chisel, a small adjustable 5in. plane, a penknife, a small soldering iron and, if possible, a small electric motor, on the shaft of which the reader will fix a disc of wood having a surface which will run true and will have a disc of glasspaper glued to the face.

This motor will require to be fixed and to have a rest close up to the glasspaper. The rest should have its top edge planed straight and true and stand dead square with the glasspaper disc. Then when it becomes necessary to square up a small wooden part of, say, a superstructure, all that is necessary is to place it on the rest, lightly press it against the glasspaper to get one surface true, turn it over and with the trued surface down upon the rest do the second surface; turn it down again and do the third surface and so on until the whole block is true. When the glasspaper is new the cutting will be rapid. Care should be taken not to put too much pressure on the wood and to protect the fingers. The rest should never be more than 1/16in. from the glasspaper.

The grade of glasspaper is important: for fine cutting and accurate work a sheet of "No. 1" is preferable to any coarser grade. The coarser the glasspaper the quicker it will cut, but on the other hand the rougher will be the lines on the surface of the wood.

Besides the foregoing list of tools a small vice will be advisable and a piece of ¼in. plate glass on which to cut the Bristol board. A steel rule about 12in. long for use as a straightedge in cutting and lastly a very small drawing-board and tee-square will be required.

Modelling H.M.S. *Vanguard*

The prototype vessel, drawn in Fig. 1, is about as complicated as any. There are so many little parts to be made and put on that if the reader can reproduce this he can make any waterline model. The full size vessel has an overall length of 814ft. 4in. and a beam of 107ft. 6in. She was designed by Sir Stanley Goodall, was laid down in 1941 and completed in 1946 by John Brown & Co., Ltd., at Clydebank. She carries eight 15in. guns and other smaller armament. Her speed is 29 knots, or over, per hour.

Commence by cutting out the hull. To do this accurately draw the outline on paper and then transfer it, by means of carbon paper, to the wood which, if the model is to be to the scale of 100ft. to 1in., could be a full ⅜in. thick. Cut to the transferred line with either a fretsaw or with a chisel. Then finish the sides accurately to the outline on the glasspaper wheel. Next, with the chisel pare down to form the sheer: this will run from ⅜in. full at the bow, 7/32in. amidships to 9/32in. at the stern. Then cut and add, sticking them with adhesive, all the small pieces of wood, each one being made of simple shape and, where they are at the same level, joined up by glueing. The semi-circular pieces are thin and will be formed in Bristol board. Small circular pieces can be of Bristol board or be formed by making a round stick of wood and then cutting off discs with a razor blade.

The turrets can be cut from wood, drilled for the guns, and these formed from pins with their heads and points removed inserted in the holes. Alternatively, they can be made up, each turret being formed of three or four pieces of Bristol board, one of the pieces being notched out to form recesses in which the guns will be glued. In the smaller turrets the guns can be made of fine wire. The masts will be of thicker wire or they can be made from dressmakers' pins. These masts would be best made by soldering the separate pieces together, but they can have each leg deeply inserted into the wood and be brought together at their tops, every-

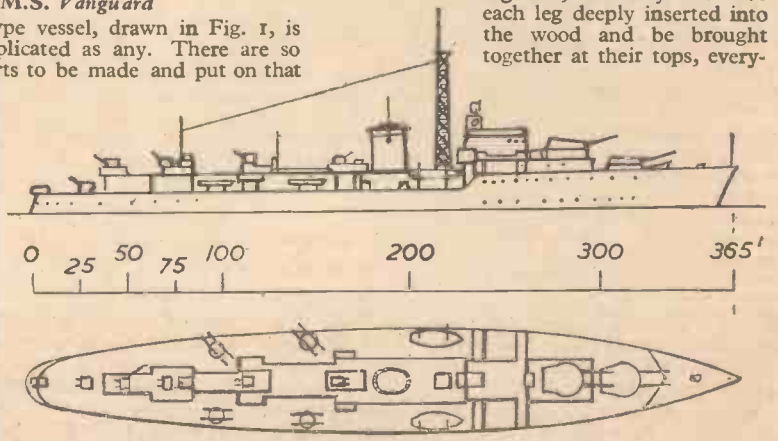


Fig. 2.—H.M.S. Agincourt *drawn to a scale of 100ft. to 1in.*

thing else being cemented in place. There is not much to add on the mizzen mast beyond two tiny bits of Bristol board, but on the fore-mast there is a topmast beside a large platform of Bristol board. It would be advisable to let the topmast go through the platform and the whole be embedded in the glue.

The two funnels can be of thin aluminium

tubing slightly flattened or they can be made from paper, rolled into a tube around a wooden core, glued and then drawn off the core. In the latter case let the paper be long enough to go around about three times and finish up on the forward side. The whole model should be given a coat of shellac varnish made of brown lac flakes dissolved in methylated spirit and when this is dry the painting can be done. The pigment will consist of a mixture of flake white with lamp black, and this should be thinned with turpentine. It will probably be necessary to give two coats.

A Destroyer Model

Fig. 2 shows a destroyer of the latest class, the *Agincourt*. The only points about this calling for comment are in connection with the hull and the mast. There is no sheer, or none worth mentioning, aft of the mast, so make it by using a 3/32in.-thick piece and add on for the forward portion an additional layer of the same thickness, thus making the forward end 3/16in. thick. Then, paring this down very slightly, put the necessary sheer upon it.

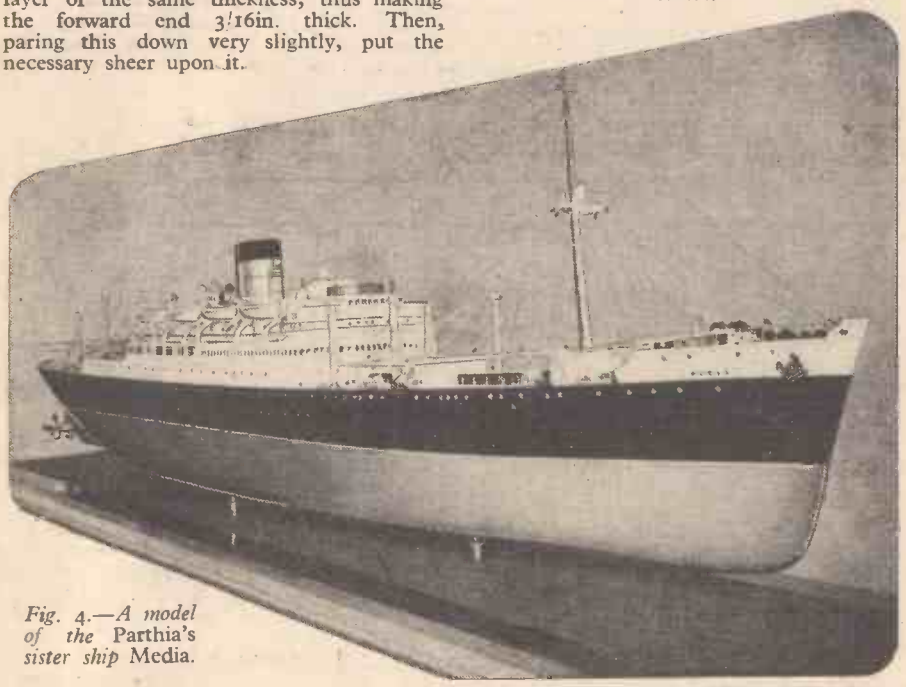


Fig. 4.—A model of the Parthia's *sister ship* Media.

The mast is a latticed steel structure and the only way to reproduce this is to cut either a bit of glass on a piece of celluloid from a set square, file it dead square with a slight taper, polish it and paint all the cross lines on it, including the vertical ones at the angles. Do this with a very fine brush or pen. If you use glass for the mast you will have to cut a slip about 3/32in. wide off the straight edge of a piece which is of about the correct thickness. Let the glass thickness lie parallel with the centre line and the cut can then be made so as to show the taper in a broadside view. The *Agincourt* has a length of approximately 365ft. with a displacement of 2,300 tons. Paint all over as in the *Vanguard*.

Modelling the *Parthia*

As an example of a modern liner for modelling the Cunard White Star ship the *Parthia* is shown in Fig. 3. She has a length overall of 534ft. and beam of 70ft. She was built by Harland and Wolff of Belfast and completed on February 25, 1947. Her speed is 17 knots and she has, beside cargo, accommodation for 250 first class passengers. She has a sister ship the *Media*, by John Brown and Co. Ltd., of Clydebank. The *Media* made her first voyage just before the *Parthia*, so the *Parthia* was the later completed vessel. A model of the *Media* was described in our October, 1956, issue.

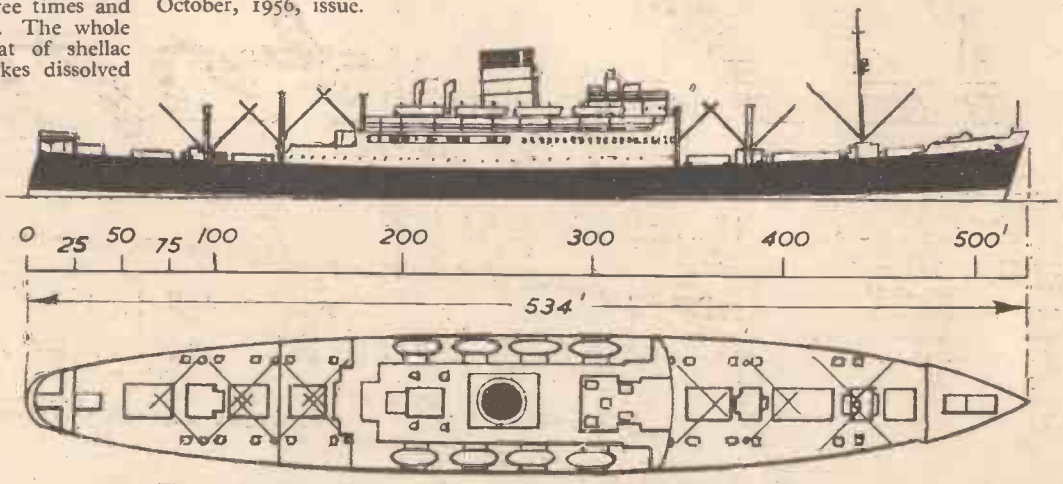


Fig. 3.—The Parthia *drawn to a scale of 100ft. to 1in.*

For the hull use a ¼in. piece of wood and this should be increased to 5/16in. at the forecastle by an extra 1/16in. and still further increased at the extreme bows to ⅜in. by a tiny bit at the point, as shown in Fig. 3. The superstructure can be of at least three layers of either thin wood or thicker than normal Bristol board. One piece of wood comes next to the hull, then a piece of four-sheet Bristol board, then another piece of either wood or cardboard, next a piece of thin Bristol board and finally a much narrower plate of wood which will bring the level up to ¼in. above the deck. The rest of the superstructure consists of little pieces. Note that the funnel, which can be either of metal or of paper, is mounted upon a rectangular base. As the funnel is only slightly flattened, metal tubing of ¼in. diameter can be used.

