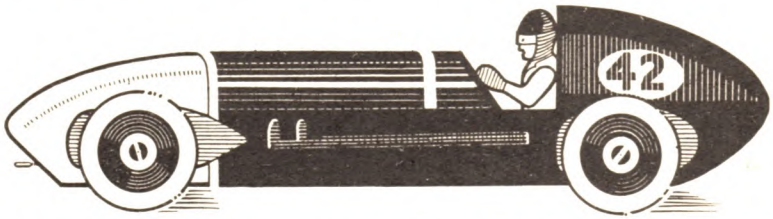
HOBBIES WEEKLY

JUNE 22nd 1955 VOL. 120 NUMBER 3112

IN THIS ISSUE

** Make it from this week's Free Design Sheet **

A TOY PULL-ALONG RACING CAR



YOUNGSTERS, whether boys or girls, as soon as they are able to toddle, delight in pulling toys along behind them when pursuing their fancy in a delightful world of make-believe. And racing cars, as every parent knows, are particular favourites for children of all ages.

This model, measuring 10ins. long and with authentic racing lines, is built up on the bread and butter principle, making a really solid and strong job. An easy evening's project, the few hours spent on it will bring hours and hours of joy to its owner.

How to Begin

To start in the construction of the car, trace off the pieces from the design sheet on to their appropriate thicknesses of wood, cut out with a fretsaw and clean up with glasspaper.

The body is built up by gluing one on top of the other the various sections as shown in the detail at the bottom of the design sheet. While the glue is drying, glue pieces 10 together to form the body of the driver, on each side of which are glued the arms (pieces 11). The positioning of the arms on the body is shown by the dotted lines on pieces 10.

Now back to the body of the car. Shape to the sections shown with a rasp or sharp penknife, and give a smooth finish with glasspaper.

The car body should next be painted before the addition of the driver and the wheels, etc. A bright red with the bonnet in cream would appeal to the eye of any child. The number can be in black letters on a white background, and the exhausts indicated in black or silver paint.

The colourings for the driver are suggested on the design sheet, and the dashboard controls and steering column can be inked in. The dashboard and driver are now glued in position, the figure being fixed to piece 3 at the base and pieces 6 and 7 at his back. After painting grey to represent the tyres, and black for the inside, the wheels are screwed into their appropriate positions on piece 2.

To a screweye fixed in the lower front of the car can be attached a piece of string for pulling. Then br-r-r-p, br-r-r-p from the twin exhausts—and away we go!

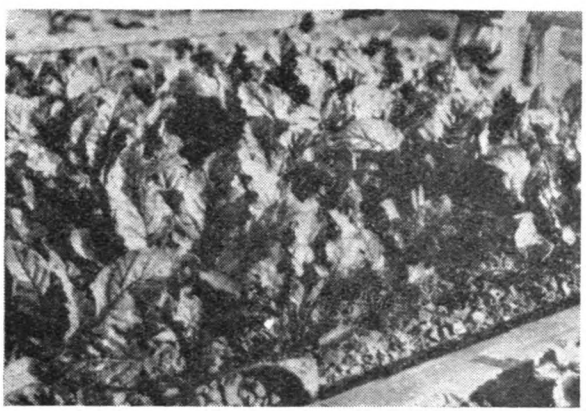
YOU CAN BUY A KIT

For making this grand toy you can obtain Kit No. 3112, including a set of wood wheels with screws, from any Hobbies branches, or post free from Hobbies Ltd., Dereham, Norfolk, price 6/3.

GROW PLANTS WITHOUT SOIL

A SYSTEM which takes the backache out of gardening is described here by J. W. E. H. Sholto Douglas, B.Sc., F.R.H.S., who has done much research in India into the fascinating technique of growing plants without using soil. 'It is often very hard to get boys to take up nature study or gardening as a hobby', he says, 'owing to the distaste for slow progress, boring digging, etc.' But, says Mr. Sholto Douglas, even the younger children can enjoy the raising of plants in hydroponic beds, described here, and all will find the method both interesting and profitable.

HYDROPONICS is a Greek word meaning 'water working', which is used to describe all the various ways of growing plants without using soil. As a result of tests conducted by scientists in Bengal, soil-less cultivation of flowers and vegetables has been greatly simplified, and new methods of hydroponics now make it possible for anyone to have a charming and useful garden at low cost. There are a few simple rules; there is no hard digging or dirty manure to handle. Apart from being a fascinating hobby, hydroponics really teaches information of lasting interest, and yields very good returns.



A close-up showing healthy young beet in a bed of aggregate

Five Essentials

All plants need five things to enable them to grow and live. First there is light, which comes from the sun. Next on the list is air, containing oxygen and carbon dioxide. Then comes water, a constituent of every tissue. Part of the food taken in by crops consists of certain mineral salts, such as nitrates. Other elements are also needed, including potassium, calcium, phosphorus, and magnesium. Finally, plants must have a support for their roots, so that they can anchor themselves upright in one place.

Vegetables, trees, and flowers differ from animals and men in several ways. They have no power of locomotion—that is they cannot move around. They do not eat solid food like human beings or other creatures. Instead plants absorb inorganic nutrients, such as those mentioned above.

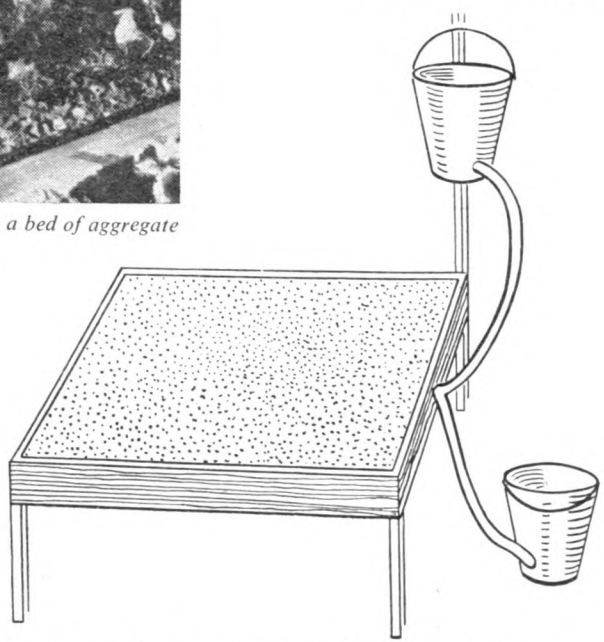
Normally, in ordinary gardening or farming, the crops get their food through the soil, which contains such nutrients. But soil is a very unreliable source of nourishment. Sometimes it does not provide the plants with a proper diet; other times it becomes too dry, or too wet, and there is always the risk of it being blown or washed away. That is called erosion. It is expensive to keep in good condition, and it needs manures and other fertilisers. There are many weeds to destroy, and digging is unpleasant.

So for many years scientists tried to grow plants without using any earth. At first, the methods were complicated, but recently, as has been said, hydroponics has been made straightforward and easy to use.

The place where plants are grown without soil is called a hydroponicum, just as an ordinary soil-growing area is known as a garden.

