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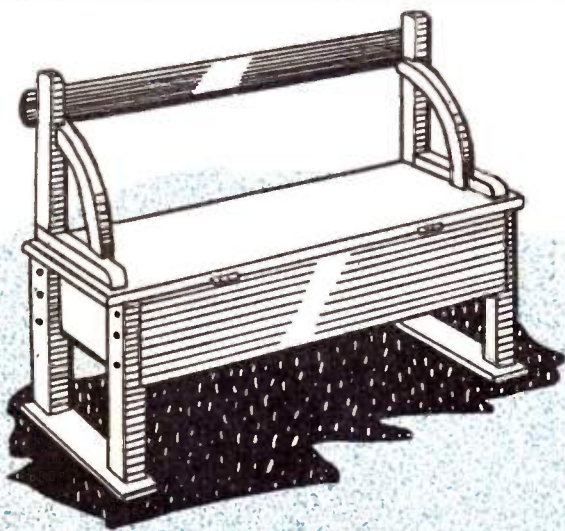
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IN THIS ISSUE

	PAGE
Garden Seat Tool Box	273
A Machine to Test your Grip	274
Breeding Caterpillars	275
R.F. Amplifiers	276
Room Plant from A Pineapple	277
Chemistry in the Home	278
Hints for Ramble Enthusiasts	279
Picture Postcards	280
Circus Lions Cage	280
Lions Cage Patterns	281
Anvil for the Handyman	282
Using Pastels for Picture Making	282
A Three-piece Puzzle	284
Is this Your Problem?	286
Patterns for 'Hunter' Egg Timer	287



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GARDEN SEAT AND TOOLBOX

CUTTING LIST

- Box sides. (2) 3 ft. 6ins. by 8½ins. by 1in.
- Box ends. (2) 1ft. 3ins. by 8½ins. by 1in.
- Bottom. 3ft. 6ins. by 17ins. by ½in. ply.
- Legs. (4) 1ft. 4ins. by 2½ins. by 2ins.
- Ground members. (2) 1ft. 7ins. by 3ins. by 1in.
- Lid. 3ft. 9ins. by 18ins. by 1in.
- Parts D. (2) 1ft. 5ins. by 2ins. by 1½ins.
- Parts E. (2) 1ft. 3ins. by 2ins. by 1½ins.
- Back rest. 3ft. 9ins. by 4ins. by 1in.

Arm rests from spare wood, 1in. thick.

FITTINGS

- 1 pair 3in. steel butt hinges. 2 doz. 2in. round-headed screws. Hasp and padlock. (optional.)

A MOST useful piece of garden furniture is illustrated. It serves a double purpose, providing a seat and a box below for containing useful garden tools. The upper part of the seat can be swung forward to gain access to the tool box below it, and can be left open to provide a low table to hold flower pots and other articles likely to be needed at the time cultivation tasks are undertaken.

Construction is simplified to suit even a tyro in woodwork, and for material a good quality deal would serve. Red deal, if obtainable, is generally the best of the soft woods to employ for outdoor articles. A cutting list is provided to aid those ordering the necessary timber. It also gives the sizes of timbers to be used.

The box part is shown in Fig. 1. It consists of stout wood sides, firmly nailed, or screwed, together, with a bottom of plywood, ½in. or ¾in. thick. The bottom should be screwed on, not nailed. All joints should be strengthened with waterproof glue, or alternatively

luted with a paste of white lead and linseed oil to seal them against damp. Any left-over paint, if thick, might do for luting, if of good quality. Note, dimensions given are outside ones based on 1in. thick wood, and must be adhered to whatever other thicknesses are substituted.

The legs, (A), are reduced to half thickness where they are to be fastened to the corners of the box, as shown. Take

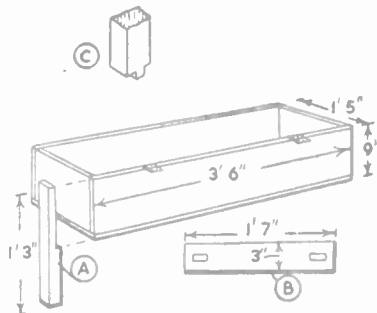


Fig. 1

care to screw them very firmly in position. They must be quite level with front and back of the box. At a distance of 9ins. in from each end, recess the top edge of the box front to take a pair of strong steel butt hinges, 3ins. long. These recesses should be deep enough to let the leaves of the hinges sink in level. Only one leaf of each hinge is sunk in, as similar recesses to sink the second leaf have to be cut in the seat lid.