The cranes are formed from dressmaker's pins, each pin having the head filed flat and filed nearly away. The crane jibs are of tinned iron florists' wire. The model should be painted the Cunard White Star standard colours: black and white for hull and superstructure and a funnel having a vermilion shaft with a black top. The insides of the ventilators are also vermilion. The ventilators are best formed by filing pins to shape and sticking tiny discs of cardboard on the side. The adhesive can be allowed to flow around the pin and this small disc, and this will form a key to hold the disc in place. Fig. 4 is a photograph of the *Parthia's* sister ship the *Media*, as modelled for John Brown and Co. Ltd., by Bassett-Lowke Ltd. It is reproduced here as a guide for details.

BOOKS Received

"Colour Photography for the Amateur," by M. Lillington Hall. 150 pages. Illustrated. 21s. net. Published by George Newnes Ltd., Tower House, Southampton Street, London, W.C.2.

IT is the rapidly increasing popularity of colour photography which inspired the author to produce this comprehensive book on the subject. It should be understood by the beginner, but is written primarily for those with some experience of monochrome photography. The principles of colour photography are dealt with in the opening chapters and then the types of film available. A section on the vital factors of exposure and colour rendering is followed by practical advice on taking coloured photographs by daylight, indoor light and flashlight, both indoors and out. Three chapters on processing colour materials precede the final chapter, which describes the apparatus available for viewing transparencies. The book contains eight colour plates, 65 illustrations and 34 tables, many of which were specially prepared by practical experiment.

"The Gilwell Camp Fire Book," edited by John Thurman and Rex Hazlewood. 157 pages. 12s. 6d. net. Published by C. Arthur Pearson, Ltd., Tower House, Southampton Street, London, W.C.2.

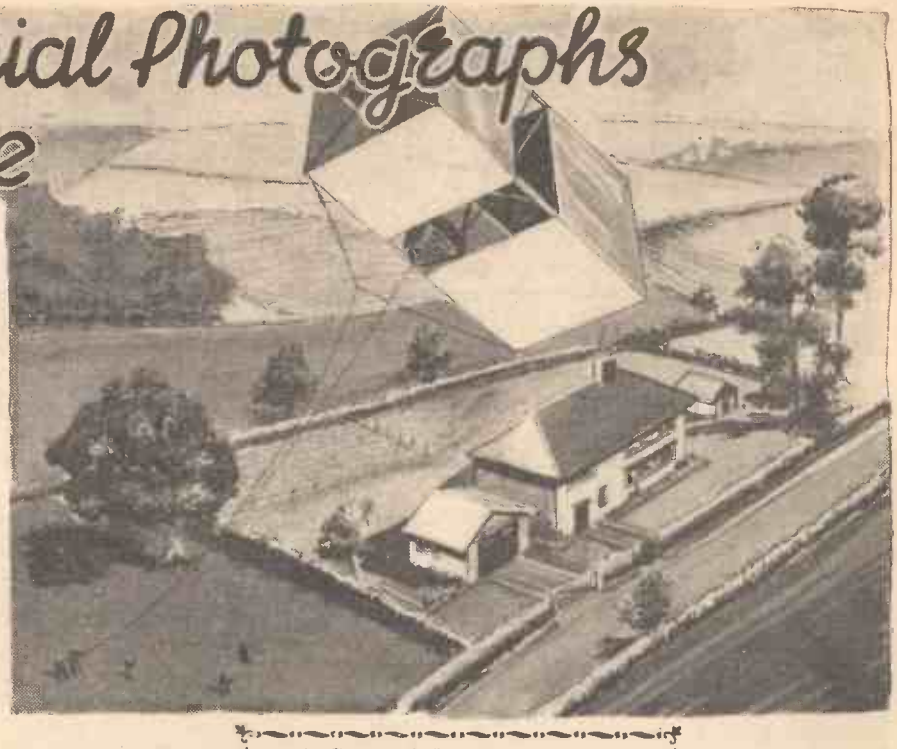
THIS book is subtitled "Songs and Yells from Fifty Years of Scouting," and this is an adequate summing up of its contents. The songs are very varied, ranging from one that was a popular song a few years back to community songs and some others that are seldom seen in print. Included, too, are songs from abroad, rounds and novelty numbers, every one being suitable for an evening's entertainment round the camp fire. The tunes are also given to many of the songs.

Correction

We regret that in our review of the "Speedicut Manual of Screw Thread Tools," in our April issue, the price was wrongly given. The correct price is 25s.

Taking Aerial Photographs with a Kite

A Fascinating Variation for the Kite-flying Enthusiast



A Special Section for the **JUNIOR READER**

THE two obvious necessities for taking aerial photographs with a kite are a suitable camera and a kite of sufficient size to carry it aloft; one 6ft. high is suggested.

Making the Kite

Four 6ft. bamboo canes, as straight as possible, and six shorter lengths, for cross pieces, about 4ft. 6in. long, are required. Nine yards of calico or some lightweight tent cloth will serve for the covering material. It is advisable that the cloth should be closely woven, to hold the wind, otherwise it will be necessary to give it a coat of aeroplane dope after the kite is made. Some thin string or wire for staying the framework and at least 60 yards of good strong cord are required. The best kind of cord is that sold at fishing shops and ship-chandlers for conger eel fishing, etc.

The heading sketch shows the shape of the kite and main details of construction. Seam the covering material first in two parts for top and bottom, making sure that the join is absolutely square. Assemble the struts next and a knowledge of lashing will be found useful here. Rigidity is ensured by diagonal struts (the six 4ft. 6in. lengths) braced between the uprights at each end and in the centre. The framework should be strengthened so that a camera may be mounted on the central axis of the kite, that is, approximately pointing down the string. Different types of camera will require different mountings and ingenuity must be used, but in all cases the centre of the kite will be found the most suitable place, because here the movement is at a minimum when flying.

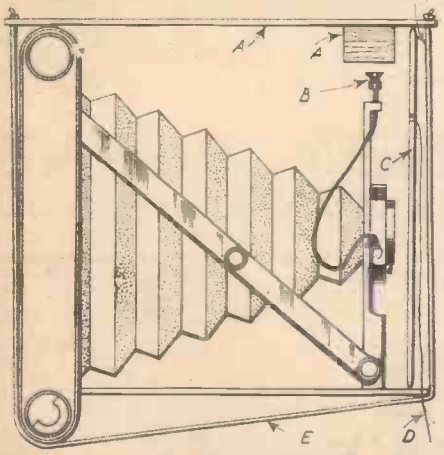


Fig. 1.—A method of arranging the shutter mechanism. A—Actuating arm; B—Shutter release; C—Wedge; D—Release string; E—Tensioning elastic.

Flying the Kite

Before the camera is mounted in the kite it will be advisable to have a little flying practice. The cord should be attached to one corner of the kite in an irregular Y formation so that the ground strain is applied just above the centre axis of the kite. Different wind velocities seem to demand different flying angles and the matter is one for experiment.

A team of four is essential for handling the kite. It should be remembered that a kite of this size has a very great pulling power, and if the cord became tangled round someone's neck there could be unpleasant results. Two members of the team should concentrate on the "take off" of the kite. They hold it firmly by the outer ribs so that they may run a short distance with it before throwing it up. At least 40 yards of cord is laid along the ground at a small angle to the direction of the wind. The "pilot" who holds the cord and manipulates the flight of the kite is advised to wear a pair of old gloves. The fourth member of the party will supervise the paying out of cord and prevent any tangling of that which lies on the ground.

The great point to remember in flying a big kite is that it is not really flying when you have to run along with the string. One should try to rise above treacherous ground currents at the first attempt, and if the kite will not remain in the air at a height of 200ft. the wind is probably not strong enough for flying. When you are certain that you know how to "take off" and how to make a good landing, which can only be achieved with practice, you may mount your camera in the kite. It is advisable to arrange the mounting in such a way that the struts project a little farther than the camera, thus avoiding damage in the event of a crash.

Working the Shutter of the Camera

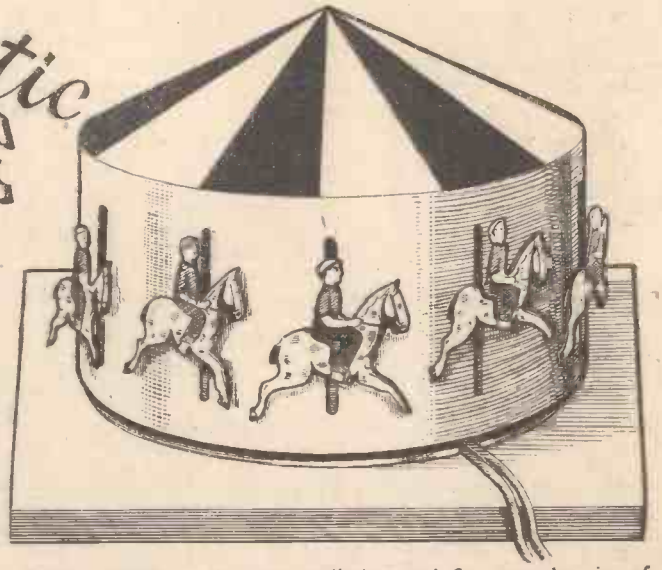
There are various ways of releasing the shutter of the camera. The best way is to have the shutter released by a separate and lighter string, operated from the ground. If the shutter of the camera is operated by simply pressing down a button, a very easy device can be arranged as shown in Fig. 1. A short wooden arm is pivoted across the top of the camera and a downward movement provided by a few turns of elastic round the camera. The arm is held in position by a wedge, which when removed causes the arm to drop on the button and work the shutter. This idea can be adapted to suit most types of camera and the idea is shown diagrammatically in Fig. 1.

The lighter string is secured to the wedge and it will be found useful to leave a short loop on this string, and then fasten it to the framework by two turns of cotton thread. This prevents a premature release of the shutter, which may be caused by the kite tugging on a gusty day. It is also useful to prevent any jarring of the camera at the moment of exposure, for when the string is pulled from the ground the first action is to break the thread, and in the fraction of a second before the wedge is pulled clear the kite has time to recover from the twitch.