To start a hydroponicum, the following equipment is needed:

1in. wooden boards, with a supply of 2in. wire nails; or if boards are not available, then a roll of roofing felt and some 2ins. laths (the amounts of wood or felting required will depend on the size); tin strips, to make seepage gutters with; $\frac{3}{8}$in. or $\frac{1}{4}$in. grade gravel; coarse sand; a length of 1in. water piping, hosepipe, or a watering can fitted with a rose.



In this portable hydroponic trough the buckets are changed over as they fill and empty, the lower one taking the drainage

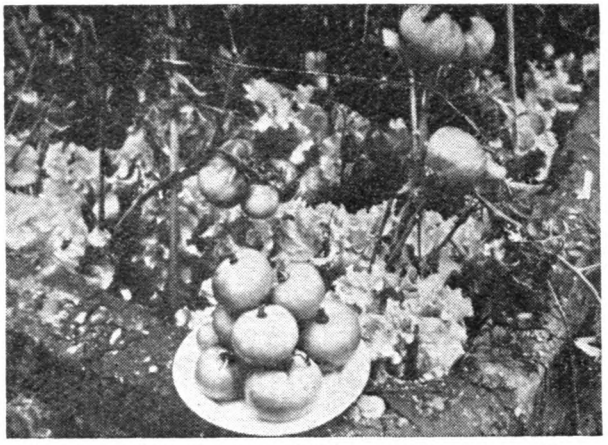
Fertiliser-grade chemical salts, or

synthetic resins (amberlites) needed are: nitrate of soda, superphosphate of lime, calcium sulphate, potassium sulphate, and magnesium sulphate (Epsom-salt). Tools required are a small garden fork, and a bucket or tin for mixing the chemicals.

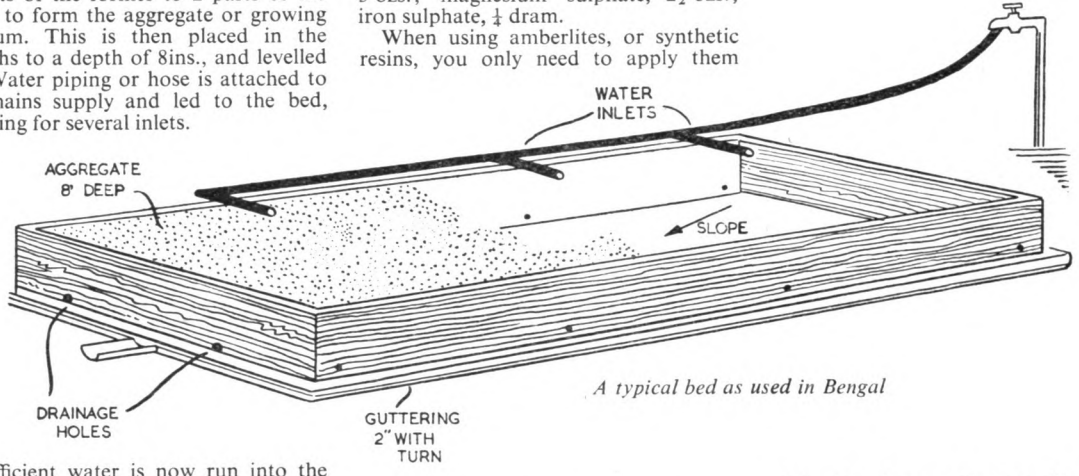
Making a Trough

A hydroponicum may consist of one or more troughs. The trough is constructed from the boards, or the felt and laths. Allow for the width to be not over 1yd., with sides 8ins. high. Any convenient length may be used. Joint and nail corners, and ensure a good tight fit all around. When using felting it should be stretched over a frame of laths. At the base of the side walls drill small drainage and seepage holes of ¼in. diameter with the brace and bit. Tack 3in.-wide tin strips on to the bottoms of the beds, bending them up along the outer edges to form a guttering for waste seepages.

When the trough is ready a slight camber is given to the base to permit good drainage. The gravel and sand are now well mixed in the proportion of 5 parts of the former to 2 parts of the latter to form the aggregate or growing medium. This is then placed in the troughs to a depth of 8ins., and levelled off. Water piping or hose is attached to the mains supply and led to the bed, allowing for several inlets.



Lettuces and tomatoes are ideal for profitable intercropping



A typical bed as used in Bengal

Sufficient water is now run into the aggregate to moisten it thoroughly. Care must be taken not to give too much water, and it should not be allowed to stand on the surface of the trough. This would kill the plants by taking away oxygen from their roots. Just enough water should be given daily or periodically to keep the aggregate about as moist as a damp sponge lightly wrung out. After a few days the amount of water needed is easily assessed by experience.

Mix up the fertilizer salts, and apply the whole mixture at the rate of 1½ozs. per square yard of trough surface space every week, by sprinkling it evenly between the plants. Immediately after application, wash the salts down into the aggregate with a gentle spray of water. This sends them to the root zone, where they are quickly sucked in by the 'mouths' of the root hairs.

The salt formula is: Nitrate of soda, 6 ozs.; superphosphate, 3 ozs.; calcium sulphate, 1½ ozs.; potassium sulphate, 3 ozs.; magnesium sulphate, 2½ ozs.; iron sulphate, ¼ dram.

When using amberlites, or synthetic resins, you only need to apply them once every six months. Mix these quantities of amberlites in with the aggregate in the beds:—For each 1sq. yd. of trough surface add every six months 37 ozs. of calcium amberlites, 18 ozs. of magnesium amberlites, 2½ ozs. of phosphorus amberlites, 5 ozs. of sulphur amberlites, 1 oz. of boron amberlites, 1 dram of iron amberlites, and ¾ oz. of manganese amberlites.

Mix all these deeply and thoroughly into the growing medium.

In this case add 1 oz. of potassium nitrate (saltpetre) to each 5 gallons of water used in keeping the troughs moist, twice a week. This chemical supplies nitrogen and potassium to the plants. Always keep chemicals stored in dry tins. They should not be allowed to fall on the plants' foliage, or they may burn them. Allow plenty of light and air for the crops.

Seeds should not be buried deeper than ¼in. for small ones, like flower seeds, or lettuce or tomatoes. They can be transplanted later. Bigger ones, like peas, beans, or sweet-corn, can be 1in. deep. Space out as advised for ordinary gardening, but all distances may be cut down by one-third. This means that in hydroponics you can grow more plants in any given area.

Provided the simple rules are followed, and the troughs are not saturated or allowed to get too dry, and correct quantities of nutrients are given, hydroponics can be a subject of unfailing interest, and is a very profitable hobby. You can grow as much as 20 lbs. of fruits per tomato plant, and lettuces will be ready for eating in one month. It is fascinating to have full control over your plants without hard digging.

Experiments with Formic Acid

NEARLY everyone is familiar with formic acid without knowing it. Few of us have escaped a nettle sting. It is this acid which nettles use to make us respect them. In perspiration, too, there is some formic acid, but the amount is too small to make us shy away from ourselves!

In the sixteenth century it was recorded that red ants emit an acid liquid and in the seventeenth century formic acid was isolated from them. Since the entomological name for red ants is *Formica rufa*, it is easy to see how the acid received its name.

