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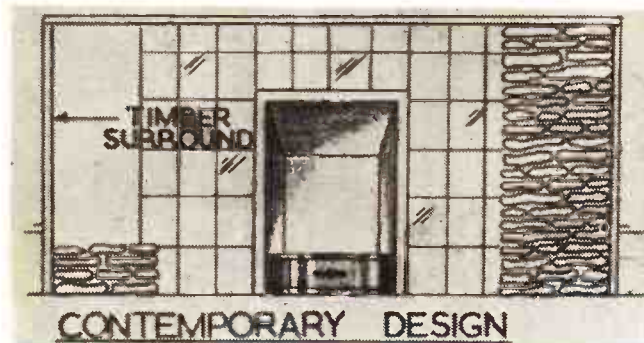
## A JOB FOR THE HANDYMAN

# CONSTRUCTING FIREPLACES

**T**HE combination of modern, simple-line, contemporary furniture and a fireplace of rough, walling stone is becoming increasingly popular. The reason is not far to find. One 'shows

off' the other. Further, a fireplace of rough stones looks more inviting, more cosy than a streamlined affair.

The construction of a stone fireplace is simplicity itself. There are, however,



one or two points to consider — if you are the tenant of a house it is advisable to get your landlord's permission. Remember too, it will be a fixture and his property should you leave the house. Secondly, the stone fireplace, when complete, will in most cases be heavier than that of your present unit. Therefore it must only be built on ground floor rooms and not on first or other floors.

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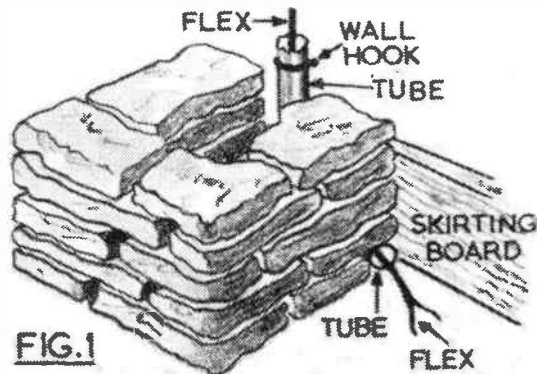
The flat stones to be used are those yellow flat ones normally used for the construction of crazy paving. Your dealer may call them Cotswold walling, random walling or some other local name. As regards the quantity to order, start with 5 cwt. This will probably be sufficient for, as explained later, the fireplace columns are built hollow and less stones will be needed than would at first appear.

The compo or mixture to be used in laying the stones is that of 4 parts of sharp sand to one of cement. Half a cubic yard of sand and one bag of cement should be sufficient.

#### Removing old surround

The majority of fireplaces in use today are those with a tiled back and hearth and a wood surround and mantelshelf.

To remove the wood surround, first chip away some of the plaster at the sides. You will find that it is held by two or more metal plates, screwed into a



wooden plug set between the brickwork of the wall. Unscrew the plates and gently lever the surround away from the wall.

Do not worry about the gaps of bare brickwork showing now you have removed the surround. The built walling will hide all this.

#### Design of the fireplace

If you have not already decided, now is the time to choose what type of structure you would prefer. You may like the design shown in the photograph. It is built throughout of walling and incorporates two extended portions as 'seats' at the base of the columns, a central arch complete with an attractive keystone, a long mantelshelf with two smaller, drop ends made from cement compo and a kerb made in the same manner.

Or, you may prefer a contemporary design, such as shown in the drawing. Here a surround of 8in. by 1in. prepared

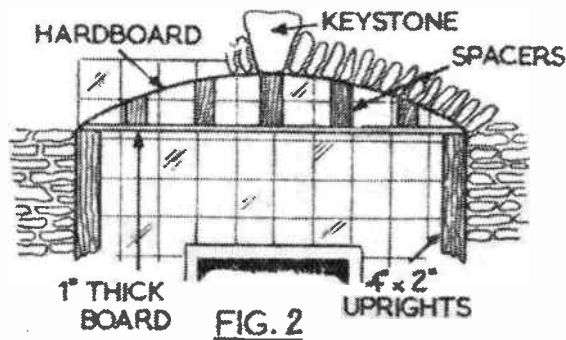
timber is first fixed in position and the walling built up in the inside corners. The surround is held with metal plates, screwed into wooden plates in the joins in the brickwork. Remember to fit the plates on the inside edges of the wood surround so that when the stone pillaring is built they are hidden from view.

Take great care to see that the surround is fixed square and level and when laying the stones, set them back approximately  $\frac{1}{2}$ in. from the front edges.

#### Building the fireplace

As shown in Fig. 1, the two side columns are built hollow. This has two advantages; the structure is lighter, materials are saved, and the hollow can be used to house any electrical wiring (described later).

Note the laying of the stones. Do not have the joins between two stones opposite one another in successive layers. Use approximately  $\frac{1}{2}$ in. thick layers of



the compo. Tap the stones well down and remove the excess compo squeezed out by the pressure, with the trowel. After laying approximately six stones, go back over your work and smooth or 'point' the compo joins to make them smooth and even.

If you are working on a very warm day you may find that the stones have extreme 'suction' and the compo dries almost as soon as it is applied, making the work rather tedious. To overcome this, soak the stones in water preparatory to laying.

#### Use of the hollow

Seen also in Fig. 1 is the housing of an electric cable. This can be more useful than is at first apparent. For instance, you may use an electric clock. Most probably this meant a length of unsightly trailing flex leading to the clock.

Now is the opportunity to hide the flex, to enter it at the base of the column nearest to a convenient plug point and to

emerge at a neat and hidden position behind clock location on the mantelshelf.

Or, you may like to incorporate a small recess in each of the finished columns, illuminated by concealed lighting. Now is the chance to make a neat and tidy job of the wiring.

Finally, you may have an electric plug point on the opposite side of the fireplace to where it is most needed and which has meant trailing flex. You now have an opportunity of bringing a lead from this plug, through the concealed tubing built into the fireplace, to emerge on the other and more convenient side of the chimney breast.

Use electrician's conduit tubing to enclose the flex and hold it back to the wall with a metal hook, here and there. A good idea is to fit a tight, rubber washer at the tube ends to prevent any chafing of the flex on the tube rim.

#### Building an arch

To build a central arch, some shoring

will be needed as shown in Fig. 2. This consists of a simple arch shape, made by nailing a suitably wide length of  $\frac{1}{2}$ in. hardboard to the opposite ends of a length of 1in. thick board, and bowed to form an arch. Spacers, consisting of cut length of 3in. by 2in. timber are inserted between the horizontal board and the curved hardboard and nailed in place. Finally, the shape or 'jig' is held in its working position by being nailed to two 3in. by 2in. uprights, cut to reach down to the hearth level.

The best procedure is to first build up the side stone columns to approximately half their finished height and to allow the cement compo to harden overnight. Then fit the jig to be a tight fit between the partially built columns and also keep the uprights from 'wandering' by nailing a scrap length of timber across their fronts, somewhere near the base.

Select carefully the quantity of stones that will form the arch arc. Choose those as near uniform in size as is possible.

Select also a nice, flat, triangular stone for the keystone. It should be taller than that of the arch stones and if necessary chip away a stone to make a suitable shape.

Start laying the arch stones from a point level with the outside points of the jig. You will, of course, have now built the side columns up to this level.

As you proceed, lay each individual stone at an approximate right angle to its meeting point with the jig. It is advisable to make a slightly stronger compo for these stones, consisting of 3 parts of sand to one of cement. As with the columns, point the joins as you go along.