When taking your aerial photographs it should be the duty of those responsible for "throwing" the kite to unwind and keep an eye on the exposure release string. It must be kept clear of tree tops or obstructions, and should be paid out fairly slackly. In fact a team of four will have their work cut out to watch every detail and make a successful photograph. The member of a party detailed to make the exposure must watch his opportunity. When he feels that the camera is pointing at the object to be taken, and a little practice will make him expert at this, he will watch the kite, pulling his string when he is sure of steady flight. He will be surprised at the amount of pull required, but when he sees the end of the string fluttering down from the kite he will know that the exposure has been made.

A Simple & Realistic ROUNDABOUT

An Ingenious Toy on Which the Horses Go Up and Down as They Go Round



A BASEBOARD about 12in. square has fixed to its centre an upright spindle made from a long nail, as shown at N in Figs. 1 and 2.

The two cotton reels A and B and the half cotton reel C in Fig. 1 are glued together as shown and placed over the spindle.

To C is fixed a screw H, the head of which is filed flat on each side so that if one looks at it from above it appears as if the head is missing. This can be seen from the end elevation in Fig. 1.

The carrying bar is provided with a hole for the spindle to slip through so that it is supported by the cotton reels and is free to revolve. On the underside of the carrying bar about ⅛in. above the head of the screw, is fixed a stop block (P).

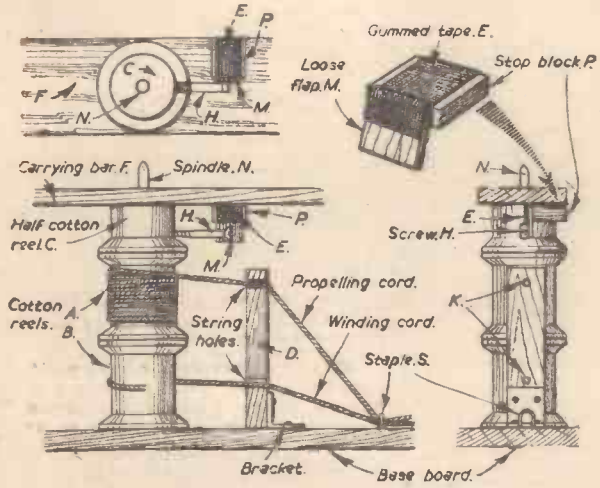


Fig. 1.—Details of the working arrangements.

The Carrying Bar

Between the stop block and the carrying bar is fixed a piece of gummed tape E. One end of the gummed tape overlaps the stop block and is stuck to the loose flap M, which reaches down level with the screw head.

Thus, if the cotton reels are held stationary, the carrying bar can only revolve in one direction, namely, so that the screw H strikes the loose flap from the back and pushes it away from the stop block.

About an inch away from the cotton reels is fixed an upright piece of wood D in which are two holes K and K. It is held in position by a bracket and four screws. The staple S is fixed about 1in. away from D. Each cotton reel has a length of string or cord attached to it. On one side it is wound round in a clockwise direction and on the other it is wound in an anti-clockwise direction.

Thus if the string on one is pulled the string on the other will wind up. Each string is passed through one of the holes in the wooden upright and then through the staple.

The Cardboard Cylinder

The cardboard cylinder shown in Fig. 3 has a number of slots cut in it and being fixed to the carrying bar is intended to revolve. It fits loosely over another slightly smaller but stationary cardboard cylinder shown in Fig. 2, which is fixed to the baseboard by means of the tags A, B and C.

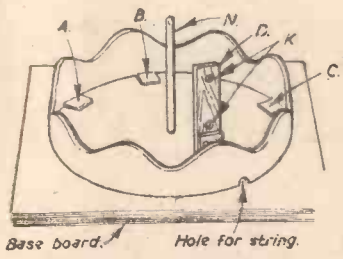


Fig. 2.—The stationary cardboard cylinder and how it is attached.

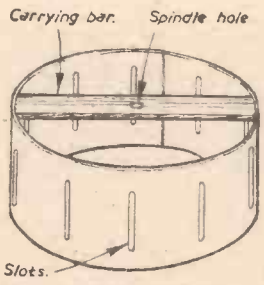


Fig. 3.—The outer slotted cylinder.

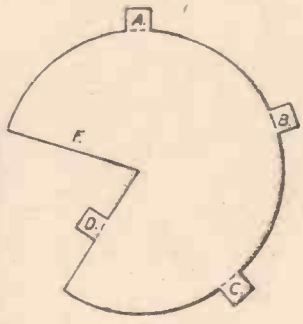


Fig. 4.—How the roof cone is shaped before bending.

The upper rim of the smaller cylinder is cut in a wavy fashion like a switchback, as shown in the sketch, the tops of the waves reaching to about the middle of the slots in the larger cylinders.

Any number of horses required can be traced from Fig. 6 on flat cardboard and then cut out. Fig 5 shows how they are fixed on the roundabout. The wire, which is bent as shown and attached with the aid of gummed tape, is inserted through out of the slots in the large cylinder, and fits over the rim of the cylinder inside.

A nut or similar object is attached to the end of the wire to act as a balance weight.

As the large cylinder revolves, the wire resting on the wavy rim of the cylinder inside will go up and down carrying the horse with it.

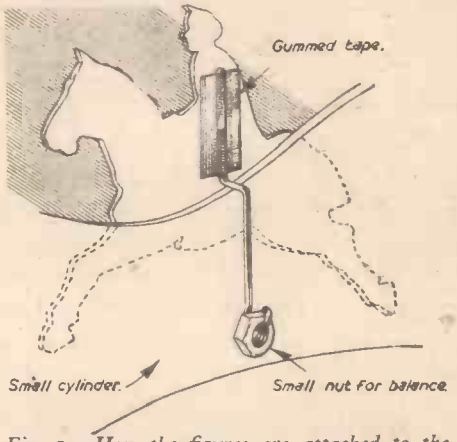


Fig. 5.—How the figures are attached to the roundabout. The outer, slotted cylinder is not shown.

A single piece of paper cut as shown in Fig. 4 is made into a roof of the roundabout by sticking the tag D over F.

The cone is fixed on top of the large cylinder by bending the tags A, B and C and sticking them inside the rim. Cylinder and cone are the same diameter.

Paint the roundabout carefully in bright colours.

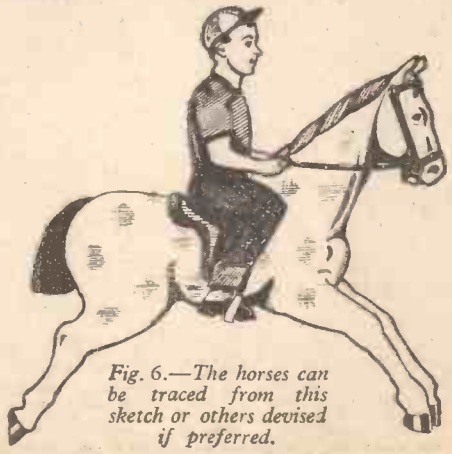


Fig. 6.—The horses can be traced from this sketch or others devised if preferred.

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.

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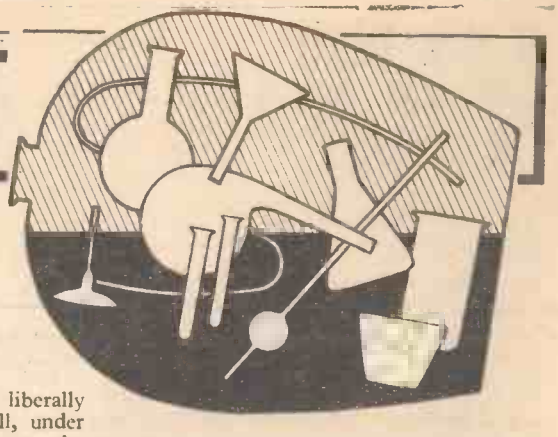
THE JUNIOR CHEMIST



No. 7.—Some Interesting Nitrogen Compounds

IT is a curious fact that, although nitrogen is an inert, uninteresting gas, its compounds are exceedingly active. So active, indeed, are nitrates and nitro-compounds that they form a source of modern high explosives—this is in contrast to nitrogen gas, which forms 78 per cent. of the atmosphere which we breathe, and which in itself will neither burn nor support combustion.

You can prepare nitrogen gas quite easily by heating ammonium nitrate in a test tube and collecting the gas given off. It is not a very exciting or interesting experiment. Nitrogen is, of course, essential for plant life, and chemical fertilisers consist usually of nitrates, which supplement the nitrogen supply in the soil when this is considered weak.

The amateur chemist will see in his laboratory many useful nitrogen compounds : ammonia, nitric acid and potassium nitrate (saltpetre), for instance, and he may use these as a starting point in the preparation of other compounds.

How to Make Nitric Acid

When a powerful electrical discharge is passed through the atmospheric air the intense heat causes a union of the nitrogen and oxygen present. The gas formed, called nitric oxide, on cooling, undergoes a transformation, and when passed into water forms a nitric acid. In this way small quantities of the acid are yielded during a thunderstorm. In Norway large quantities of acid are manufactured by means of the electrical power, but there is a more convenient method of manufacture which you may adopt in your laboratory. The chemicals required are saltpetre and strong sulphuric acid. The apparatus required is quite elementary : a Bunsen burner, tripod, gauze, two flasks and a length of tubing. Bend the tube as shown in Fig. 1 and pass it through a cork which will fit one of the flasks. In this flask place about an ounce of saltpetre and two ounces of the strong sulphuric acid, and arrange your apparatus as shown in Fig. 1, with the delivery tube beneath the surface of about three inches of water in the receiving flask, which is in turn surrounded by water in the bowl. Apply gentle heat until all reaction in the generating flask is finished. The gas liberated and which passes down the delivery tube into the water is nitric acid. With the water it forms a solution which may be concentrated if necessary by heating until fumes are evolved.

Experiments with Nitric Acid

If the above instructions have been carefully carried out you should have a good yield of strong nitric acid with which to perform several interesting experiments.

Making Sulphuric Acid

By boiling a small piece of sulphur with nitric acid in a test tube you can make sulphuric acid. This is not the commercial way of manufacturing vitriol, but it is an interesting laboratory experiment.

Fire Without Matches

Experiments of this type are always popular, and with patience and luck one can secure a good blaze using nitric acid. Dry sawdust liberally sprinkled with the strong acid will, under favourable conditions, take fire spontaneously.