Later it was found that it could be made synthetically in the laboratory by heating oxalic acid. Industrially, it is now prepared cheaply by acting on heated sodium hydroxide with carbon monoxide; this produces sodium formate. By distilling the sodium formate with sulphuric acid, formic acid is obtained.

It comes to the laboratory in various strengths, but the usual formic acid content lies between 25 and 50 per cent, the remainder being water. It is this type which we can use for our experiments.

First note its odour. Sulphur dioxide is often thought to have a characteristic smell. Formic acid smells astonishingly like it—a fact to be borne in mind, for on a casual examination it could be mistaken for a solution of sulphur dioxide.

Litmus paper will show it to have a strong acid reaction. It and its salts are strong reducing agents, as we shall presently see.

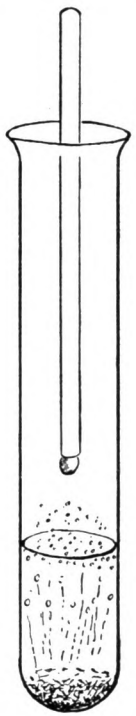
Preparing Sodium Formate

The most important salt from our point of view is sodium formate, for it leads to some very interesting experiments which will tell us a lot about the formic acid radical. To prepare this salt, add a solution of sodium carbonate (washing soda) a little at a time to formic acid, stirring well at each addition, and then bringing a drop of the mixture on to red litmus paper. When one drop shows a change to purple, the acid has been neutralised and you now have a solution of sodium formate. Should you overshoot the mark and get a blue colour on the litmus paper, add formic acid a few drops at a time until the mixture gives a purple reaction with litmus paper.

To isolate the salt, boil the solution to fairly low bulk and then continue the evaporation to dryness on the water-bath. After powdering the white mass so obtained, it may be bottled for your stock.

To show the reducing properties of formates, dissolve 1 gram of sodium formate in 5 c.c. of water. Add a few drops of silver nitrate solution and heat the mixture. It will blacken and a dark deposit of metallic silver powder will be found in the test tube. Silver formate is first produced in this reaction, but is then reduced down to the metal.

Dissolve about 0·5 gram of sodium formate in 2·5 c.c. of water and acidify it with an equal volume of dilute sulphuric acid. Heat the solution and add a few drops of potassium permanganate solution. The purple colour of the latter will be discharged and carbon dioxide disengaged with effervescence. Here again the reducing property of the formic acid radical is evident.



Carefully lower a glass rod carrying a drop of lime water into the test tube

Strange to say, though formic acid can be prepared from oxalic acid by means of heat, heat will also turn sodium formate into a salt of oxalic acid. Place a gram of sodium formate in a hard glass test tube and heat it over a bare flame. The salt will melt and give off gas. Turn the tube mouth to the flame. A sharp pop and a momentary flame will indicate that hydrogen is being given off.

When gas evolution slackens and the salt begins to blacken, stop heating and let the tube cool. Warm the residue with a little water and filter the liquid. To show the presence of sodium oxalate in the liquid, add enough ammonia to give a distinct smell. Add calcium chloride solution. A white precipitate of calcium oxalate appears. If you add calcium chloride solution to an ammoniacal solution of sodium *formate* you will obtain no precipitate. The change is thus proved.

An important test for formates is the reaction with ferric chloride. While trying out the test you can at the same time prepare a specimen of basic ferric formate. Dissolve 13 grams of sodium formate in 125 c.c. of water and add to it a solution of 14 grams of ferric chloride in 30 c.c. of water. The orange of the ferric chloride will be immediately changed to a full red due to the formation of normal ferric formate.

Orange-brown Precipitate

Now boil the solution and keep it boiling for about a minute. The liquid clouds and an orange-brown precipitate forms. The ferric formate has given up part of its formic acid and become converted into insoluble basic ferric formate. If you smell the hot liquid you will note the odour of the liberated formic acid. Filter off the precipitate and wash it on the filter with water until one wash water gives no white precipitate with silver nitrate solution. The substance may then be dried in the oven for your stock. The characteristics of this test are the formation of a red solution in the cold and an orange-brown precipitate on boiling.

Another formate which is affected by heating with water is mercurous formate. This salt and the mercurous nitrate from which it is prepared are poisonous, so care should be taken to wash your hands after performing the experiment.

As the salt is unstable there is no point in keeping a specimen. Consequently, only a small quantity need be prepared. To a few c.c. of sodium formate solution in a test tube add mercurous nitrate solution gradually. A beautiful pearly white precipitate of mercurous formate separates out. Heat the solution. It blackens and begins to effervesce. The blackening is due to reduction of the salt to metallic mercury. The latter appears not as the familiar bright globules of metal, but in the form

● **Continued on page 183**

Here's magic for you

THE CHINESE RICE BOWLS

By R. W. Wood

THIS bewildering trick is very easy to make and to perform. The effect is that a small china bowl is shown quite empty. It is then filled with rice, poured openly from a box or bag. A second bowl is placed over the first and both bowls are inverted. After a few moments of 'patter' on the wonders of Chinese magic, the upper bowl is slowly lifted and it is seen that the rice has doubled in quantity, both bowls being full to overflowing! The heaped-up rice is now smoothed down level and the empty upper bowl is replaced. A moment later it is again removed, and now the rice has vanished, the lower bowl being filled with water! This is poured from bowl to bowl as a charming and mysterious finale.

To make the trick, first obtain two china (or earthenware) bowls about 4ins. diameter. One of these must now have the rim ground smooth and flat. This is easily done by laying a sheet of medium-grain emery paper on a level surface and rubbing the bowl over it with a circular motion. The next requirement is a disk of very thin glass, and this should be $\frac{1}{4}$in. more in diameter than the bowls. The glass disk is easily obtainable from any glass merchant who specialises in the making of leaded lights. He is equipped with a machine for cutting glass disks of any size. Sufficient rice to fill one of the bowls completes requirements.

To perform the trick, first fill the bowl with the ground rim nearly to the top with water. Moisten the flattened rim all round and lay the glass disk over it. This bowl can now be placed upside down on a tray, the water remaining safely in the bowl. The second empty bowl is now placed over the 'water bowl' and the bag of rice is to hand.

Now take up the top bowl, show it casually empty and stand it back on the tray ready to receive the rice. Pour in the rice cleanly and openly, allowing it to run in a stream from a little height. Next take the lower bowl, keeping it mouth downward, and place it over the bowl of rice. Pick up both bowls and reverse them with a flourish. This brings the bowl of water below the bowl of rice. On lifting the upper bowl the rice will appear to have doubled, because it will be resting on the glass disk. The rice will flow from the upper bowl, giving a perfect illusion that both bowls are full of rice.

Now smooth away the rice that is heaped on the glass disk, replace the upper bowl, after showing it empty; then remove it, taking away the glass disk. Place the bowl mouth downward on the tray for a moment, picking it up and leaving the disk behind.

It only remains now to pour the water from bowl to bowl, and this is the part of the trick that really amazes the audience. They are completely bewildered at the magical appearance of the water from nowhere!