Be certain that the keystone is fitted exactly in the centre of the arch, place it in position lastly, after the two halves of the arch have been laid.

Whilst the columns have been built hollow, it is not advisable to build the portion above the arch in this manner. However, where stones taper off towards the rear and same is not seen when the fireplace is complete, there is no need to cut and fit small pieces of stone into these gaps. Aim at laying the stones so that not too much of a gap is left unsupported by other stones, over and below them.

When the building is complete, leave the wooden shoring or jig in position for at least two days, before removing.

#### Building recesses

Unless you are building the stone columns of the fireplace to a width of 12ins. or more it is best not to incorporate any recesses in them. The reason is obvious. To include a recess means that, at this point, quite small stone layers

will have to be fitted on each side of the recess space and that these small stones will also have to support the remaining part of the column built over them.

However, recesses are attractive, and if you like them and the width of the columns allows it, do not be deterred. Keep the recess positions about a third from the top of the column so that you have more solid strength under it and less mass of the solid column resting on top of it. Mix up a compo of 2 parts of sand to one of cement and choose flat, even stones for the recess side layers.

Also, remember that you will need two stones of an approximate width and depth of the column dimension to use as the base (or shelf) of the recess and for the top (or ceiling) of the recess. So, keep some stones of this dimension apart to be used solely for this purpose.

#### Mantelshelf and kerb

A solid, cement mantelshelf can be made by first nailing together a simple framework of 1½in. by 1in. timber, with inside measurements to suit the size of shelf required. Decide whether you want the shelf front and sides to overhang and allow your measurements accordingly.

Lay the framework on a level piece of wood and fill in with a mixture of 3 parts sand to one of cement. You may, if you wish, do this operation outside on a level length of paving, but to prevent the compo mixture from adhering to the paving, lay one or two layers of newspaper inside your frame or mould, before filling in the compo mixture.

Before the compo sets really hard, chamfer off the leading edges of it with a small trowel or table knife. Smooth the

surface of the compo continually to form a smooth and even surface. Remove the wood framing before the compo sets really hard so that you have an opportunity of smoothing off the sides, formerly enclosed by the wood frame. Nicks can also be cut on the sides at this stage to give the effect of imitation joins in the mantel length (see photograph).

Kerbs are made in the same way, and will, of course, be of a size to fit between the built stone columns. However, do not make the length a tight fit but rather allow an easy fit so that they can be easily moved into position and the free ends joined to the column sides with cement compo.

Allow at least two days for kerbs and shelves to harden off before moving. Care must then be used in lifting same and placing in position. Enlist aid, so that three persons lift the finished shelf allowing no unsupported portion to suffer an undue strain with the risk of breaking.

If you have some clean galvanised wire netting (don't use anything rusty), it can be used as reinforcement for the compo shelf and minimises the risk of the shelf cracking or breaking during fixing. The wooden frame should be half-filled with compo, the wire netting laid across the surface and the rest of the compo then inserted. Remember to cut the netting 1 in. less in dimension all round, than that of the mantelshelf so that no wire points emerge through the front or sides of the finished shelf.

Bed both the shelf and the kerb on to a ½in. layer of compo and sprinkle continually with water to hasten hardening. (E.C.)

## PORTABLE WORK-STOOL

**W**HEN carrying out repairs about the house do you always reach for the kitchen chair when you want to get up to some part which is out of your reach? Do you often work with tools and nails, etc., lying around your feet (and everyone else's)? Do you often use the kitchen table as a work-bench when working indoors? If you do, then your untidy ways are sure to get you into trouble with the womenfolk.

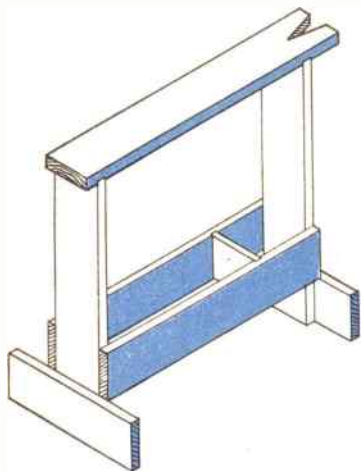
For the handyman who is constantly doing household repair jobs a portable work-stool will be found to be a very useful piece of equipment. The stool which is shown in the illustration is similar to the ones used by tradesmen joiners. This handy piece of equipment can be used as a work-bench for sawing, planing, etc., and has a tray at the bottom for holding tools and nails. It is also

ideal for standing on to get to any high parts.

The construction is of a very simple nature and requires no intricate joints. The timber required is 4in. by 1in. softwood except for the top piece which should be 4in. by 1½in. hardwood, such as beech. No lengths are given in the illustration because the size of the stool will depend on individual requirements. However, as a guide, a height of 2ft. 3ins. and a length of 2ft. 6ins. will make a handy sized stool.

The construction of the stool is very simple and the illustration is self-explanatory, but the housing joints for the fixing of the top and the end of the tool compartment should be noted.

Incidentally, two work-stools with a plank spanned between them will make an excellent safe scaffold for papering the ceiling and many other jobs.



*Described by  
Finlay Kerr*

# CHEMISTRY IN THE HOME

## MAKING YOUR OWN CHEMICALS Part 2

**H**ERE are some further chemicals which you can make for yourself. Chrome alum (chromium potassium sulphate) is readily prepared by reducing an acidified solution of potassium dichromate. Dissolve 15 grams of potassium dichromate in 100 c.c. of water, slowly run in 13.5 c.c. of strong sulphuric acid with stirring, taking care to let the mixture cool between each addition, or better, stand the beaker in a vessel of cold water. Now add a few drops at a time, 7 c.c. of methylated spirit. During this addition the temperature must not be allowed to rise above 40 degrees Centigrade and is best kept around 35 degrees. If the temperature rises too high a lowered yield will be obtained owing to production of a crystallizable modification.

The solution darkens under the action of the meths. Let the liquid stand overnight. The violet crystals of chrome alum which separate can then be removed and left to drain and dry on a porous brick.

### Copper carbonate

Copper carbonate can be made from copper sulphate. To make copper carbonate dissolve 66 grams of copper sulphate in 300 c.c. of water and pour the solution into a large vessel, such as a Winchester. A large vessel is necessary, since carbon dioxide is given off and allowance must be made for the foaming if it is not to overflow. Add a solution of 80 grams of sodium carbonate (washing soda) in 500 c.c. of water.

A bulky blue precipitate of copper carbonate forms and this, on standing, contracts and forms a heavier green modification. Filter it off and wash it on the filter until the wash waters no longer give a white precipitate with strontium nitrate solution. Dry it at room temperature or in gentle heat.

### Copper oxide

By heating copper carbonate we obtain copper oxide. Put 40 grams of the carbonate in a crucible and heat it to low redness. The green carbonate changes to the black oxide.