Ammonia from Nitric Acid

In earlier experiments you have obtained hydrogen gas by the interaction of a common acid and scrap zinc, but this cannot be accomplished when nitric acid is used. Dilute a little nitric acid with about ten times as much water and add several pieces of scrap zinc so that the metal is in excess. Warm very gently and notice the strong smell of ammonia which develops. In this experiment an acid unexpectedly gives off powerful alkaline vapours.

A Brown Fog

Drop a few pieces of scrap copper into a test tube containing nitric acid and warm. Dense brown fumes with a choking smell pour forth and create a miniature smoke screen. If your nitric acid is sufficiently strong you can make lightning paper—well known as a parlour firework. Mix very cautiously three parts of strong sulphuric acid and one part of nitric acid. In this mixture soak for several hours sheets of filter paper. Remove the papers, wash them thoroughly, and allow to dry slowly. Examination of the dried sheets will reveal the fact that the nature of the paper is completely altered ; it is in fact a nitrated cellulose almost identical with gun-cotton, which is made in the same manner, using cotton wool instead of paper. If a light be applied to your nitrated paper, it will burn instantly and completely with a flash which is quite startling.

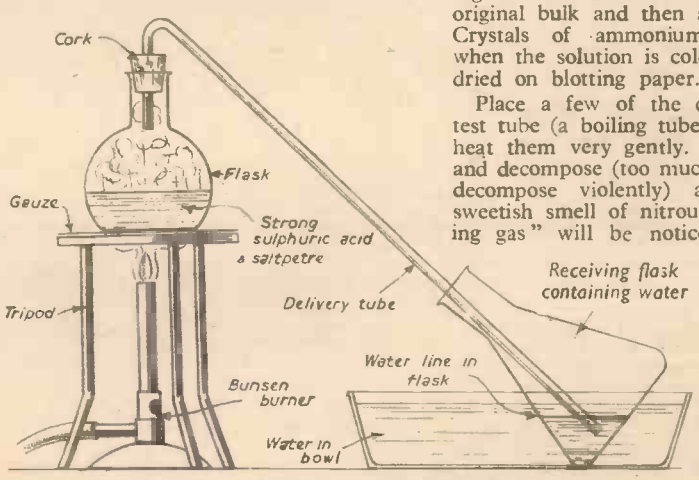


Fig. 1.—The arrangement for making nitric acid.

How Surgical Collodion is Made

A mixture of equal parts of strong nitric and sulphuric acids is made and cotton wool is immersed in it for three minutes. At the end of this time the cotton-wool is removed, washed and dried. In its dried state it is known as pyroxylin. In appearance it resembles cotton-wool, but it is harsh to the touch and inflammable, although not explosive like gun-cotton, which is, of course, more completely nitrated on account of prolonged immersion in the acid bath. Apart from its use as a skin application, collodion has been used as a "dope" for loudspeaker cones and aeroplane wings.

Laughing Gas

To make laughing gas you require a small quantity of ammonium nitrate. This you can make by cautiously neutralising nitric acid with ammonia, evaporating the resulting solution down to about one-third its original bulk and then allowing it to cool. Crystals of ammonium nitrate separate when the solution is cold and these can be dried on blotting paper.

Place a few of the crystals in a large test tube (a boiling tube is preferable) and heat them very gently. The crystals fuse and decompose (too much heat makes them decompose violently) and presently the sweetish smell of nitrous oxide or "laughing gas" will be noticed. This gas behaves somewhat similarly to oxygen in several respects. Try the effects of inserting a glowing splinter of wood into the mouth of the tube. The wood relights and burns brilliantly—almost as brilliantly as it would in oxygen.

Smoke Screen

If you have any ammonium nitrate left from the last experiment you can use it to make a smoke screen such as is used (on a larger scale, of course) in warfare. Carefully powder the ammonium nitrate and mix it with as much zinc dust or fine zinc filings. Form a little of this powder into a cone and ignite the tip with a match. The cone burns, giving off a dense white smoke which, in a still atmosphere, will render visibility well nigh impossible.

Letters to the Editor

Address letters to The Editor, "Practical Mechanics," Tower House, Southampton Street, London, W.C.2.

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

City and Guilds of London Institute

SIR,—In the February issue you referred to the City and Guilds of London Institute, which is doing so much in the national interest to advance technical education and training. Its activities embrace a very wide field; mechanical engineering, printing and catering are only some of the branches of industry for which provision is made. Its work has particular concern with the "other ranks" of industry, i.e., with operations, skills, crafts and techniques which must be effectively and correctly tackled if the work of the technologist and of management is to produce the required results. The training courses worked out by the Institute in partnership with industrial and educational interests are available in technical colleges and institutes of further education throughout the country and in many centres overseas.

There are progressive stages in the awards offered by the Institute; certificates are awarded at Intermediate, Final and Full Technological Certificate levels, and a high level Insignia Award in Technology is conferred on candidates who have gained a Full Technological Certificate or a suitable alternative and who fulfil certain other conditions, including a minimum of seven years' responsible industrial experience. This Insignia Award enables the holder to be designated by the letters C.G.I.A.

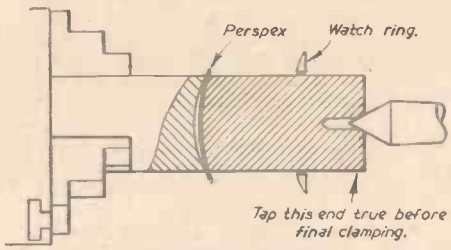
The letters A.C.G.I. to which you referred in the February issue stand for the Diploma of Associate of the City and Guilds of London Institute, and is awarded to students who have satisfactorily completed a course normally extending over three academic years at the City and Guilds College, and have passed with sufficient merit the several examinations. The City and Guilds College is one of the constituent colleges of the Imperial College of Science and Technology, University of London.—D. GWYNN-JONES (City and Guilds of London Ins.).

Cutting Perspex Discs

SIR,—Reading the article in the February issue by C. W. Tinson on "Cutting Perspex discs," brings to mind an instance when I cut a Perspex watch glass; in this instance a bevel and a domed surface were required.

The job was carried out in the lathe. A piece of wood was mounted in the three-jaw chuck and centred, and a domed surface turned on the other end, the diameter was just less than the watch ring.

Another piece of wood was now turned, but with a concave surface deeper than the dome required. This was left in the chuck, while a piece of Perspex was roughed out. With the other piece of wood on the tail stop centre the Perspex was placed between the two pieces of wood, which were tightened up to form the dome. The Perspex was then turned and bevelled. It must be remembered to slip the watch ring on to the first piece of wood as shown in the sketch.



Mr. A. L. Franks' method of cutting "Perspex."

To avoid damage to Perspex a piece of thin paper can be included each side of Perspex. Larger diameters can be turned the same way without concave and convex faces.—A. L. FRANKS (Poynton).

The Carbonic Acid Car

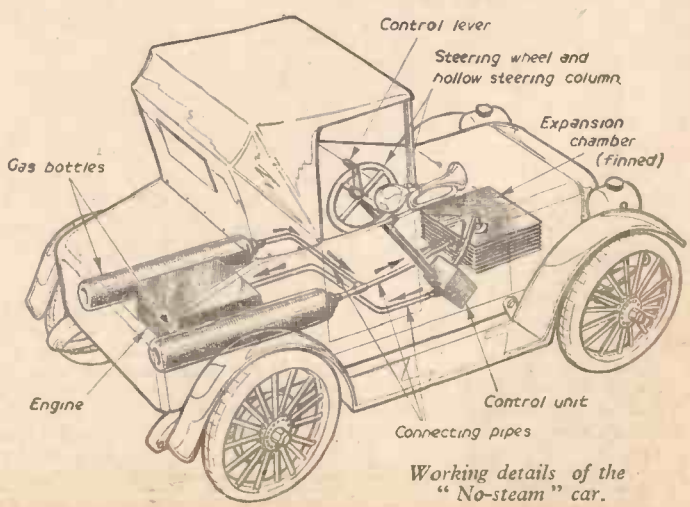
SIR,—Thanks to the petrol shortage, the steam car is in the news again. Old hands recall the unique advantages of this type of car—its engine silence, the uncanny hill-climbing power, and the easy control of speed, from walking pace to full speed, merely by moving one level. In addition, a steam car can reverse without the necessity of gears.

Of course, the old hands are not blind to the many disadvantages of steam cars; the heavy fuel consumption, the weight of boiler and the indispensable water tank, not to forget the necessity of having to watch the water level all the time. No, the steam car does not appeal to the motorist of to-day, who has been spoiled by modern engine perfection; he simply will not put up with boilers, water tanks, etc. But the principle of the steam car is perfect, and if we could only dispense with boilers, burners, and water tanks, and so on, yet retaining the "steam engine," all would be well.

Fantastic as it sounds, it can be done and has actually been done. About fifty years ago I saw such a "no-steam" car in a Continental exhibition. The design made such an impression upon me that I still remember the main details. The car was of French design and manufacture, obviously an experimental model. The elegant two-seater looked just like a standard car of that period.

But the power plant was quite novel in its conception. A small "steam" engine provided the power; instead of steam, however, compressed carbonic acid gas provided the energy. The gas was stored in two large steel cylinders of the conventional type, which were housed at the rear of the car, in the "boot" (see sketch). The engine was mounted between the cylinders. As far as I can remember, there was only one control lever, the spindle of which passed through the hollow steering-wheel column. According to the position of the lever, different speeds were obtained, as well as reverse, the only additional controls being hand- and foot-brakes. I believe the radius of action, with the two gas bottles fully topped up, was about 250 kilometres (about 155 miles).

The car shown in the exhibition was quite as big as a standard car, and was obviously a converted standard chassis. With a modern small car and a similar power plant, much greater ranges could be obtained. Of course, the driver would have to rely upon service stations which can supply fully charged bottles of gas, taking the empty ones in part exchange for recharging. Carbonic acid gas was probably used because it was easily obtainable in cylinders in most towns. It was used in public houses to lift beer from cellar to bar by pressure. Compressed air can be used instead of the more expensive carbonic acid gas, and the recharging costs of the cylinders are then negligible. It may not be necessary to remove the steel cylinders from the car for re-charging, a small electrically-driven com-



Working details of the "No-steam" car.

pressor would soon "top up" a nearly empty cylinder.