As a final hint it should be mentioned that most performers allow the bowl of water to stand with its rim on the back edge of the tray in the initial stages of the trick. In this position it is easy to pick up, and there is no danger of the glass disk being left on the tray—an accident which would completely ruin the effect.

SIMPLE FRETWORK

Make this Novel Pen and Ink Rack

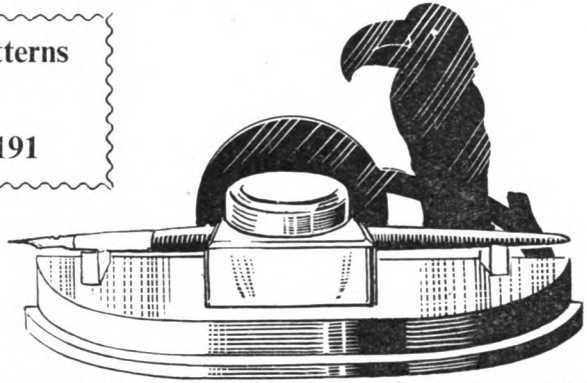
THE strange-looking bird, called a toucan, forms the basis for this attractive cut-out rack. The shapes are easily cut with a fretsaw from odd pieces of $\frac{1}{8}$in. and $\frac{3}{8}$in. thick wood.

Use Carbon Paper

First trace all the parts and then transfer them to wood by means of carbon paper. The main base (A) is $\frac{1}{8}$in. thick, piece (B) is $\frac{3}{8}$in., pieces (C) are $\frac{1}{4}$in., and the cut-out background is $\frac{1}{8}$in. thick. This can be increased to $\frac{3}{16}$in. if desired. Note that a piece is cut from piece (B) to take the glass inkwell. This can be obtained from Hobbies Ltd., Dereham, Norfolk, price 2/-, post free.

Clean up the pieces with glasspaper and glue them together. Piece (B) is glued on the top of piece (A), piece (D) is glued to the back and pieces (C) are glued to piece (B) to form a rack for a pen.

Full-size patterns are on page 191



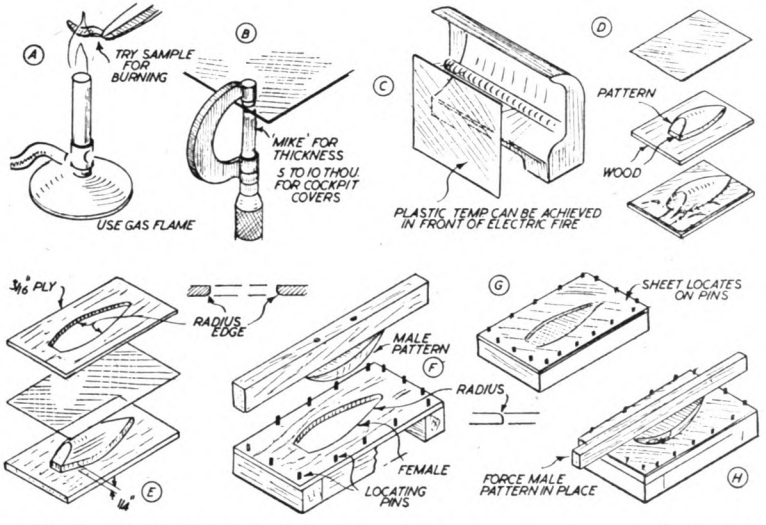
The whole article is now painted with plastic enamel paint, choosing a light shade for most of the work, but making the back cut-out black. It will stand out in bold relief and look very attractive.

(M.p.)

SIMPLE PLASTIC MOULDING

By R. H. Warring

THIS article is intended to describe simple plastic moulding techniques for the man who occasionally wants, say, a moulded cockpit cover for a model aeroplane, or a shaped fairing for a boat. It is not intended to cover the production of novelty items in moulded plastics, for which a certain amount of special workshop equipment is usually required for satisfactory repetition work. As such, therefore, the materials most likely to be met with are acetate and nitrate (celluloid) sheet and, to a more limited extent, acrylic (Perspex) sheet.



Cellulose nitrate or celluloid sheet is not recommended for heat moulding, largely because this material is inflammable. Additionally, transparent celluloid tends to darken on ageing and lose its clarity. The most satisfactory form of thin sheet for simple moulding is cellulose acetate, which is readily available, or cellulose acetate butyrate. Try a sample of the available sheet for burning by holding it in a gas flame (A). If it ignites after a while and flares up, it is most likely celluloid. If it just burns weakly, or shrivels and melts, it is acetate sheet.

For moulding cockpit covers and similar components, acetate sheet of 5 or 10 thousandths of an inch thickness is generally used. Thicker sheet (·015 in.) may be used for larger mouldings. In thicker sizes still, Perspex is generally considered superior for working. The thinner the acetate sheet the more uniformly it can be softened for moulding.

The classic 'amateur' method of moulding acetate sheet is to hold the sheet in front of an electric fire until softened (C), and then press in place over a suitably shaped male mould or pattern. The only form of temperature control is judgment when the sheet is soft enough to mould, but despite its many limitations the method can work quite well. It may be necessary to re-heat to soften several times before the full depth of the drawing is realised and the sheet finally conforms to the full depth of the pattern (D).

One of the main difficulties is how to hold the sheet without getting burnt, particularly in close proximity to an electric fire element. A pair of old gloves should be worn for protection and the sheet propped up, rather than held, during heating. A better method of heating is to place the sheet in an oven, laying on an asbestos mat and adjusting the oven temperature control to the figure which does give definite softening of the sheet.

Forming by the method shown tends to be relatively inaccurate. All commercial mouldings of this type are produced with male and female moulds, usually of metal, but sometimes of wood. A simple and easy-to-make form of double mould is shown in (E), the particular advantage being that a cut-out is employed instead of a hollowed-out female mould.

The female pattern—the cut-out—should fit right over the male pattern with a clearance all round equal to the sheet thickness. The male pattern itself must have additional depth to accommodate the thickness of the female plate. Although the moulding will actually be drawn to full depth, wrinkling is likely over the bottom ¼in. and so this part should be regarded as excess, to be trimmed off later. Bottom edges of the cut-out should be radiused. The technique is to sandwich a heated sheet of plastic between the two moulds and then force down over the male pattern.

Reversing the technique, and locking the plastic sheet to the female plate, generally produces more consistent results (F). Here the female cut-out pattern is mounted on a form of box, with locating pins driven around the edges. Corresponding holes are pierced in the plastic sheet, which thus drops over the locating pins and is held in place (G). The male pattern is screwed to a stout handle or bar of wood, to which pressure can be applied to force the softened plastic sheet to the shape required (H).

Several Advantages

There are several advantages to this method, even if the necessary patterns take a little longer to make in the first place. It does ensure, however, that after intermediate heatings the sheet is always replaced in the same way (over the locating pins), and is always drawn uniformly. Shallow drawings may be accomplished with a single heating of the plastic to soften. Immediately the sheet is removed from the oven, however, it starts to cool down and so re-heating at intervals may be necessary in order to accomplish deep drawings. Alternatively it may be possible to place sheet and mould within the oven and work (with glove-protected hands) at the softening temperature throughout. The temperature required will not be high enough to char the wood. For acetate sheet the optimum softening temperature is about 150 degrees C.—considerably higher than that of boiling water, which is sometimes recommended as a method of softening sheet for moulding. As an alternative to oven heating, immersion of the sheet (or even the whole assembly) in a heated oil bath which can be raised to about 150 degrees C. without boiling gives good results, but needs very careful handling. The use of high temperature liquid baths should be limited to those with some acquired skill in the process.