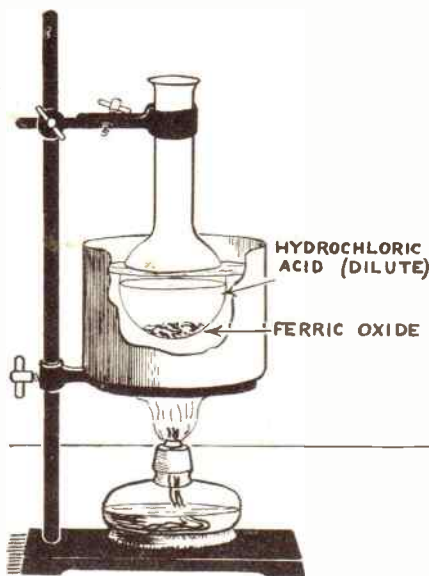
### Cobalt carbonate

Cobalt nitrate can be prepared from cobalt chloride via the carbonate. Dissolve 50 grams of cobalt chloride in 250 c.c. of water and add a solution of

65 grams of sodium carbonate in 400 c.c. of water. Filter off the reddish pink precipitate of cobalt carbonate and wash it on the filter until the wash waters no longer give a white precipitate with silver nitrate solution. Dry the carbonate at room temperature or in gentle heat.

### Cobalt nitrate

To make cobalt nitrate from it, put about 12 grams in a beaker. Dilute 20 c.c. of strong nitric acid with 60 c.c.



*Making ferric chloride*

of water and add portions to the cobalt carbonate until it has nearly all dissolved. Effervescence occurs from evolution of carbon dioxide. Warm the solution. If the rest of the carbonate dissolves, add a little more until there is a slight excess. Filter the red solution and evaporate it to very low bulk on the water-bath and let it crystallize. Remove the crystals and dry them on a porous brick.

### Ferric oxide

Ferric oxide, useful not only as a source of ferric salts, but as a polishing

powder or jeweller's rouge, is simple to make from the very cheap ferrous sulphate. Take 100 grams of ferrous sulphate crystals, spread them out on a dish and put them in the oven. This will remove most of the water of crystallization and make the subsequent heating easier. The cream coloured powder remaining is then heated to redness in the fire for three-quarters of an hour. A tin may be used as the heating vessel, but first remove the tinning by heating it alone in the fire and rub out the scale with emery paper. The ferric oxide is thus obtained as a red powder.

### Ferric chloride

To make ferric chloride from ferric oxide, put 8 grams of the oxide into a flask and support it in a water-bath (see diagram). Dilute 30 c.c. of strong hydrochloric acid with an equal volume of water, and pour it on to the oxide. Leave the flask in the boiling bath for an hour. Swirl the flask occasionally. Filter from any residue and evaporate the orange-yellow solution of ferric chloride to dryness in an evaporating basin on wire gauze. Bottle it while still warm, for it attracts moisture from the air.

### Basic lead carbonate

Basic lead carbonate is often needed in the laboratory for the preparation of soluble lead salts. You can also make from it a supply of lead monoxide (litharge). To make the carbonate dissolve 38 grams of lead acetate in 200 c.c. of water. Stir into it a solution of 29 grams of sodium carbonate (washing soda) in 200 c.c. of water. A heavy white precipitate of basic lead carbonate falls. If the mixture is not alkaline to red litmus paper — that is, it does not turn it blue — add a little more sodium carbonate solution until it is. Wash the precipitate by decantation with plenty of water and dry the lead carbonate in a warm place.

### Lead monoxide

Lead monoxide is prepared from the carbonate simply by heating. Put 35 grams of basic lead carbonate into a crucible or iron ladle and heat to low redness, keeping up the heat for five or ten minutes. On cooling, lead monoxide will be left.

● Continued on page 69

# HOW TO MAKE A PERISCOPE

**T**O make this simple but effectual periscope you will need two mirrors, each 4ins. square. These are set in wooden frames, details of which are given in Fig. 1.

The three parts of the frames have the same outer measurements. The base pieces are  $4\frac{1}{2}$ ins. square by  $\frac{1}{2}$ in. thick (A). The mirror surrounds are made to

*By H. Ridgway*

the shape indicated (B). To do this, draw and cut out an inner square,  $\frac{1}{4}$ in. from the edges of your prepared piece of wood. This will be  $\frac{1}{8}$ in. or  $\frac{3}{16}$ in. thick, depending upon the thickness of the mirrors. Glue the surrounds to the base pieces, after testing that they are an easy fit for the mirrors. The rims (C) which hold the mirrors down, are  $\frac{1}{16}$ in. thick, and have sides,  $\frac{3}{8}$ in. in width. These are glued to the surrounds; but before this is done, ascertain whether the mirrors need any packing underneath, to bring them in firm contact with the rims.

The frames are secured to a bar, made from two 10in. lengths of  $\frac{1}{2}$ in. by 1in. stripwood. These are connected with a small hinge, screwed on the  $\frac{1}{2}$ in. side (A in Fig. 2). On the opposite side fix a small hook and eye, to keep the bar rigid when in use. Drill two holes,

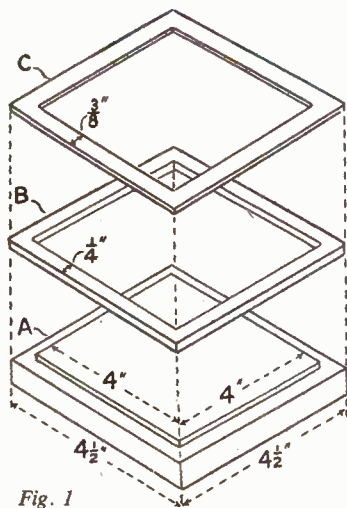


Fig. 1

$\frac{1}{2}$ ins. from the top and the bottom. Pass suitable round-headed screws through them, and secure the frames to the bar. The screws should be adjusted to hold the frames firmly in any given position. The usual angle for the mirrors for viewing is  $45^\circ$ , and this should be marked clearly at the top and bottom of the bar.

When not in use the periscope can be folded to half its length, and the two

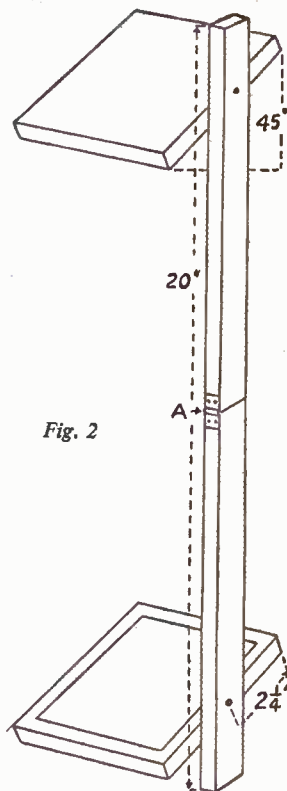


Fig. 2

mirrors are protected by meeting in a vertical position. Make secure by passing a strong rubber band round the frames and the bar.

• Continued from page 68

## Making your own Chemicals

### Lithium sulphate

Lithium sulphate is soon prepared from the readily available lithium carbonate. Measure out 50 c.c. of cold water into a beaker and stand the beaker in a pan of cold water. From a burette gradually add 13.2 c.c. of strong sulphuric acid, stirring constantly and temporarily halting the addition if the liquid in the beaker grows warm. Should you get any of the strong acid on the skin, the usual treatment should be adopted, that is, flushing with water and application of a paste of sodium bicarbonate and water.

Remove the beaker from the water and add gradually 18.5 grams of lithium carbonate with stirring. Brisk effervescence takes place owing to evolution of carbon dioxide. When all the carbonate has been added, wash down the

sides of the beaker with the help of your wash bottle and then boil the liquid. Filter hot from any residue and evaporate first to low bulk over wire gauze and then to dryness on the water-bath. White lithium sulphate remains in the evaporating basin.