To avoid freezing-up the engine (when expanding, gas or air cools to a low temperature) it may be necessary to provide an expansion chamber between engine and gas cylinder. If this chamber is provided with fins, it will reduce the working pressure of the engine to a reasonable level, in addition to equalising the temperature.

Why bother with steam if compressed air is a far cheaper, simpler and lighter power supply? I believe that this type of "Comcar" (compressed gas car) was built for a French doctor who wanted an easy-to-handle car which would start at the touch of a lever and travel without exhaust noise—valuable points on night calls.

Perhaps an enterprising concern will consider making a few experiments in developing a "Comcar." There should be no great difficulties, seeing that the French engineers built a successful model of this type fifty years ago. Engineering has made great strides since then!—C. A. OLDROYD (Barrow-in-Furness).

Steam Cars

SIR,—I have been interested in the recent articles and letters on steam cars, but I do not think a steam car burning oil would help us at all Our great problem is to obtain a source of power which does *not* depend on foreign oil. Some years ago some experts calculated that there was about thirty years' oil supply in the Middle East; yet we go on tying our economy more and more to oil, scrapping electric trams for buses, steam trains for diesels, using more oil for heating, cooking, and as fuel for ships, planes, cars, etc. America itself is *importing* more and more oil. Why is America building 100,000-ton tankers, spending millions in pipelines to bypass Suez, buying up Trinidad Oil Wells, developing atom powered ships? I suggest it is because American oil wells are becoming exhausted, or at least they can't keep up with to-day's demands. Consequently, that world shortage of oil may arrive sooner than the estimated thirty years.

The only alternative is electric vehicles. A storage battery that is lighter and better than the lead-acid type and more robust than the nickel-iron-alkali type is wanted. An American designer said recently that if only a much better storage battery was available it would revolutionise the motor-car industry.

I think that within 30 years our ships will be atom-powered, our trains will be all-electric, our buses will be trolley buses and our cars will be either battery driven or we may have devised a kind of sunken conductor in the road surface with a pick-up on the car, running on induced current.

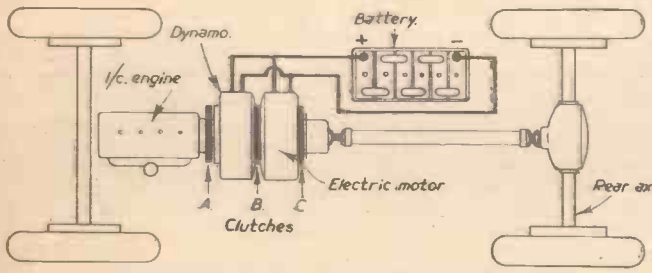
I can't imagine a small boat or a motor cycle of the future, I think they will have to come back to oars or sails in the former case and feet, bicycles or horses in the latter.

I have an idea for a petrol-electric vehicle in mind. It is to have an engine (Austin 7) coupled to a dynamo. On the same centre line an electric motor would be coupled to the rear wheels. Between the dynamo and motor would be a clutch, also a clutch between motor and rear wheels and between engine and dynamo. The method of driving would be as follows: If engine is to be used, clutch C open, A and B driving, press starter. With engine going and charging battery, open B and close C. Holding B open and probably speeding up engine, feed the output from the dynamo together with some drawn from the battery into the motor. When the road speed has sufficiently increased, close clutch B and run on engine with assistance from battery if required.

In traffic jams or on long declines, B would be open and the engine charging the battery, on long descents, say, B would be closed and A open, so with the motor switched off the battery would be charged by the vehicle's own impetus. Clutch C would be probably coupled to the brake so that the comparatively heavy rotor could be immediately uncoupled from the rear wheels in the event of a sudden stop. I have always thought that if there was some sort of clutch in between the armature and road wheels of many of our present electric vehicles, the transmission would last a lot longer. There may be something of the kind in modern vehicles, but with the fierce jump they give from a standstill it always amazes me how worms, spiral bevels or axle shafts can stand up to it. In my vehicle would be a built-in charger to boost the battery up overnight from the mains if required.

I was considering a voltage of about 100.

If I had got it on the road, with three clutches, two brakes and two accelerators, it would have been like tuning in one of the early superheterodynes! — W. R. BROOKS (Scarborough).



Mr. W. R. Brooks' petrol electric arrangement.

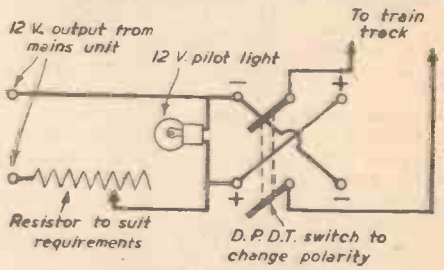
SIR,—May I comment on your recent editorials (January and February) about steam cars? Presumably these would be run on coal but the difficulty with this is its bulk and dirt. Maybe we could supply pulverised coal in sealed containers and blow the dust into the firebox, or perhaps some genius will come forward with a small-sized and reliable mechanical stoker. No doubt if many steam cars with coal-fired boilers came on the roads the Government of the day would put a tax on the coal, or on the car, otherwise the Exchequer would lose the motorists' share of the taxes. In fact, I cannot believe that the steam car would be as cheap to run as its I.C.-engined relation. We are perpetually short of coal, even now, and if much of our oil imports was replaced by home-produced coal we would be much worse off. I am quite prepared to believe that the steam car has advantages from the performance and driving points of view.

Re your allied subject, the electrolysis of hydrogen from water. I imagine the cost of a wind-driven electrolysis plant for home use would be out of the question. From bitter experience I know the trouble and expense associated with a wind-driven lighting set, with its dynamo and batteries, and sitting waiting for a wind. Having produced the gas we should have to put it in "portable" form, either compressed in cylinders (with the added cost of the compressing plant and cylinders) or pumped into "gas-bags" slung on the roof of the car. Imagine the reaction of a modern car "stylist" if asked to fit a gas bag into the "line" of his latest model! The cylinders are heavy and dear, and the gas-bag only gives a range of 20-30 miles, I believe. Also, are we to have a gasometer to hold our reserve supply of hydrogen, or do we make it as needed?

If we could produce enough electricity near home in wind-driven plant, then it would be better used in battery-driven electric cars, which are quite practical if not very exciting. The batteries of such cars could be charged from the mains, and thus they would run indirectly from coal. But I am not impressed by any of the alternatives suggested to oil.—JOHN D. MCCOMBE (Co. Down).

Mains Power Pack

SIR,—I was very interested in the article entitled "Mains Power Pack for Models" by F. G. Rayer, published your April issue. I made up a similar unit some time ago to drive my son's train set. I used an old Varley multi-transformer and an A 4 Westinghouse rectifier. In addition I built up a control box with reversing switch. The circuit is shown in the sketch. The resistor controls the speed and the D.P.D.T. switch changes polarity and reverses train.—A. H. MARRIOTT (S.E.2).



Control box circuit.

Water Tank Repairs

SIR,—In the March PRACTICAL MECHANICS, page 318, you reply to a letter from G. E. W. Hicks, Somerset. May I add another solution? I do not know, of course, what size tank he refers to in "large galv. tank" but I know how two 3,000 gallon galv. iron tanks were cured permanently. They were (and are) on high stands and were commencing to leak. The cure was this: in one tank at a time holes were punched through the sides and wire netting neatly laid round inside. The bottom was then cemented and after drying sufficiently a cement coating some two or three inches thick was laid right round up to the top. It was waterproofed with a final coating of cement wash and salt, although "Pudlo" would probably have been better. These tanks have now been in service since 1926. —R. F. MACDONALD (Johannesburg).

Chinese Ring Puzzle

SIR,—I read with interest your article describing the Chinese ring puzzle in your January issue.

I found one myself in the interior of China in 1908; it had, and was called, "The nine connected rings."

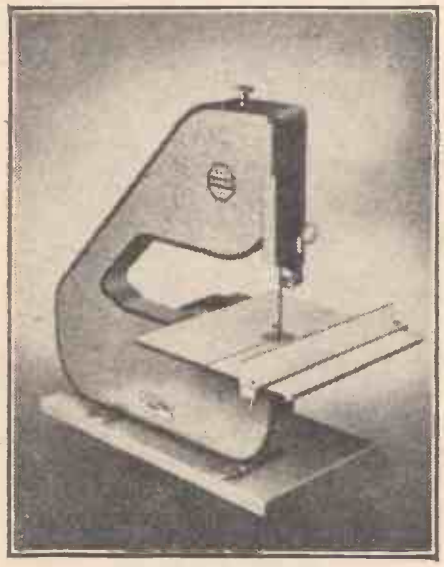
It was patented in the United Kingdom in 1907 (No. 18840) by an American applicant. The application was dated August 21, 1907, and accepted on December 12 of that year, a speedy operation which the inventor of to-day would like to see reintroduced.

The six-ring version, as described in your article, is made and sold by the Chad Valley Company.—H. G. LOWDER (London, N.W.3).

TRADE NOTES

Burgess Bandsaw

THIS electrically-powered tool can be used for cutting all kinds of wood, plastics, hardboard, light alloys, etc., up to 3½in. thick. The throat depth is 12in. and the table, which is 10in. square, can be locked in position at any angle from horizontal to 45 deg. Inside the aluminium alloy main frame run three aluminium alloy wheels with rubber tyres. The drive from the motor is by means of a chain. The removable table fence considerably extends



The Burgess bandsaw.

the capabilities of the bandsaw and can be used on either side of the blade. The manufacturers are Messrs. Burgess Products Co., Ltd. (Small Tools Division) Hinckley, Leicestershire. The price of the bandsaw, complete with motor, is £17 10s.

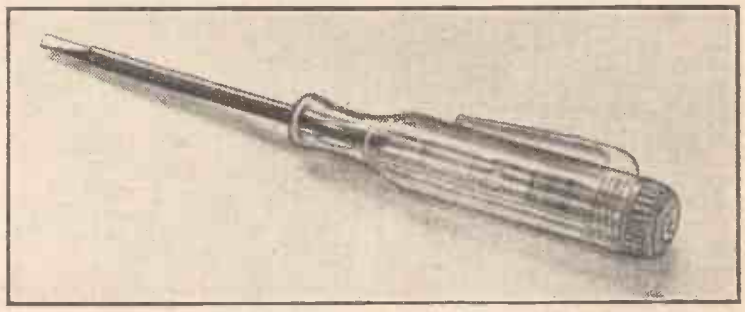
Fluorescent Remote Control Gear

FROM the British Distributing Co., 591, Green Lanes, London, N.8, comes news of a new fluorescent remote control

(Right)—The Wolf ¼in. capacity two-speed portable drill.