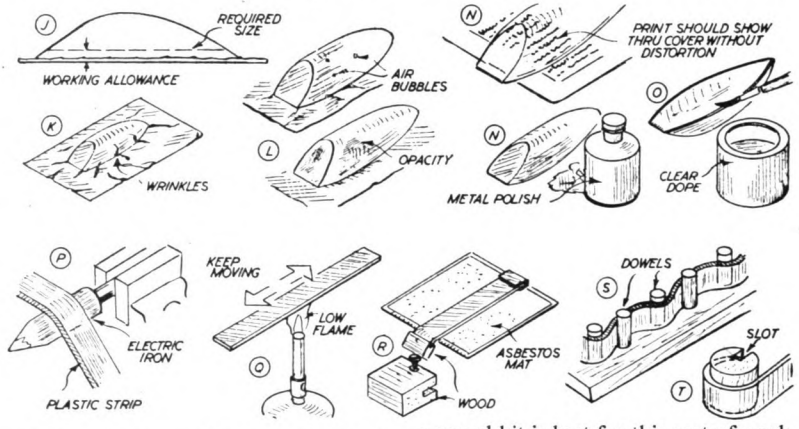
Most plastic mouldings are produced with a certain working allowance on the bottom, for it is in this region that flaws, such as wrinkles, are most likely to occur. Thus such flaws can be cut off, leaving a perfect moulding (J). If wrinkles do occur on the main part of the moulding (K), there is very little that can be done about them. If they are not too bad it is sometimes possible to file flat, which produces an opaque spot, and then polish with metal polish to bring up clear again. This process is tedious and seldom removes all traces of the wrinkle. It may, however, be the only solution in the case of a large moulding which is otherwise satisfactory. Otherwise it will be quicker to make another moulding, this time taking care to avoid wrinkling. If this persists, check that the clearance between the two dies used is not excessive.

Not Waterproof

Other faults likely to occur are air bubbles trapped in the moulding, or milkiness or opacity in certain areas—L. Both are due to incorrect technique, such as too high a softening temperature, or a fault in the original plastic sheet. Contrary to popular opinion acetate sheet is not 'waterproof' and an excess of moisture absorbed in the sheet may show up as bubbling or blushing. Blushing or opacity can also be caused by the moulds being damp or too cold. Whilst it is not possible to pre-heat wooden moulds, at least they can be dried before use.

One check on a good moulded transparency is that it should be possible to read it through print, without obvious signs of distortion (N). Held up to the light the moulding should also be free of 'ripples' or grain effects—such as by trying to draw when the sheet is too cold, or unequal softening causing thin spots. For a really sparkling finish, even the best of mouldings will benefit from a polish with an abrasive metal polish, both inside and out (N).

Usually a moulded canopy is attached to a model after the model is painted



and the surest way of ruining the finish is to use an excess of cement to anchor the moulding After trimming to an exact fit the best way to secure is to run a line of thin dope (or acetone) around the bottom edge of the canopy. Wait until this edge is thoroughly tacky and then press the canopy in place, holding until set. This should completely eliminate smearing.

For moulding thicker strips of thermoplastic materials (e.g. plastics which soften on heating and re-set hard on cooling again) try an electric iron held in a vice (P.) The plastic strip can be worked around the hot iron until it gives readily to the required curvature. Remove from the iron and hold for a second or two until it sets. An iron with a round bit is best for this sort of work.

With skill, softening by direct flame heating can be used (Q), but this technique needs quite a bit of skill to master. The plastic must be kept moving all the time to give uniform heating and removed from the flame as soon as it reaches its softening point. Otherwise it will tend to melt and become uncontrollable.

Actually oven heating is about the best method of treating thicker plastics, laying on an asbestos mat and adjusting the oven temperature control for the required degree of heating. End fittings can be made from wooden blocks to assist in handling the hot plastic strip (R), which can then readily be formed to quite intricate shapes, if necessary, by quickly laying around suitable formers, such as dowels set in a suitable base (S). One very simple way of forming a loop end in a strip of plastic is to use a length of slotted dowel (or broomstick), as in (T). In such cases the thickness of plastic may be anything up to $\frac{1}{4}$in., the material usually being Perspex. Perspex moulding is really an art in itself, although simple jobs can be tackled with it quite successfully on a trial-and-error basis. Patience and practice are the keynotes of success, remembering also that a thermoplastic material can only be worked when raised to its plastic temperature. Trying to force cold plastic to shape will either have no results at all—or break the plastic.

● **Continued from page 180**

Home Chemistry

of globules so minute that they look like a dull grey-black powder.

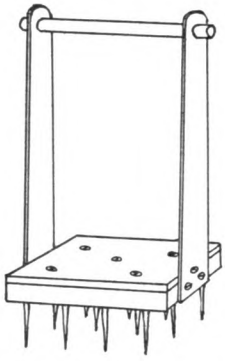
While the liquid is effervescing you can identify the gas. Carefully lower a glass rod carrying a drop of lime water into the test tube, bringing it close to the surface of the liquid, as shown in the diagram. The lime water will grow turbid from formation of calcium carbonate, thus indicating that the gas is carbon dioxide.

Copper formate is affected like ferric formate by heating with water. The easiest way to produce this salt is to mix solutions of sodium formate and copper sulphate, when sufficient is present in the mixture to demonstrate the reaction.

Dissolve 4 grams of sodium formate in 15 c.c. of water and 7·5 grams of copper sulphate in 35 c.c. of water. Mix the solutions. The blue of the copper sulphate is intensified, because copper formate is of a deeper colour. Now heat the solution to boiling, stirring constantly. A lovely green sandy powder separates out. This is basic copper formate. Filter the liquid hot and keep the filtrate aside. Purify the basic copper formate by washing it on the filter until one wash water gives no precipitate with lead acetate solution. Dry the compound in the oven for your stock.

You will note that the yield is small compared with the quantities of reactants used. Also that the filtrate you have kept is still deep blue. This leads one to think that longer boiling is necessary completely to decompose the normal copper formate in the solution. Boil a little of it in a test tube. No precipitate appears. The explanation of this puzzling phenomenon is that during the formation of the basic copper formate free formic acid is produced. As the concentration of acid increases it redissolves the basic copper formate as fast as it is produced. This is proved if you take a little basic copper formate and warm it with formic acid, when it will dissolve. (L.A.F.)

MAKE THIS SIMPLE AERATOR



By A. F. Taylor

ALMOST all living things require plenty of air in order that they may survive and grow satisfactorily. It is generally found that plants grown in the open, with room for the air to circulate freely, are stronger than those grown in close quarters.