### Basic magnesium carbonate

Basic magnesium carbonate is rather dear to buy from your pharmacist, and it well pays to make your own from the cheap Epsom salt (magnesium sulphate) and washing soda (sodium carbonate). Dissolve 83 grams of magnesium sulphate and 100 grams of sodium carbonate each in 500 c.c. of boiling water. Mix the boiling solutions while stirring well and continue boiling for fifteen minutes. Filter off the white precipitate of basic magnesium carbonate and wash

it well with water until one wash water is shown to be free of sulphates by its not giving a white precipitate with strontium nitrate solution. Dry the magnesium carbonate either at room temperature or in the oven at not higher than 100 degrees Centigrade.

### Potassium chromate

Potassium chromate you can make from potassium dichromate. Powder and mix 22.05 grams of potassium dichromate and 15 grams of potassium hydrogen carbonate. Put the mixture in a beaker and pour on 75 c.c. of cold water. Let the whole stand overnight, when the effervescence which at first occurs will have subsided. Now boil up the liquid. Effervescence recommences. Continue boiling until it ceases. Let the orange solution so obtained stand a few hours until it turns yellow. Then evaporate it to dryness on the water-bath. Stir it often, otherwise a pellicle forms at the surface which delays evaporation. Potassium chromate is left in the basin as a yellow micro-crystalline powder.

# 'INLAID' WORK WITH PAINT

**P**ERSONAL birthday gifts often present something of a problem, but here we have a novel craft which enables you to make something especially for a recipient. The effect is to produce something in the fashion of oriental inlaid work, Japanese lacquered craft being an example, but actually we use paint in conjunction with a method of stencilling in reverse. Whitewood ware, obtainable at crafts shops, will enable you to produce napkin rings, egg cups, cigarette boxes, and bowls and many other articles while plain plywood can be converted into teapot stands, trays and chequerboards.

Whatever is used as a base, the first task is a general cleaning of the material with fine glasspaper for a smooth finish followed by an application of the ground colour in a flat paint. Two coats may be necessary since the first will only act as a sealer, and this ground should not be laid on too thickly, noting that it is advisable to glasspaper between the two coats and after. The colour will also be the colour of the finished design which is ultimately surrounded by black to create the effect of inlay. For example, an ivory coat of paint would produce an ivory inlay, while for a floral design two colours may be used. You may also apply matt varnish which leaves the natural wood grain quite clear.

For a personal napkin ring a letter representing the initial of the surname is cut out and attached to the ring, but more will be said on this later. If you wish to produce a perfect initial you have a choice of Roman capitals or some of the modern types and you are advised to search newspapers or magazines for

the particular letter you require, either tracing the outline on to the stencilling material or sticking on and cutting out with knife or scissors.

Designs for floral effects can be produced by observation of wallpaper patterns, designs, and so on. Where perfect balance is desired, as in our sampler, sprays of leaves can be cut out in pairs providing the material is reversed. Needless to say, a really sharp knife is essential to ensure a clean cut, but you may use scissors, and a pen-nib trimmer for any fine corrections after attaching to the work.

## Inking in details

Reference to Fig. 1 will reveal the appearance of the work after peeling away the motifs and blacking the remainder. The napkin ring shows an initial on one side only but a small design could also be added. It will be noted that the leaves on the right of the sampler have been 'veined'. These veins were added before final varnishing with an ordinary pen and Indian ink, another modification you may use if you wish.

After many experiments it has been found that the new plastic self-adhesive coverings, such as Contact or Fablon, are ideal for our purpose, being easy to cut and ensuring perfect adhesion at the edges of motifs.

These materials have a protective backing which is peeled away before application, just like a vulcanized cycle patch and you may prepare your design or initial on the face of the material by marking out in pencil. The backing is peeled away by inserting a knife point between the two when the design can be

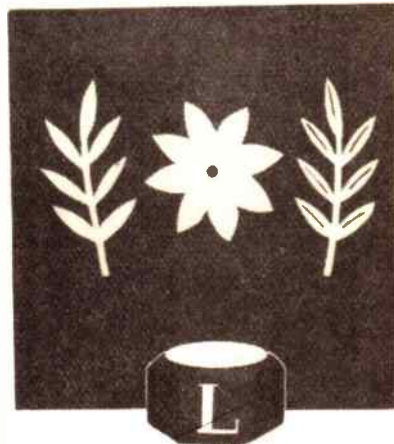


Fig. 1—This shows the appearance after applying black paint and stripping the designs.

applied to the work. Before applying to the work and removing the backing it is wiser to place temporarily in position, marking with a pencil. We may mention that it is quite possible to remove a motif and replace without harm if it becomes necessary. When the position has been decided and the pattern applied you need only press down firmly with the fingers, but you must make certain that the edges are in perfect contact otherwise the tiniest leak may cause a blurred edge on the finished work.

## Applying the colour

Our next task is the application of the black colouring and for this we again use flat colour. A small quantity of flat black paint, mixed with a little turpentine, is applied with a stencil brush held vertically. Note that the paint must not be too thin and the brush must be held vertically, dabbing on small quantities at a time. An old shaving brush is admirable for this purpose if trimmed square.

Once the black colour has been applied all over the work ample drying time should be allowed, after which the cut outs will peel away quite easily if first lifted with the point of a knife and there will be no residue of adhesive, leaving the pattern apparently inlaid.

All that is now required is a final coating of clear white varnish, or cellulose lacquer, to impart a high gloss, when the design or initial will appear to be inlaid. The varnish used will be determined by the type of work produced, including heatproof varnishes for use on teapot stands and trays. (S.H.L.)

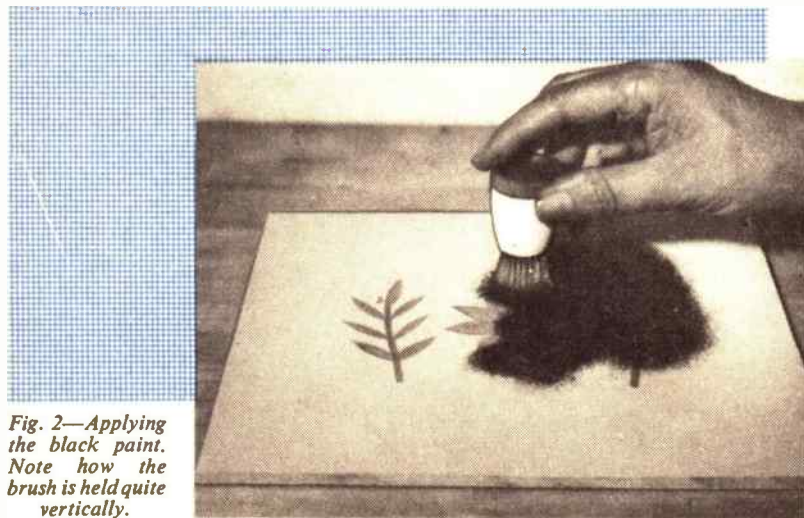
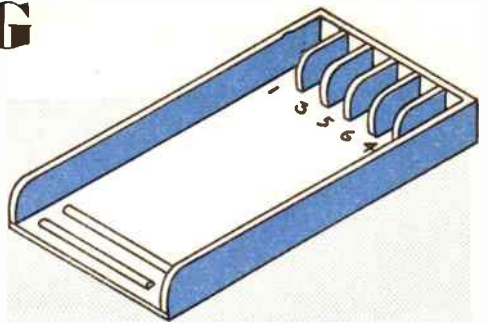


Fig. 2—Applying the black paint. Note how the brush is held quite vertically.