The new fluorescent remote control gear unit.

gear unit. It is available in either 40w. or 80w. sizes and contains an aircooled choke of the latest varnished type, suitable for tropical use, together with a power factor condenser, starter and socket terminal block all wired ready for use. The units are intended for display work where the tube requires to be free mounted from the fitting, and the control gear required to be in a distant position. Prices are 35s. 6d. for the 40w. type and 42s. 6d. for the 60w. type.



The "Screwmaster" electric mains tester.

Electric Mains Tester

THE purpose of this new "Screwmaster" is for determining the positive or live terminal of any electrical circuit. As can be seen from the photograph, the plastic handle is translucent and fitted with a pocket clip. The steel screwdriver blade is fitted with a red plastic insulating sleeve and the tester is insulated to 5,000 volts. To use, merely place the screwdriver end on an electric contact, putting the thumb on the brass socket at the other end of the tester. If the contact is positive or live, a neon light in the body of the tester illuminates; a negative contact gives no result. The retail price is 5s. 3d., and the makers are J. Stead & Co. Ltd., Manor Works, Cricket Inn Road, Sheffield, 2.

Wolf Two-speed Portable Drill

A GENERAL duty, ¼in. capacity, two-speed portable electric drill has now been made available by Wolf Electric Tools Limited. The introduction of this machine will enable users to perform ¼in. (high speed), and ½in. (low speed) drilling operations in metal at the correct cutting speeds and with the minimum of effort. One advantage with this machine and its dual function is that when drilling deep ½in. diameter holes in hard materials, extremely high penetration speeds can be obtained by drilling a ¼in. diameter pilot hole before boring out to the required diameter.

For hardwood the drilling capacities are higher, namely 1in. diameter on the low, and ⅜in. diameter on the high speed. A further feature of this new machine is that the switch handle is fitted with specially moulded insulation, thus conforming to International requirements.

The machine costs £22 15s. if fitted with a ½in. capacity drill chuck, or £20 15s. if fitted with a No. 1 Morse taper socket.

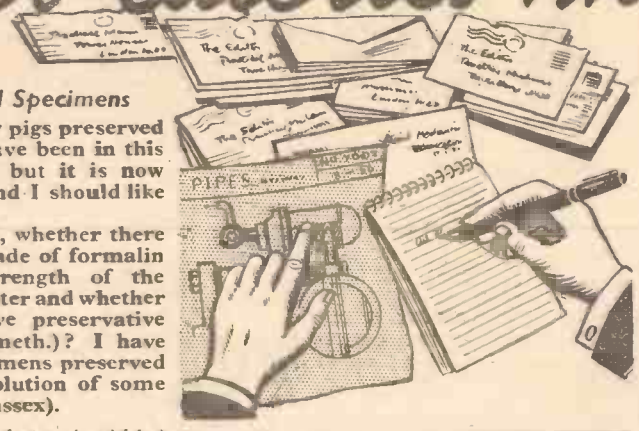
Universal motors for both DC and single phase AC 25/60 cycles are supplied for 100/110, 110/130, 150/160, 200/220, and 220/250 volts; also for 32 and 50 volts to special order. Each machine is supplied complete with a starting switch, a tubular side handle, 10ft. of 3-core T.R.S. cable (one lead for earthing), one spare pair of carbon brushes and a capsule of oil. Accessories include a chuck and arbor for fitting to the drill, a drill stand and machine vice. A full range of wood drilling bits up to the maximum capacity of the machines is also available together with a range of hole cutters.

Dormer Drills

THE Sheffield Twist Drill and Steel Co., Summerfield Street, Sheffield, 11, announce an addition to their range of twist drill sets. The new sets are in all-steel cases, and the drills automatically appear and retract with the opening and closing of the lid. The drills are firmly held in metal sections, each hole having its size clearly embossed on the face of the holder. Large sets are available, containing the fractional range of 1/16in. to ½in. by 64ths, drill gauge sizes 1 to 60, or letter sizes A to Z. There is also an intermediate range of 1/16in. to ½in. by 32nds and a small set of 1/16in. to ½in. by 64ths. All ranges are available in high speed steel and carbon steel drills.

Offered with the cases are identical ranges of drill blanks.

Your Queries Answered



Formalin for Anatomical Specimens

I HAVE some freak baby pigs preserved in formalin. They have been in this solution about 12 years, but it is now becoming rather yellow and I should like to replace it.

Can you tell me, please, whether there is a particularly clear grade of formalin for this work; the strength of the solution, using distilled water and whether there is a more effective preservative (discounting colourless meth.)? I have seen some Japanese specimens preserved in a particularly clear solution of some kind.—E. W. Collins (Sussex).

COMMERCIAL formalin is (or should be) a perfectly clear water-white 40 per cent. solution in water of formaldehyde gas, CH_2O. Almost any dilutions of this solution are strongly preservative in character. Hence, it would be perfectly true to state that you can use any formalin solution for the preservation of your anatomical specimens. The trouble, however, in your case is that if, as you say, the specimens have already been immersed in a formalin solution for 12 years, any change in the strength of this solution is sometimes likely to bring about an unwanted distortion or shrinkage of the specimen immersed in it.

The existing solution should be analysed for its formalin strength and an exact replica of this solution should be made up freshly. The specimens will then be able to be transferred to the new solution without any risk of the above-mentioned changes occurring.

For preservative purposes, a solution of one volume of commercial formalin in six volumes of water is used.

Sometimes a solution of alcohol is used in place of formalin. For this purpose a mixture of equal volumes of rectified spirit (or the cheaper iso-propyl alcohol) and water is used.

Again, Blum's Fluid has been a favourite among many anatomists for preservative uses. This is essentially a mixture of alcohol and formalin. It has the composition below :—

Commercial formalin ...	6	parts	by	volume
Rectified spirit ...	20	,,	,,	,,
Water	40	,,	,,	,,
Glacial acetic acid ...	1	,,	,,	,,

If you wish to retain the existing discoloured solution in which the specimens are at present immersed, merely filter this through a column of decolourising charcoal several times. This treatment will either remove the colour entirely or very much lessen it, so that the solution can then be returned to its original specimen jars.

Colours for a Terrazzo Floor

PLEASE tell me if the colour is incorporated into a Terrazzo floor or painted on and how are the colours obtained ?—J. Lanning (Eire).

IT is usual to incorporate the colour into a Terrazzo flooring, and not to paint it on. The various coloured materials are obtained by incorporating the following ground pigments into the cement used to make the Terrazzo :—

Yellow (or buff) : yellow ochre or barium chromate.
Green : green oxide of chromium.
Black : manganese black.
Brown : burnt umber or brown oxide of iron.
Blue : prussian blue or ultramarine.
Red : red oxide of iron.
Chocolate : manganese black mixed with red oxide of iron.
Grey : Germantown lampblack (ordinary lampblack is unsuitable).

The appropriate colour is mixed in the dry state with the cement, the amount required being determined by trial and error or by the depth of colour required.

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.

Reversing Negative Film

IS there any easy way to make ordinary 120 films into positives, by reversal ?—D. Parish (Oxford).

NO reliable method of making ordinary films into positives by reversal exists. Reversal may be obtained by a process similar to that used in solarisation, but uniformity of results would be difficult to obtain. For this method, the film should be developed until the image begins to appear, then briefly exposed to white light, directed upon the emulsion side. Full development is then undertaken (in darkness or with the usual ruby light), and the film fixed and washed in the usual way. With this method, reversal of the image is obtained by deeper layers of emulsion being shaded from the exposure to white light, where some development of the original image has taken place. Accordingly, those areas where no first image has appeared will be darker than those where an image was appearing, when the process is completed. Careful notes of the time of initial development, intensity and distance of illumination, and time of final development should be kept.

It is assumed that you wish to make positives for lantern projection. If so, the usual method would be preferable. Messrs. Ilford produce lantern plates of slow type which can be printed by contact, from an ordinary negative. It is also possible to print on to ordinary film, but this is rather rapid. As a guide to the use of the latter, 2 seconds exposure is suggested, with an average negative, using a 30° Sch. film and 1 candlepower lamp at 1ft.

Removing Mirror Silvering

PLEASE tell me how to remove the silvering from a plate glass mirror.—F. W. Woonton (Nottingham).

THE professional method of removing the silvering is to rub the back of the mirror over with a rag charged with warm methylated spirit or, alternatively, with acetone. Afterwards the mirror is lowered into a shallow glass tray in which it is immersed in warm nitric acid (about 1 in 3 dilution). The nitric acid speedily removes the silvering after its protecting back has been dissolved away by the methylated spirit rubbing. An alternative method is to brush the back of the mirror over with a warm caustic soda solution (1 in 4), using a stiff brush for the purpose.

Electro Deposition Queries

I WISH to make a model car body by the process of copperplating a lead pattern to 1/32in. thick and then melting out the lead pattern, leaving a hollow body.

The pattern I have is of solid lead moulded to the desired shape, and I have boiled it in soda to remove any grease or oil.

The windows, wheel apertures and underneath have been painted to resist the plating of these spaces. Dimensions of pattern are approximately 7in. by 2in. by 2in.

What size of bath is required? Would a beeswax lined wooden box serve as effectively as a glass bath?

What should be the composition and proportion of solution? How far apart should the pattern and copper bar be? What voltage and current is required from battery or accumulator to obtain an even, smooth coating and how long should it take?—D. Taylor (Malta).

WE consider that you should use a tank of glass, earthenware (glazed), lead or iron (preferably stove enamelled). A suitable size of tank would be 11in. by 11in. by 8in. deep. The two anodes may be spaced as far apart as convenient with the pattern suspended in between. It is advisable to agitate the solution during the plating process, preferably by means of a small motor-driven propeller, in order to obtain an even deposit.

The pattern could first be given an initial plating of 20 minutes' duration, using the following solution:

Copper sulphate, crystals, 2½oz. per gallon; sodium cyanide, 130 per cent., 4oz. per gallon; sodium bisulphite, 3oz. per gallon; sodium carbonate, 2oz. per gallon; caustic soda, ¼oz. per gallon; using anodes of twice the area of the pattern and a current density of about 0.25 amp per square decimetre. The pattern should then be rinsed and the plating continued with the following solution:—

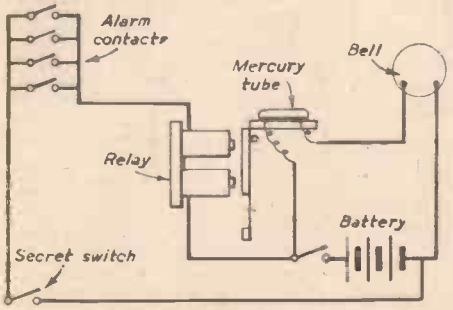
Copper sulphate, crystals, 10 oz. per gallon; sulphuric acid, 1 fluid oz. per gallon; sodium sulphocarbolate, ⅛oz. per gallon, using the same electrodes as in the preliminary plating and a current density of 1 to 1½ amps. per square decimetre. It will probably take about 40 or 50 hours to deposit a thickness of 1/32in.