The state of the soil is an important factor, and air is necessary to help keep the roots healthy. It is for this reason that we dig our gardens at frequent intervals so as to aerate the soil.

Our lawns, however, do not receive this attention and they are often rolled and trodden on until the soil is a close solid mass. The loss of air to the root system is bad for the grass, which often suffers in consequence. We all know that it is impossible to dig a grass plot frequently, but there are other means by which the air can be made to penetrate the soil and get down to the all-important root system.

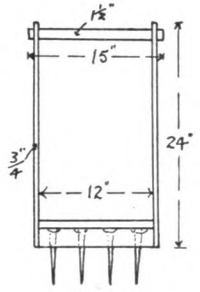


FIG. 1.

The idea is to puncture the surface of the lawn with a number of small holes to a depth of several inches. This can be done with a pointed iron spike, but it is extremely tedious, especially if the area is large. The simple tool described in this article will, however, solve the difficulty and do the job quite efficiently and much quicker. It consists of a number of spikes fixed into a block of wood and with a handle to facilitate the task.

A thick block of wood is needed to hold the spikes securely, as there will be a considerable strain, especially if the tool is used on dry ground. It should not be less than 2ins. thick, and it is best to use a hardwood for this. A piece 12ins. long and 9ins. wide will hold a dozen spikes spaced at a distance of 3ins. each way.

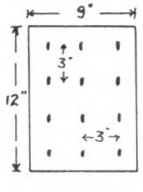


FIG. 2.

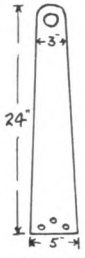


FIG. 3

The spikes can be placed closer, or the block made a little larger, but this would make the work more difficult and is not to be recommended. Cut nails, which are rectangular and tapered, are the most suitable for the spikes and the position for these is shown in the plan, Fig. 2.

Drill holes just a little smaller than the nails, and sink the tops to fit them exactly, so that when driven in they are quite tight and do not wobble about. The best length for the nails is between 5ins. and 6ins. To hold them in position a cap about ¾in. thick is securely screwed on top.

Secure Handle

The handle must be strong with two substantial supports and the sizes for these are given in Figs. 1 and 3. Cut two pieces of wood 24ins. long and 5ins. wide at one end, tapering to 3ins. at the other and about ¾in. thick. Fix them securely with several screws into the blocks and drill the hole in the top for the handlebar about 1½ins. diameter.

If any roughness is removed from the nails with a file and smoothed with emery cloth before fixing them in position, the tool will be found to work more easily, and the soil will not stick to it so much.

The best time to use the aerator is when the lawn has had a shower on it, or after it has been watered. It may be difficult to penetrate the soil if the surface has been baked during a dry spell.

Vertical Chiselling

IN the handling of chisels, the first consideration must always be safety. The four methods of holding a chisel which will be given (the first method only being dealt with here) eliminate the danger of cuts.

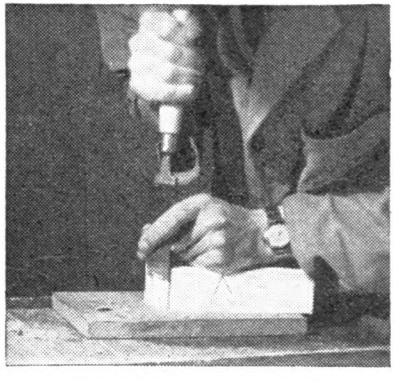
The photograph shows how to hold the chisel for vertical paring.

Like a Dagger

Hold the handle in the right hand like a dagger. Point the forefinger of the left hand and put it round the blade of the chisel. The side of this hand holds the wood down firmly on to the chiselling board.

Now the right shoulder is brought down on to the top of the handle. It is the shoulder which supplies the downward pressure.

Always use the widest chisel possible for the job, and take off the thinnest



slice you can manage. The chiselling board must be kept free of chips, so that there is no space between the board and the wood. (K.B.)

Points to watch in

Buying a Second-Hand Camera

By E. G. Gaze

AS soon as the owner of a camera realises the possibilities of photography he wants to branch out from the 'family-in-my-garden' or the 'holiday-on-the-beach' type of snap. He begins to think in terms of pictures instead of 'snaps'. And then he feels that he needs a camera that is more versatile than his old snapshot box or cheap folding one.

Having decided the size of film he prefers—35mm., larger roll film or plate—he studies dealers' windows and photographic magazines. He is faced with a bewildering array of attractive instruments and an equally wide range of prices. Perhaps he turns his mind to a second-hand camera.

Trial Period

He can go to a reputable dealer—and, incidentally, learn a lot about the reasons for choosing a particular camera—or he may decide to buy privately. In this case examine well before buying, and insist on a reasonable trial period in which you can test the instrument. Here are some general points to look for, particularly in an old or well-used camera.

Firstly, light leakages. Bellows may be worn or cracked, in a plate camera there may be wear in the slide register; if a plate camera has a roll-film holder examine it well, as these can give excellent service only if they are in good order. Make test exposures and examine the negatives carefully for traces of stray light affecting the film.

Secondly, the lens itself. Small 'bubbles' are often present in good quality optical glass, and are harmless. But watch out for a fine mass of scratches on the lens surface, often caused by rough cleaning: slight surface scratches of this type can cause light scatter on the image—it may be so slight as to be undetectable and, therefore, of no consequence. Deeper scratches can mark the image. Open the back of the camera and look through the lens towards the light: if a scratch appears small and dark, then it is obstructing a very small portion of the total light passing through the lens and is usually harmless—if the scratch appears light, then it is scattering light and causing general fogging of the negative image. Lenses can, of course, be repolished: but this is a job for expert attention, expensive and not always justified by results. If a lens needs repolishing it may be wiser to leave it and not buy.

Thirdly, the shutter mechanism. Plate cameras, and many other smaller roll-film ones, have focal plane shutters. The cloth blinds of these—in some miniatures they are metal—can develop pin-holes which brings up, again, our first point of unwanted light reaching the negative. In an otherwise satisfactory camera, new blinds may be worth while: pin-holed blinds can be temporarily repaired by the old method of brushing on a mixture of lampblack and tyre cement solution. With worn blind shutters, too, you may find uneven exposure or even cut-off of part of the negative size due to faulty action of the blinds.

With the diaphragm-type of shutter wear, even particles of rust can affect the proper opening and closing of the metal leaves.

Test the shutter at all speeds. Remember that marked shutter speeds may only be relative to each other: most shutters with wear tend to give a slower speed than the marked figure. You can have the speeds tested expertly by many firms or repairers: it's always useful to know your actual shutter speeds, as distinct from the marked value, when assessing your exposure times.

Photograph Newsprint

Fourthly, the focusing mechanism. See that is smooth and sweet in action and not strained or damaged by grit. With a reflex camera it is wise to test the image focused on the ground glass screen with the image recorded by the negative. If the negative image isn't as sharp as the one focused on the screen, then the negative and screen are not in correct register. Sometimes small washers may be missing under the screen. You can test by photographing a page of newsprint. By this means you can also test the focusing scale of a non-reflex camera by exposing at a carefully measured distance according to the focusing scale, and then exposing in addition with the focus set a little above and below that marked distance on the scale.