# AN ENTERTAINING BALL GAME

NOW that winter is on its way it will soon be time to start thinking about how to amuse ourselves during the long dark evenings at home. If you are the type of person who enjoys playing games of skill with one or two of your friends then here is a ball game which is sure to hold your interest. The



*By Finlay Kerr*

apparatus required for the game is illustrated above and the object is to roll a set number of balls (usually three) towards the pockets at the bottom and score the highest number of points in a given number of chances. As you will notice, the lowest points are at the outside and the highest points are positioned near the centre.

depend upon the diameter of the balls and the number of pockets you make. Once cut, smooth off the sawn edges.

After this, obtain some 1½ in. by ½ in. edge moulding and nail this around the two sides and back edge of the base. The front or near ends of the side members should be rounded off to give a neater finish. Mitre or butt joint the edging at the back corners.

The next step is to make the divisions

The obstacles are simply small pieces of ½ in. diameter dowelling cut 1½ ins. long. These are not fixed to the base but are merely inserted into holes previously bored in the base at suitable positions. By doing this, it is then a simple matter to remove the obstacles when younger children want to play the game.

To complete, give the board a coat of lacquer and paint or apply numeral transfers opposite each pocket.

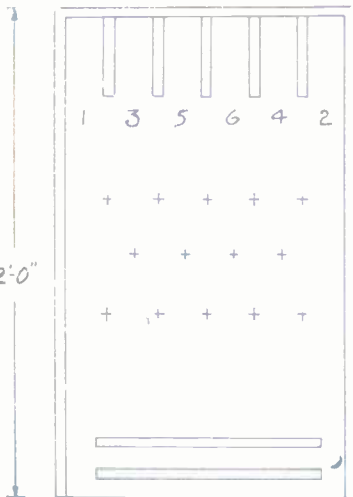


Fig. 1

Before making the board it is advisable to obtain the necessary balls first. These may be ping-pong balls, rubber or plastic balls, etc. about 1½ in. in diameter. Chain stores and toy shops usually have a large selection of such balls. Note that the width of the pockets should be ½ in. wider than the diameter of the balls. This is the reason why you must obtain the balls first.

The base of the board consists of a piece of ¾ in. thick plywood. The length should be about 2ft. and the width will



Fig. 2

for the pockets. These are made from 1½ in. by ½ in. timber and are cut about 4 in. long. The number will depend on your own requirements. Once again, round off the front ends as shown in Fig. 2 and nail in position.

The small trough at the top of the board for holding the balls is made by fixing two short lengths of moulding to the base at a convenient distance apart to suit the balls.

It is obvious that the board must be slightly raised at the front end in order that the balls will run down to the pockets. This may be done in three ways, as illustrated in Fig. 3. At (A) two small rubber buffers (the type used for W.C. seats) are screwed to the underside of the base. At (B) two rubber (or plastic) headed upholstery tacks are inserted to give the desired slope, whereas at (C) a small section of wood is attached to the underside. The amount of tilt required will depend on individual requirements.

When older children or adults are playing the game it may be found necessary to make it a little more difficult. This can be achieved by inserting obstacles in the middle of the board so that the balls have to be manoeuvred around them as shown in Figs. 1 and 2.

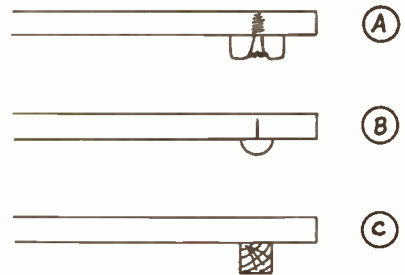


Fig. 3

A free design for making a Toy Fire Engine—very popular among small boys as Christmas gifts—will be given in next week's issue. Also many more exciting projects.

**MAKE SURE OF YOUR COPY**

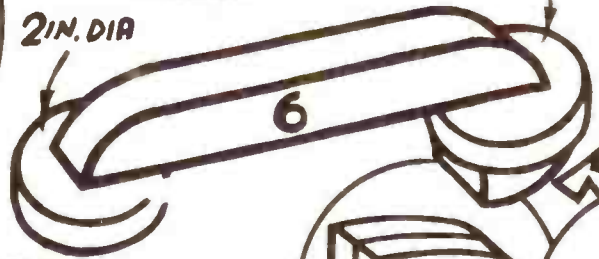
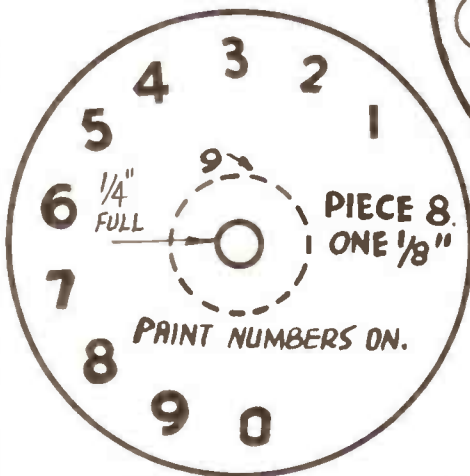
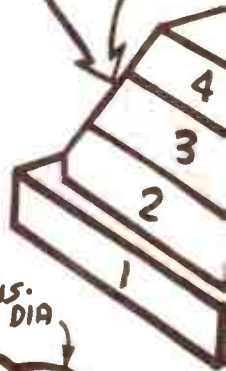
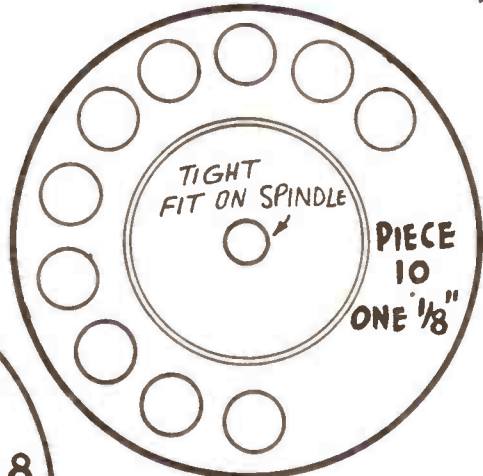
# TOY TELL