About 10 amps. at 6 volts with a variable resistance for current control should be adequate.

Burglar Alarm Construction

I WISH to fit a burglar alarm in my house, so that an alarm bell will ring immediately any of the 15 windows is opened or, of course, either of the doors. I have heard of an idea, whereby two simple contacts come together when the windows are opened, and these are connected in circuit with a master switch consisting of an electromagnet which in turn pulls over a contact when a current passes through it, this contact completing the bell circuit. Should the window be closed after the burglars have opened it, the bell continues to ring. Can you help me in this matter?—A. W. Burgin (Barnsley).

IT is a somewhat difficult matter to protect all windows by burglar alarms and, of course, it is possible that a window may be broken and entry made through the broken window without opening the window frame. A simpler system would be to provide alarm contacts on all inside and outside doors. It is seldom that a burglar confines his attention to one room, and it is quite likely that one of the first actions of a burglar after entering a room is to open the outside door to ensure that he has a quick means of escape.



Suggested alarm circuit.

We suggest that contacts be fitted which are closed as soon as an attempt is made to open a door (and/or window). All these contacts should be connected in parallel with each other and through a battery to a relay. The relay might consist of the movement from an ordinary trembler bell which is mounted with the bell uppermost. The bell and knocker should be removed and a light arm, carrying a mercury tube switch, pivoted so that its free end rests on the armature of the bell movement when the latter is de-energised. In the event of coils of the relay being energised by the opening of a door or window its armature is attracted and allows the arm to fall so that the mercury switch closes to ring a large bell from the mains or from a battery.

With this system the alarm contacts operate on a low voltage circuit and can be of a very simple type. The relay, switch and bell circuit and the battery should be placed in the most inaccessible room of the house; the bell might be fitted in the loft or even outside the house near the roof. Once an alarm contact has been closed the bell will continue to ring until switched off, even if the door or window is reclosed. If required a small switch can be fitted in series with any individual alarm to render this inoperative when required. Alternatively the same purpose may be served by using some sort of an adjusting screw to prevent the particular contacts from closing, or an insulated sleeve might be slipped over the contacts. Some type of secret switch will apparently have to be connected in circuit which is used to set and reset the alarm, and which is accessible from outside the house, to enable authorised persons to set the alarm after leaving and to re-enter without starting up the alarm; in addition to a switch in the bedroom for the same purpose.

A suitable mercury switch could be obtained from one of the following firms:—

The Mercury Switch Manufacturing Co., Ltd., West Drayton, Middx.; Hall Drysdale & Co., Ltd., 58, Commerce Road, Wood Green, London, N.22; Engel & Gibbs, Ltd., Warwick Road, Boreham Wood, Herts.

Desiccator

CAN you tell me of any substance (preferably a powder) which can be placed with highly polished, delicate watch parts in store, to prevent their being attacked by rust?—G. D. Smith (Middx.).

YOU require a piece of laboratory apparatus known as a "desiccator." This, which comprises a stout glass-lidded container may be had, price from 5/- upwards according to size, from any firm of laboratory suppliers, such as Messrs. Griffen & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.

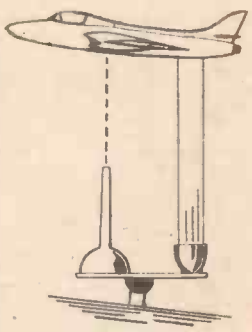
The base of the desiccator is filled with fused calcium chloride, silica gel, magnesium perchlorate ("anhydrone"), concentrated sulphuric acid or any other moisture-absorbing material, and the watch parts are placed in a tray above (but not in contact with) one of the above drying agents. Any of these drying agents may be obtained from the people who supply the desiccator.

The alternative is to wipe the parts over with Croda Fluid, No. 7, which is a rust-preventing grease based on lanoline and made by Croda, Ltd., Snaith, Goole, Yorks.

There is no actual powder which, of itself, will keep the parts dry, for powders always tend to absorb atmospheric moisture. Hence, even if the parts were buried in a powder their condition ultimately might be worse than if they have been stored in contact with damp air. In our opinion, you would get very satisfactory results from the use of a chemical desiccator containing one of the above-mentioned drying agents.

Searchlight and AA Gun Arrangement

IN my small sketch is shown a combination of a searchlight and anti-aircraft gun. Am I correct in assuming that when the beam is on the aircraft, hits would invariably be scored on the plane?—P. Walsh, Curradoon, Ireland.



Suggested searchlight and A.A. gun combination.

A SEARCHLIGHT and anti-aircraft gun mounted jointly in parallel alignment on an adjustable base is unworkable. Such a combination would preclude a direct hit unless the aircraft was flying low overhead. In this arrangement no allowance is made for the curving trajectory of the shell, nor for the time lapse between the sighting/firing moment and the delivery of the shell at altitude.

Artificial Stone Wall: Concrete Fencing Posts

I WISH to make a quantity of artificial stone, approximately 1½in. in thickness, for the purpose of building a "hollow wall" some 2ft. in height. The hollow is to be filled with soil and to contain various plants. Can you please recommend a mix that will give a fairly durable stone, not necessarily of great strength, but of a good, dark creamy colour?

Can you also please recommend a mix for the construction of reinforced concrete fencing posts?—R. A. Broadbank (Kent).

TO make the "artificial stone" you will require a cement mixture made up as follows:

Portland cement, 1 part (by measure); sand, 1 part (by measure); coarse stone chippings, 1 part (by measure); stone dust (or other inert filler), 1 part (by measure). The sand used must not be sea-sand. Any other sand will be suitable.

A good mix for the construction of concrete fencing posts is the following:—

Portland cement, 1 part (by measure); sand, ½ part (by measure); fine filler, ½ part (by measure); coarse stone fragments, 2 parts (by measure).

Information Sought

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

Floor-sweeping Compound

I WISH to make some floor-sweeping compound. I believe that sawdust is used as a base and an oil used in the mixture. Can you tell me what the actual ingredients are and where I can obtain the oil or fluid used?—F. C. McMahon (Co. Antrim).

Pearl Plating

PLEASE give me details of the process for pearl plating organic and inorganic objects. I have read details of this in an American advertisement.—W. Smyth (Cardiff).

Spin-drier

PLEASE give me details of the principles of a spin-drier for clothes and supply information on its construction.—R. Green (Yorks).

Printing Photographs on Stone

CAN you please tell me how to print photographs on stone. I have seen such a photograph incorporated into a gravestone and, being in the trade myself, would like to be able to carry out the process.—A. A. Bean (Jamaica).

THE Cyclist
Editor : F. J. CAMM

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Phone : Temple Bar 4363
Telegrams : Newnes, Rand, London

WHAT I THINK By F. J. C.

The Certificate of Driving Merit

THE Cyclists' Touring Club, no doubt with a lively eye on its declining membership, has not been slow to take advantage of the fact that in some parts of the country children are granted cycling proficiency certificates. No doubt its object is to increase its membership, for it is not so many years ago that this club was severely criticising the police and others who wished to institute such tests, not only of riding efficiency, but of mechanical efficiency. It proposes to create a new membership class for children who have passed the test which the C.T.C approves, and these new little Lord Fauntleroys of the road may become associate members with most of the advantages of ordinary members, at 5s. a year. It is not intended to encourage juvenile cyclists to become better riders. The member who proposed the motion really gave the game away when he said "it would give the club a vast reservoir of potential members, but its success would depend upon the schools and the enthusiasts in the schools." Had the C.T.C. really had at heart the desire to improve the standard of cycling among juveniles it would have instituted its own certificated tests many years ago. After someone else, however, has instituted them (Rospa, for example) it cottons on. This is a further indication that the cycling clubs are effete bodies which need to be reconstituted and infused with fresh blood with ideas more in keeping with 1957 than of 1897.

Safe Cycling

IN this connection, if all juvenile cyclists read the book entitled "Safe Cycling," published by Her Majesty's Stationery Office at 9d., and adopt the instructions there given they will have no need to pass any of these really unnecessary cycling proficiency tests. They will automatically become good cyclists. The booklet is a supplement to the Highway Code. In the booklet is a diagram showing the points which require regular attention and adjustment, and it goes much further than anything the C.T.C. has done to enhance cycling efficiency.

The N.C.U. Moves

THE National Cyclists' Union have now moved from Doughty Street to their new address at 21, Blackfriars Road, London, S.E.1, and all communications should be addressed to it there. I am glad to observe that an entirely new and more co-operative spirit now permeates this Union, but I could wish that it changed its name to the National Cyclists' Association. The very word union connotes militarism, and the N.C.U. has certainly been a militant body ever since it started. It could demonstrate by this change of title that it has changed its policy. Both the C.T.C. and the N.C.U. are passing through bad times. Each is losing membership at a heavy rate. The question of amalgamation, which is the only solution to the problem, is as remote as ever. Personalities are involved and the interests of the members are subjugated to them.

Memorial to Frank Urry

THE Centenary Club, which was founded by the late Frank Urry, who was a regular contributor to this journal, has proposed that a memorial be instituted to him. He was president of the club from its formation in 1939 until his death last year. I am glad to note that this move is afoot. The C.T.C., for which Frank did so much, has not paid adequate tribute to his life-long services to the Club, and probably still feels bitter that he should have resigned from it and severed all official connection, as well as returning his award because of the attitude of the C.T.C. council. He felt, so he told me, that he had had one of those raw deals which have been handed out to others. It was his view that cycling politics had always been underhand and unsportsmanlike.

Cycling Casualties

ACCORDING to the M.O.T. booklet mentioned above, cyclists' casualties could be reduced by about 40 per cent. if they would cut out the three major faults of which they are accused, namely, not watching what they are doing, which in 1955 caused 3,925 accidents, turning right carelessly (5,113 accidents) and crossing road junctions carelessly (2,420 accidents). It is true that large numbers of cyclists expect the other man to exercise care and some club cyclists who ought to know better are not immune from criticism. The anti-motoring brigade of cyclists are the worst offenders. These are the sort of cyclists who have been led by the C.T.C. and the N.C.U. in past years "to fight for cyclists' rights" and to be aggressive towards other road users.