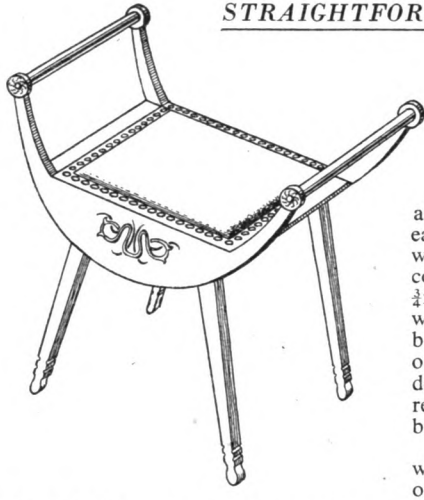
With coupled rangefinder cameras the machined coupling can wear, and this, too, should be tested for accuracy. Focus by rangefinder, expose; then focus by measurement and expose, if you find any discrepancy in the measured distance when compared with the rangefinder figure.

Finally, examine your test negative for stress lines or scratches—often in the form of tram-lines—caused by faulty film transport as the film is wound on the take-up spool between exposures.

To sum up: test thoroughly, by stages, make test exposures—insist on a trial period to allow you to do this.

Here are some generally accepted terms of abbreviation in describing a camera.

Dbl. Ext.	Usually a plate camera with bellows focusing movement that is capable of being racked out to twice normal extension to allow of near life-size copying of small objects. Also allows use of lens of longer focal length than normal.
F.P.A.	Film-Pack Adapter. Usually a plate camera which takes film in special packs as well as ordinary plates.
R.F.H.	Roll-Film Holder. A plate camera with this can use ordinary roll film.
F.P.S.	Equipped with a focal plane type shutter.
D.A.	Delayed Action shutter. An inbuilt delayed action in shutter mechanism delays actual tripping of shutter after it is fired; delay of several seconds allows the photographer to include himself in the picture.
C.R.F.	Coupled Rangefinder incorporated in focusing movement.
E.R.C.	Ever-ready case with camera.
Sync.	Shutter is synchronised for flash.
Cpld.	Additional lens offered (or lens not standard) is automatically coupled to rangefinder when in use.
Coated Ctd. Bloomed	Lens is coated to avoid glare or light scatter on negative image. Most modern lenses are so coated, older ones can be coated if required by specialist firms.



A Dressing-Table Stool

By A. Fraser

MOST women spend some considerable time before their dressing-table mirrors. A seat is, of course, essential, and it is rather surprising what little attention is given to this important item by furniture makers generally.

However, the handyman can easily produce a stool that will fulfil all requirements. The stool described here, while not difficult or expensive to make, will be found to possess an elegance and attractiveness that will appeal to all ladies. While if the reader has some skill and imagination above the average, he can introduce decorative improvements to the design given here, and produce a piece of work that has an appearance of real distinction.

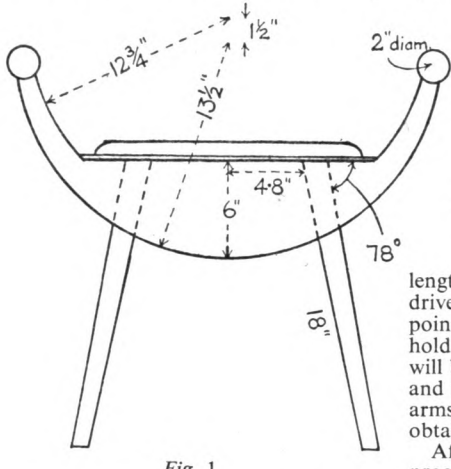


Fig. 1

Perhaps the most important part of the stool, and the one which gives it its individual character, is the rounded outside portion which forms the well of the stool, and at the same time the attachment for the rails, or handles, at each end of the stool. Some thought is worth devoting to this portion. It could, for instance, be made of ⅝in. or ¾in. board. Owing to the shape, this would have to be made of two or three boards joined together, and then cut out to the necessary shape. This is definitely the best way for superior results, but it needs skill to join the boards satisfactorily.

Another way is to cut it out of one whole piece of plywood, preferably ⅝in. or ½in. thick, if this can be afforded. Otherwise, thin plyboard will have to be used, backed for the main part with cheap ordinary board. The narrow arms at each end can be backed with some superior quality wood, as these show.

Improvised Compass

Before sawing out the special shape of these front and back rounded parts, they must be drawn out correctly. To do this, an improvised compass must be made. This is easily done, using a length of spar or stripwood, with a nail driven through one end as the compass point, and a hole bored at the other to hold a pencil stub firmly. Two such holes will be needed—one for the outer round and the other for the inner round of the arms. The necessary dimensions will be obtained from Fig. 1.

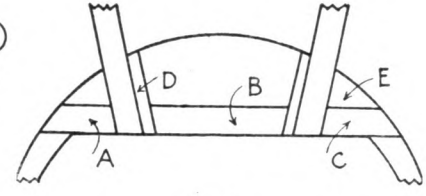


Fig. 2

After these rounds have been drawn, proceed to draw in the straight portion. Lastly, draw the circles at the top of each arm. The shape should be sawn out with a fretsaw, and this should be done with care. A badly sawn-out shape will detract greatly from the appearance of the stool.

It need hardly be said that decorative shapes cut out of the centre portion, and, perhaps, at either end, can improve appearances. Time spent on working out a suitable design is well worth it.

Before finishing with the front and back rounded shapes, it is necessary to bore holes about ¼in. deep into the centre of the rounds at each end of the arms. This should be done on the inside, and the purpose is to provide accommodation for the round rails at each end of the stool. The diameter of the holes should, therefore, be the diameter of the dowel rod to be used. This can be ¾in. or ⅞in.

Use a Protractor

The front and back are next dealt with as follows. Place face down on the floor and draw in the positions of the legs. The best way to do this is first to fix the position of leg top along the seat edge and set off the angle with a protractor. As the width of the leg at this part will be 1½ins., this can be drawn in, using a piece of batten this size.

A further line, ½in. to the inside of those already drawn, should be put in parallel to these, to indicate the position of the cross-board D (Fig. 2).

When the positions of all the legs and boards have been drawn in, then the battens (A), (B) and (C) (seen in Fig. 2) can be dealt with. These are cut from 1in. by 2ins. stuff, and should be sawn to fit the spaces shown by the drawings already done. The edges should be flush with the seat edge of the stool, and see that the angles fit the lines drawn. The legs, when fitted, will then be held firmly.

Fig. 3

These battens not only hold the legs but serve as a frame for the seat to be fixed to later on. They should be glued and nailed, or screwed, into position.

Making the Legs

While these are setting, the legs can be made. These are made from 1¼ins. by 1½ins. square sectioned wood, and it will be found an added improvement to taper them off slightly from the point where they leave the rounded part of the stool. The tapering should be slight, so that the bottom section of the leg is about 1⅛ins. square.

● **Continued on page 188**

The leg is finally given a small touch of ornamentation as shown in the inset (Fig. 3). The rounding off of the extremity is done with a chisel, while the forms above this are easily executed with an Abrafile.