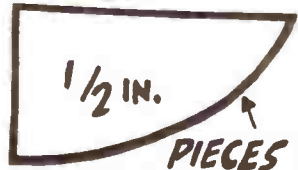
SHOWING HOW BODY IS SHAPED



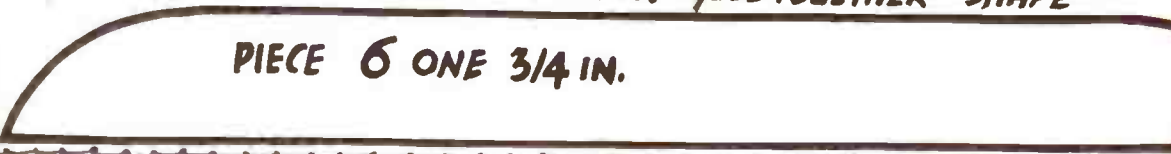
SPACER 9.  
BETWEEN  
PIECES  
8 & 10



$\frac{1}{4}$ " AT

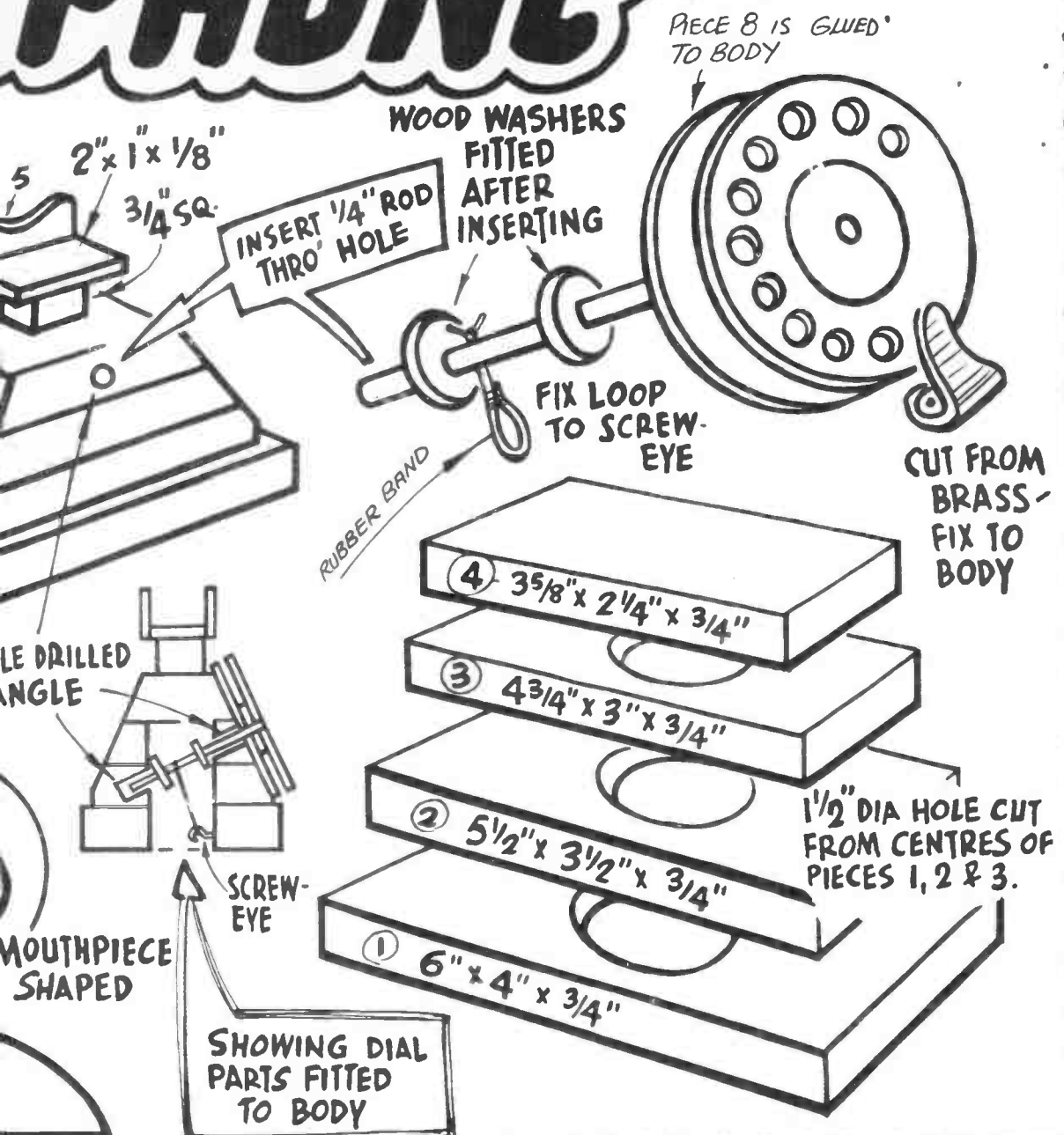


PIECES 7  
CUT FOUR - GLUE TOGETHER - SHAPE





# PHONE



# ADDING AN OHMS RANGE

THE meter used in the simple D.C. multimeter previously described, can be used to measure resistances from about 200 ohms to about 25,000 ohms fairly accurately. Consider the circuit in Fig. 1.

With a 3 volt torch battery in series with the instrument it is required to have a FSD when the test terminals are shorted together. What then must the series resistance be? We apply Ohm's Law:

$$R = \frac{3}{1/1000} = 3000 \text{ ohms.}$$

How do we measure an unknown resistance? We take the resistance and place it across the test terminals. Suppose the reading is 0.35 of a milliamp, i.e., 0.35 of a full scale deflection. Then the resistance in the circuit is given by:

$$R = \frac{3}{0.35/1000} = \frac{30,000}{35} = 8,500 \text{ ohms (approx.)}$$

But 3000 ohms of this are in the instrument itself. Therefore, the unknown resistance is 8,500 - 3000 = 5,500 ohms.



Fig. 1

Another example should make the method of working out clear. Suppose an unknown resistance across the test terminals gives a reading of 0.2 mA. Then total resistance in the circuit is given by:

$$R = \frac{3 \text{ volts}}{0.2/1000 \text{ amperes}} = \frac{3000}{0.2} = \frac{30,000}{2} = 15,000 \text{ ohms.}$$

3000 ohms of this are already in the instrument. Therefore, the unknown resistance is 15,000 - 3000 = 12,000 ohms.

The best method of using the instrument is to work out the value of the unknown resistance for each setting of the

pointer and draw up a calibration card or a graph. (Note: The graph will not be linear, and it will be difficult to obtain accurate readings near the ends. The

Extra components needed:  
 Potentiometer — 1000 ohms. Wire wound.  
 2,500 ohm carbon resistance. ½ watt.  
 3 volt torch battery.  
 Clip for battery (an old condenser clip will do).  
 One insulated terminal.

most accurate readings will be obtained for about half scale deflections, i.e., for resistances in the region of 3000 ohms).

In the circuit shown in Fig. 2 it will be noticed that the 3000 ohm resistance used in the circuit above has been replaced by a resistance of 2,500 ohms, together with a wire wound potentiometer of 1000 ohms. This is to allow the meter to be set to FSD. This is necessary because when the battery is first purchased its voltage will be a little above

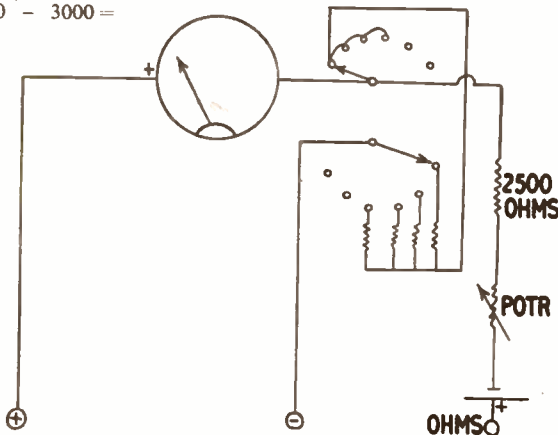


Fig. 2

3 volts, and when it has been in use for some time its voltage will fall to below 3 volts. The procedure for using the instrument is now: (i) short the test terminals and adjust the potentiometer for FSD, (ii) place unknown resistance across terminals and read scale, (iii) consult calibration card or graph to determine unknown resistance.

The extra components are mounted on the multimeter as shown in Figs. 3 and 4.

The outer zinc case is the negative terminal of the battery and this must make good contact with the clip since the negative lead is taken from the clip.

Therefore, before placing the battery in position, the cardboard cover must be removed. To measure resistance, the negative lead on the front panel is merely transferred to the terminal marked 'ohms', and then the two leads are applied to the tags of the resistance to be measured.