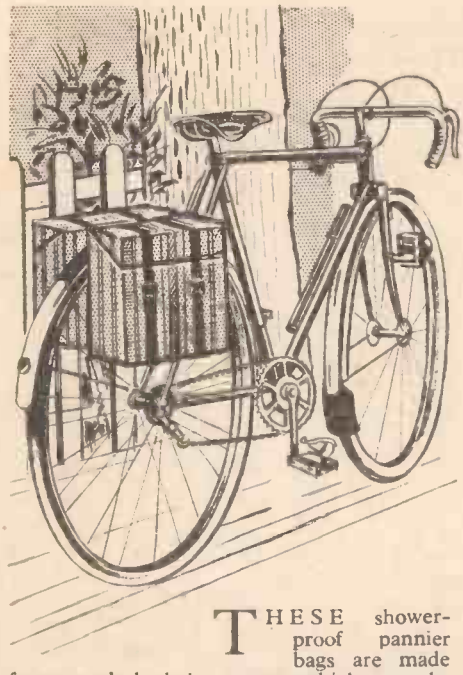
These two bodies erected an Aunt Sally in order to knock it down and impress their members with their zeal.

Shaftesbury
Dorset.
The old Saxon town of the middle west. A view of Gold Hill the steep cobbled street leading to the church.

A Tandem Association?

A MEETING with the object of forming a tandem association was recently held for the purpose of uniting tandemists into a body "to fight to maintain the position of an aspect of cycling which is being forced farther and farther into the background." This is a further example of invention of an imaginary grievance—with the object of starting an association to eliminate the imaginary grievance—another Aunt Sally. It is quite untrue to say that tandems are being forced into the background, except by the competition of motorised vehicles. The tandem is an awkward machine to store and it is an awkward machine on sharp bends.

It is a boring ride for the back-seat passenger and, like the tricycle, is becoming obsolescent. I have never understood why anyone wants to ride a tricycle. It is an uncomfortable machine, having three tracks instead of one, thus providing a bumpier ride than with a bicycle, it is heavier and therefore requires greater effort to propel, and therefore a lower gear, and it is cumbersome. The tandem machine looks wrong. It belongs to the past, and I do not believe that the proposed association will do anything to make it more popular. It has, in a word, had its day, and the sooner manufacturers take to providing a two-seater of more orthodox design and more in keeping with engineering principles the better. In any case, the numbers of tandemists are not such as to warrant a separate association. Since the interests of tandemists are identical with those of solo cyclists, existing organisations, if they do their job, would be able to protect them from any infraction of their rights, and perhaps to persuade them that such anticipated infractions are quite imaginary. There are far too many unnecessary associations already. Those who wish to enjoy cycling, as a pastime, will find that they can best do it by remaining aloof from any association and thus remaining clear of cycling politics. Although the subscription to-day is really inadequate to provide the services claimed, the members get very little indeed for their money.



Gay Cycle Pannier Bags

Make These Useful Containers for Your Summer Tour

By "LIBRA"

THESE shower-proof pannier bags are made from a deck-chair canvas which can be purchased for about 5s. from a multiple store.

First, two pencil or chalk lines are marked on the canvas 2½in. from the edge, as shown at BB in Fig. 1. The canvas is then folded at AA, 15in. from the end, and sewn into a bag with double thread about ¼in. in from the edge.

Fold the canvas as shown in Fig. 2 ; the points are sewn across at CC and then turned under and stitched in position. The bag is now turned inside out to hide the seams.

Four cuts are next made at DD and the top folded as in Fig. 3.

Turn over a ¼in. hem at the top of the bag and pass a piece of blind cord through it. The corners of the flaps are turned over a piece of cord along the line EE and sewn down. The front of the flap is also hemmed over the cord.

Two straps of brightly coloured chair webbing are passed right round the bag and suitable buckles sewn on. If preferred, the straps need be sewn only to the back and the bottom of the bag, so that wet oilskins, etc., can be tucked under them. A webbing carrying handle is also useful. Figs. 4 and 5 show the completed bag.

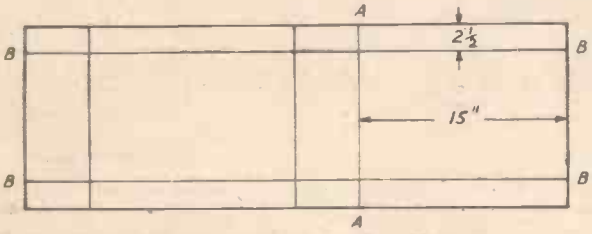
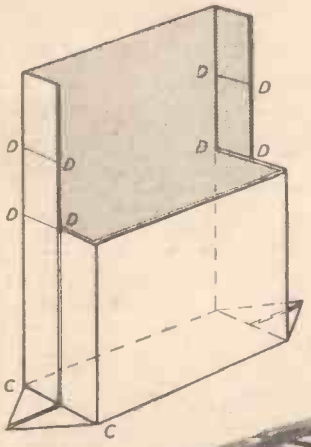


Fig. 1.—Marking out the canvas.



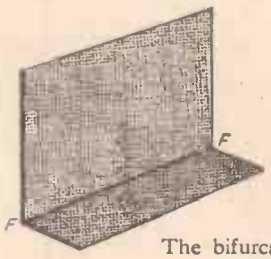


Fig. 2.—Method of folding and stiffening.

Stiffening

A piece of hardboard or 1/16 in. fibre board is bent to an L shape to fit into the bag to stiffen the back and bottom. The bend can be obtained after cutting partly through and soaking well in water. The stiffening is shown in Fig. 2 and the bend is marked FF. Rivet on to a piece of steel strip two hooks, spaced to suit the cycle carrier. The strip is then riveted with bifurcated rivets to the bag. The bifurcated rivets (⅛in. dia. x ½in. long) can be obtained cheaply from a cycle shop. If a 6 B.A. washer is placed over the legs of the rivet before bending them down a very strong fitting is obtained. The rivets should pass through the hardboard, the canvas and the steel strip with the heads inside the bag. They can also be used to secure the straps.

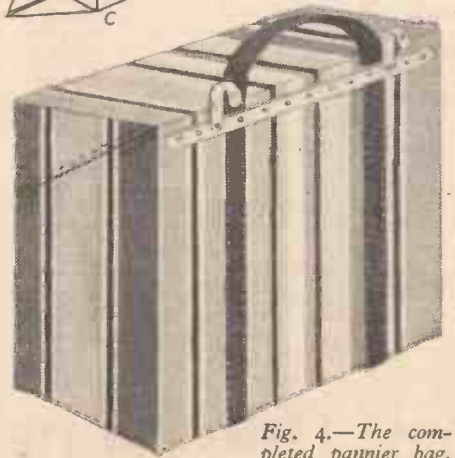


Fig. 4.—The completed pannier bag. Top straps have been omitted.

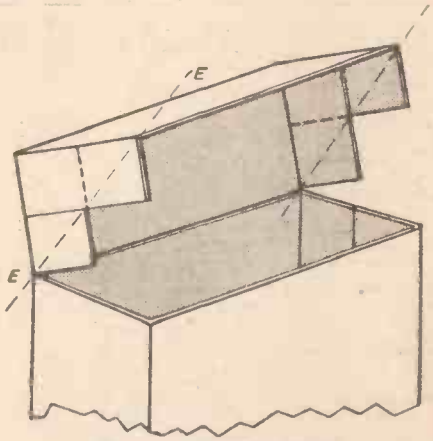


Fig. 3.—Forming the top.

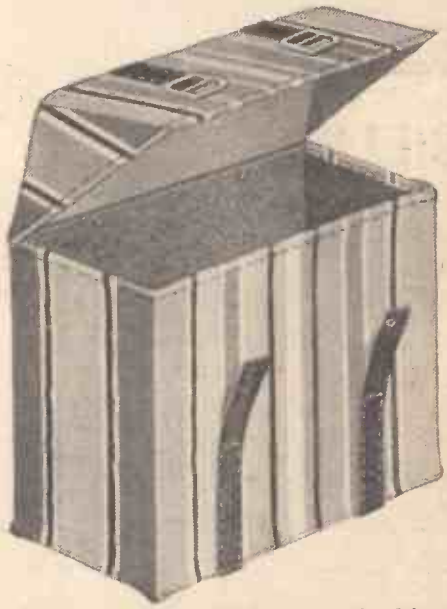


Fig. 5.—A further view of the completed bag.

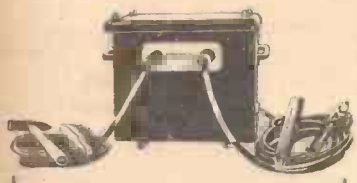
A long strap will hold the bag to the cycle carrier or the ends of the bag straps may be passed through the carrier to keep the bag in place before securing the flap.

Oiling Your Cycle

THIS is a job which should be done weekly if possible and to be thorough the cycle must be turned upside down. While the machine is in this position, oil the upper and lower head races and the front and rear wheel hubs. An ordinary oilcan may be used, but if pressure nipples are fitted an oil gun should be employed. Where nipples are fitted they should always be used ; oiling directly into the bearings may carry in dirt.

Stand the machine the right way up again and oil the bottom bracket, rotate the cranks and trail a thin line of oil along the inside face of the chain. Turn the machine first on one side and then on the other and oil each pedal in turn, making sure the oil runs through to the inner ball race. While the machine is laying on its appropriate side, oil the freewheel. Finally, very sparingly oil the moving parts of the brakes—the brake pivot and lever pivot, in the case of cable brakes and the lever pivots and stirrup guides on roller brakes.

On a derailleur gear, the lever must be oiled and the races in the jockey and actuating sprockets also. A spot of oil is beneficial too on the flat coiled spring of the changing mechanism. The lever and little actuating chain must be oiled on a hub gear.



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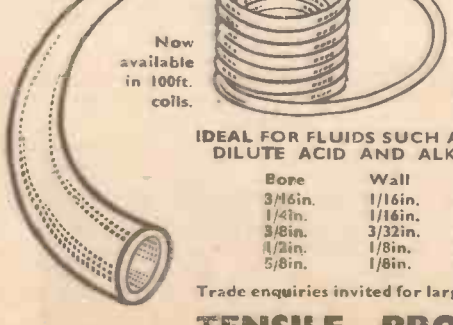

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