At the top of each leg three holes are bored—these are to give passage for the screws which will help to secure them to the stool body.

Joining the Legs

After this, each pair of legs can be joined together by a cross-board (D). This is ½in. thick and 14ins. long. Its width or depth is the distance from the seat edge to the outside round, as will be seen from the drawing. This board should be glued and nailed, or screwed to the legs. It is important to make sure the legs are equidistant and at right-angles to the top edge of the board.

Each pair of legs, when set, should be tried in position on the front and back of the stool, to see if they fit flush and properly. See especially that the tops of the legs (and board) are flush with the top edge of the seat. If not, rectify the fault with the chisel and plane.

The seat top can next be sawn out. This should be of $\frac{3}{16}$in. or ¼in. plywood. It should be 22¾ins. long and 15¼ins. wide (that is, if the thickness of front and back is ⅝in.—otherwise, find the actual width by trial assembly).

Along the short side of the plywood should be nailed a batten or spar of about 1in. square section. This should fall short at each end by ⅝in. This will bring the long edge flush up to the edge of the front and back of the stool.

All the top edges of the plywood can be rounded off to some extent with a plane preparatory to being finally

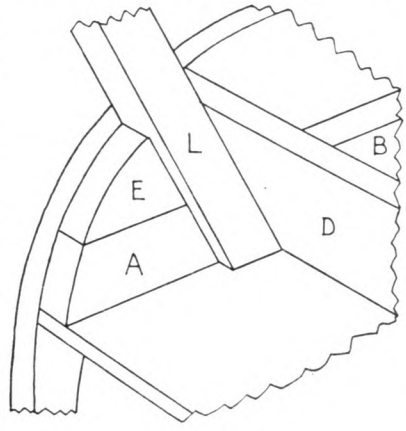


Fig. 4

rounded off with glasspaper block (when the stool is assembled).

Before fixing the top in position, first secure the legs. These are glued and screwed to the back and front, using the three holes ready bored. As an added security measure, pieces of batten (E) are thrust firmly up against the outsides of the legs and glued and screwed into place.

While this is being done, the end rails joining the arms of the stool must also be attended to. If the cross-board on the legs is 14ins., and the dowel is to have ¼in. insertion into the arms, then its total length will be 14½ins. The dowel end is secured with glue and a nail or screw through the arm of the stool. Incidentally, it should be noted that the outside top of the arm is decorated with an embossed or carved ornament of a round floral type. Rosette forms are available ready-made and would suit the case well.

When the glue has set, the stool can then have its seat attached. This, again, should be glued and nailed into place, and the upper edges finally rounded off smooth with the glasspaper block. The whole stool can thereafter be thoroughly glasspapered and fined down generally.

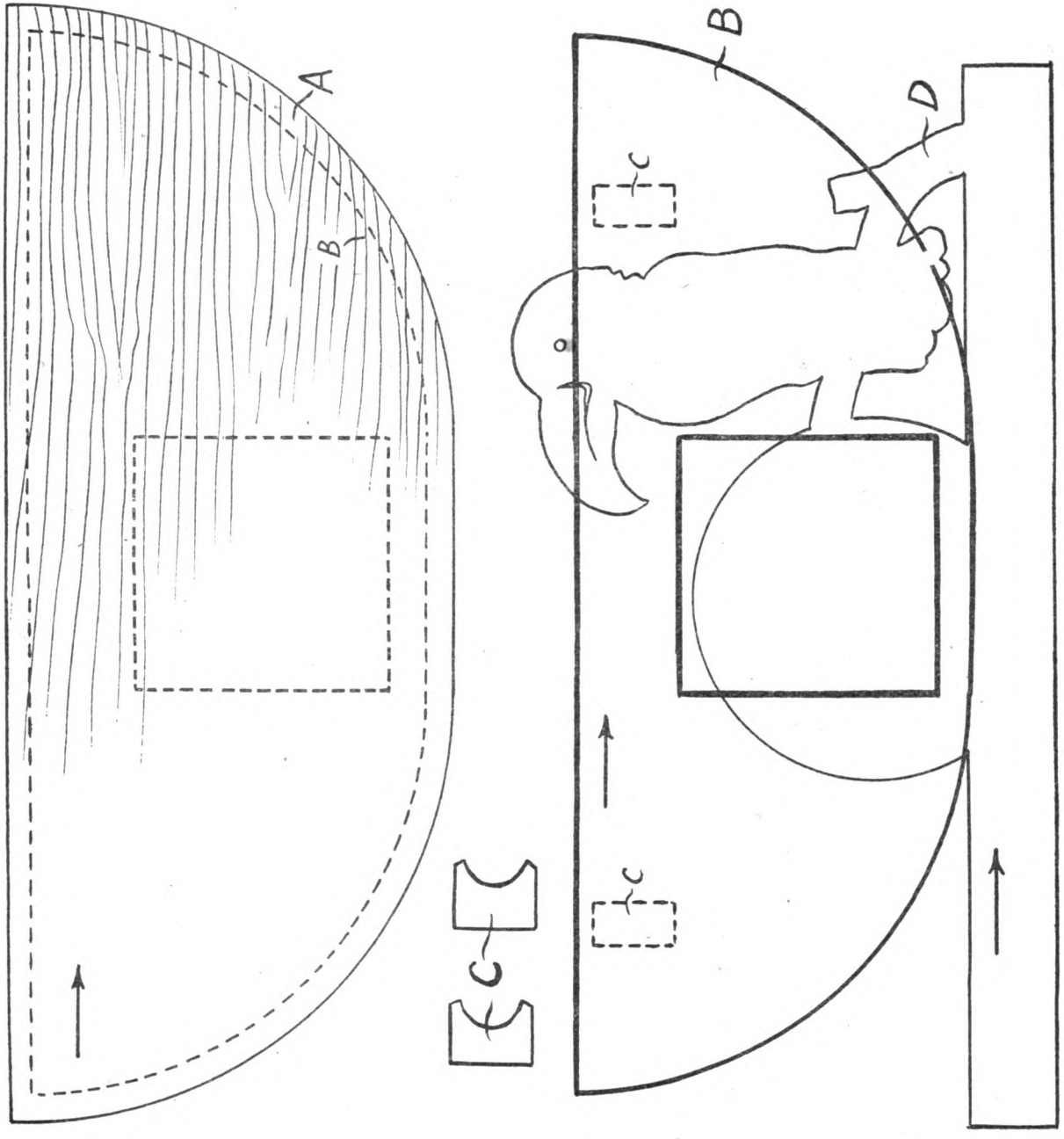
The Padded Seat

The next task is the padded seat. This is made up of a thick layer of cotton wool and/or other padding material. This is covered with a square of leather or substitute, held down, temporarily, with a few tacks, and then finally and permanently secured with trimming held down by a succession of round-headed brass studs. These should be kept rigidly in line. Badly placed studs easily spoil a good job.

Nothing has been said about varieties of wood, or of finish for it. These are largely matters of personal taste. If poor wood has been used, it will probably be best to paint the stool with some pastel shade of enamel.

SEE PAGE 181

Patterns for the Pen and Ink Rack



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