The resistance range of this instrument must be used only when the selector switch is set to a volts range. No harm can result if the meter is switched to milliamps, but it will be impossible to obtain FSD owing to the shunts which will be present in the current ranges later.

(D.A.C.)

Fig. 3

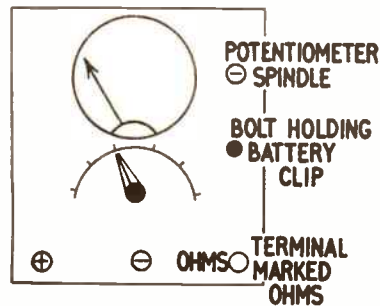
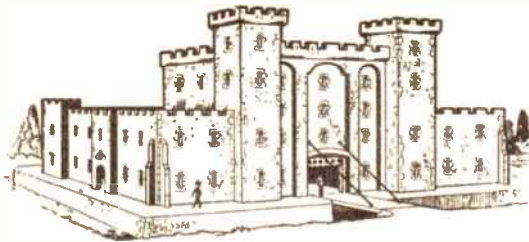


Fig. 4

The addition of current ranges to the Simple Multimeter will be described in a subsequent issue.

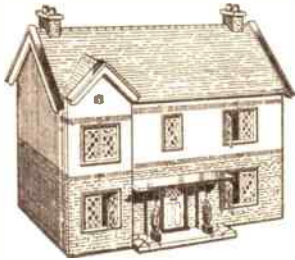
## BUILD A CANOE

Now is the time to get started on a canoe which will give hours of pleasure on the water next summer. Study the details on the back page of this issue and send for a plan of the craft of your choice.



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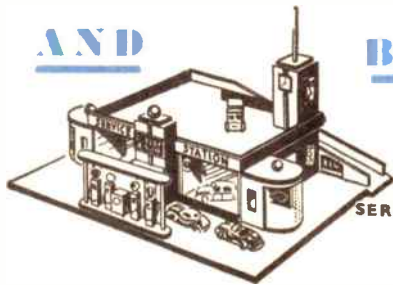
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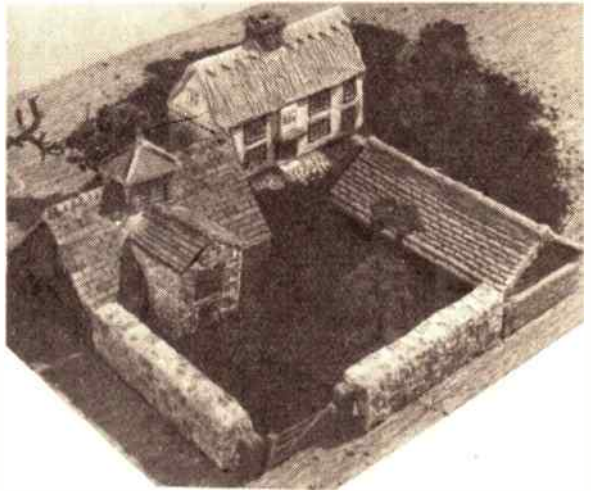
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# 'HUNTING' FOR AUTOGRAPHS

**A** POPULAR hobby today is collecting the signatures of well-known people in an autograph book.

But although a few signatures of celebrities in a book may be interesting, they have very little value. If autograph hunting is taken up seriously with a profit motive it has a great deal more to it than a mere collection of signatures.

By D. Doyle

Usually there is nothing difficult or of all-absorbing interest in obtaining the signatures of living people, although there may be actually some marketable demand for these. You may save yourself a great deal of waiting, sometimes in mobs of people, simply by writing and asking for the celebrities' signatures, and then pasting them into your autograph book. But no attempt must be made to obtain signatures from Royalty in this manner, as it is not permitted.

Real interest of a profitable nature is concerned with celebrities of the past, and there are several ways in which to make a start in this absorbing hobby.

Sometimes old files of letters and documents are often discarded in offices and occasionally from old houses. In some cases permission to browse through them may be granted. Many valuable finds have been made through this practice.

## Valuable finds

Secondhand shops may yield documents of considerable value. It is best to let the secondhand dealer know that you are interested in any old papers which he may obtain in purchasing furniture in the course of his business. He will usually co-operate if you take the trouble to explain your hobby to him. Many valuable finds have been made in this way. And hundreds of really famous documents have been discovered quite by accident whilst browsing through old books.

Of course, you must know what to look for. There is not a great deal of value attached to signatures but a letter, for instance, signed by someone famous would have a good market value, much depending, of course, on the importance of the celebrity, and what event the letter referred to. If, for instance, it happened to refer to an historical event in which the writer was concerned, then the value would be increased.

Or suppose a letter from a famous author to, say, his publisher, about a well known book, was discovered, such a letter might well be of considerable value.

Specialization in the hobby is usually wise in the long run. Select a few famous people who specially interest you, for your own reasons. Then collect only those documents and letters concerning them. Anything written about them would have some marketable value.

Your autograph collection at the finish will consist of signed letters, diaries, signed drawings, legal documents and sundry notes.

But beware of forgeries! There are many of them. If you do not know whether your documents are genuine, consult the curator of a museum. Usually they are only too pleased to ad-

vice as to whether documents are genuine or otherwise, and, in addition, some idea of value can be obtained.

Do not on any account cut a document in order to improve the look of it. You may be destroying its value, and no attempt to restore the writing must be made. If your document turns out to be valuable this work of restoration will be done for you by a specialist.

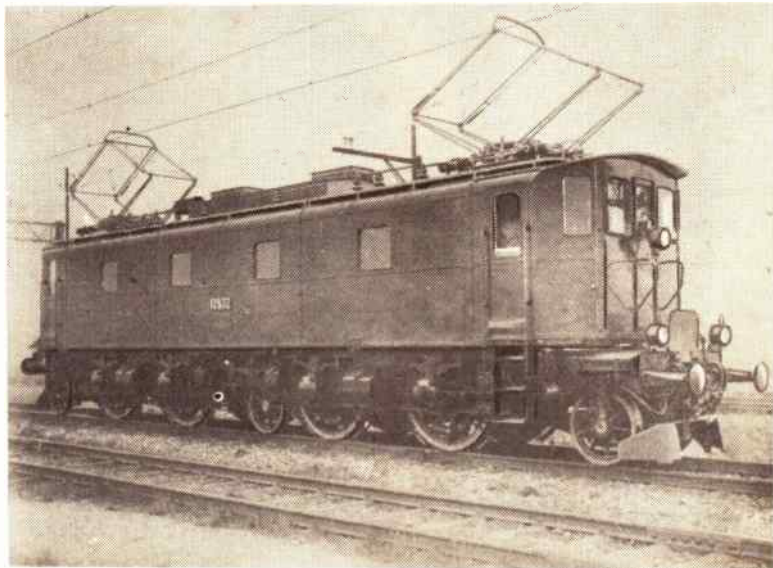
Another thing you must not do is to paste your document on to paper or a book. If it is very frail and falling to bits put it between two sheets of glass and bind the edges with adhesive tape.

The best way is to keep everything in a box file and each document should have your notes attached to it with a paper clip. It is most important not to handle the documents or expose them to unnecessary light.

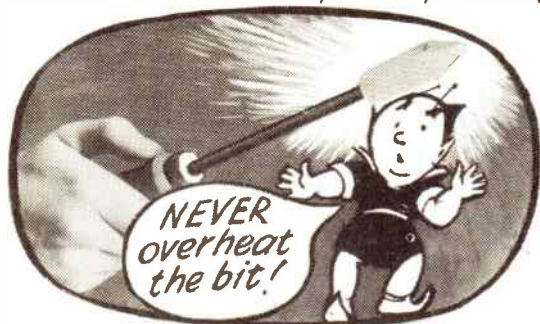
## Swiss Electric Locomotive

**T**HE electric locomotive No. 12502 shown in our photograph was manufactured in 1923 by the Swiss Locomotive & Machine Works of Winterthur for the Swiss Federal Railways. It is designed exclusively for express passenger service with heavy trains and is of the standard gauge — 1,435 mm. The monophase current is collected from the overhead power lines by bows supported by pantagraph gear as shown. The eight motors develop a combined power of 2,150 h.p. on an

hourly rating and the maximum speed is 75 km. an hour. All pairs of driving wheels are independent, and are 1,610 mm. or 5ft. 3½ ins. in diameter. Each driving axle is connected to two motors through gearing, the ratio of which is 1·57 arranged with a flexible connection formed by coiled springs which allow vertical play in the axle-boxes and do not interfere with the gear teeth alignment. The engine weighs, in working trim, 110·5 metric tons, and the total wheelbase is 13,640 mm. or 44ft. 8ins. (A.J.R.)



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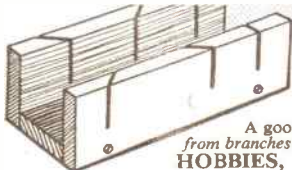
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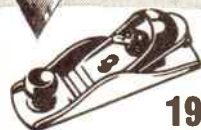


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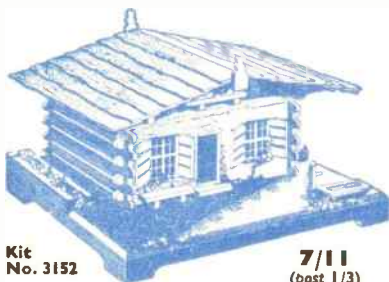
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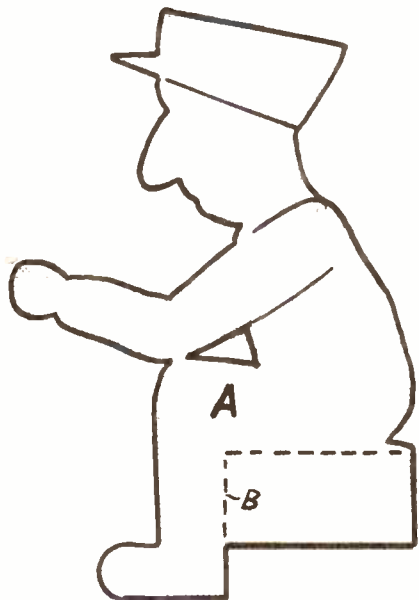
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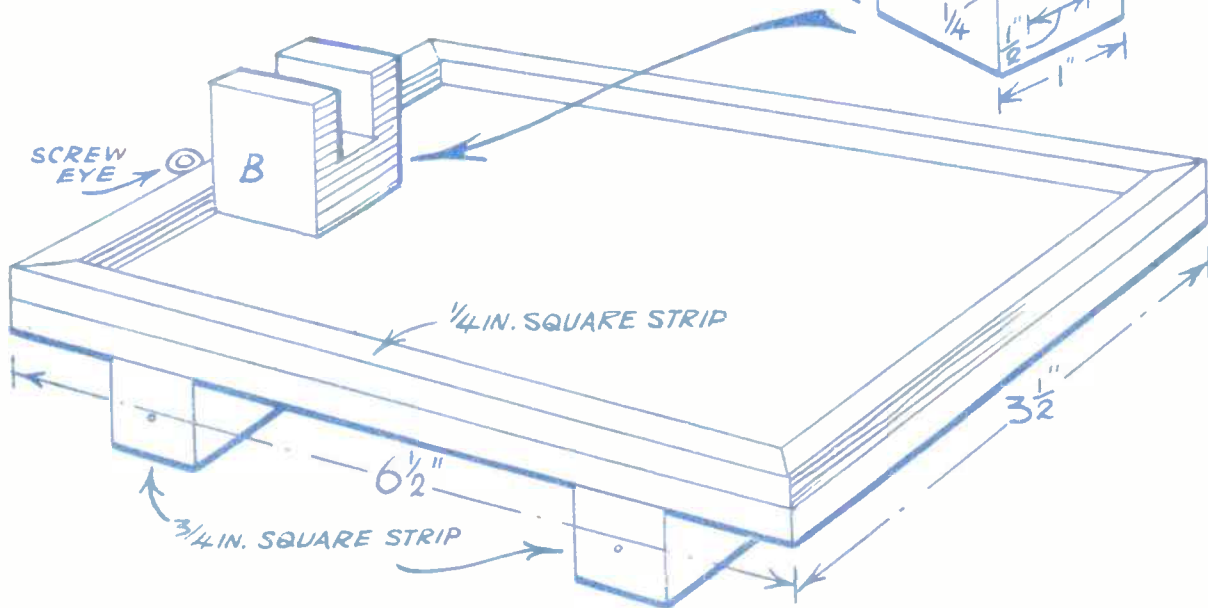
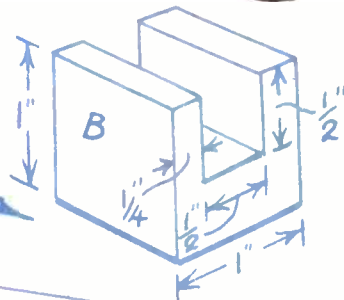
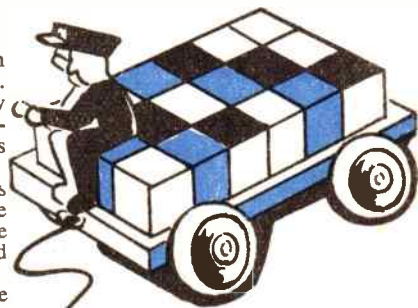
**T**HIS toy can be quickly made from stripwood and odd pieces of  $\frac{1}{4}$ in. plywood. Make up the trolley from  $\frac{1}{4}$ in. plywood and  $\frac{1}{4}$ in. square stripwood mitred round the edges. The axles are formed from  $\frac{3}{4}$ in. square strip.

The block (B) on which the driver is glued consists of a piece of 1in. square strip cut to the dimensions shown. The driver (A) is cut from  $\frac{1}{4}$ in. wood and glued in the slot in the block (B).

Now cut 17 bricks from 1in. square stripwood.

All the pieces are cleaned up and painted in bright colours.

To finish off fix a screw-eye for attaching the cord and add four Hobbies wooden wheels which are pivoted by means of 1in. round-head screws. The 2in. diameter wheels cost 1/9d. per set of four (postage 6d.) from Hobbies Ltd, Dereham, Norfolk. (M.p.)



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All of these canoes are of the decked kayak type and are primarily paddling craft, but sail is useful as an auxiliary and can add to the fun of canoeing. If sailing capabilities are particularly required, PBK 20 is the best selection.

A canvas canoe can be built by the novice with limited equipment, and the average handyman can complete the job in about 40 hours. The structure consists of widely-spaced laths on cross frames, covered with a fabric skin. There are no difficult joints or awkward work. Plywood skinned canoes need more skill and a larger tool kit.

Building costs range from about £7 (for the PBK 10). We do not supply materials for building, but addresses of firms who do so are included with the plans.

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