Two ground members are cut to dimensions given at (B). The bottom ends of the legs are joined together in

pairs by the ground members, and suitable mortises are cut in the latter to receive tenons cut at the bottom ends of the legs, as in detail (C). The given length of the legs must be increased by the length of these tenons to ensure when all are joined together the total height from ground level to the top of the box is 1ft. 4ins.

Fig. 2 shows a side view of the seat. For the seat, which also acts as a lid to the

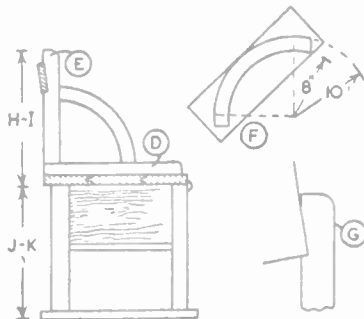


Fig. 2

box, three or more boards will be needed to make up the width. These should be of the tongued and grooved variety, but ordinary house floor boarding would serve quite nicely. Place them together and then trim off with the saw as necessary, remembering they must be long enough to cover the tops of the legs at each end and project about $\frac{1}{2}$ in. beyond. At the front the seat lid is to be level, but can project $\frac{1}{2}$ in. or so, at the back.

Cut the recesses for the hinges at this stage, it will be an easier job to do before the lid is fitted up. Now cut the

horizontal members (D), one for each end of the lid. To these the vertical members (E) are fixed with a simple halved joint. Fix with waterproof glue and nails. An important point here is the length of parts (E), which can only be given approximately as the thickness of boards does not remain constant. For instance, 1in. thick boards, bought already planed, will lose substance and prove to be about $\frac{3}{4}$ in. The length of parts (E) should be such as to make the height of (H-I), equal to that of (J-K), in Fig. 2. This is necessary if the seat, when swung over, is to make a level table top.

Parts (D) and (E), when the glue is hard, should be screwed to the seat lid, about 1in. in from each end. The hinges can now be screwed on to enable the lid to open out.

At each end an arm rest is added. This, as shown in Fig. 2, is made quarter-circular in shape. The detail (F) shows how these can be marked out on a piece of 1in. board, with the radius given. Try for fitting, and allow enough each end to screw to parts (D) and (E). The portions to be screwed should be reduced to half thickness.

The final fitment is a back rest, fixed at each end in a notch cut in verticals (E) just above the arm rests. As in details (G), the notches are cut to a slight degree from the vertical to impart a backward slope.

Rasp and glasspaper all sharp edges on the seat and backrest, and clean up generally. If considered advisable, fit a hasp and padlock to the lid at the rear to safeguard the tools. Finally, the completed article should be painted or treated with a wood preservative dye. (W.J.E.)

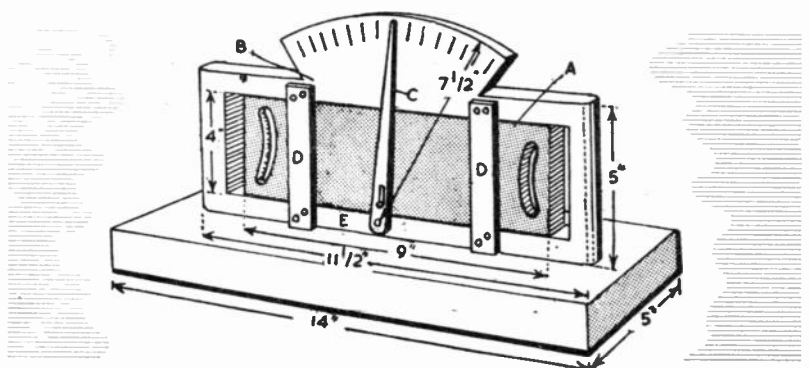
A Machine to Test your Grip

HOW strong is your grip? If you want a friendly contest with your friends, here is a little machine that can easily be made from a few pieces of scrap wood.

It consists of a piece of wood (A), sliding in a frame (B). Hand holes in each end of (A) allow the contestants to obtain a grip, and by clenching the hand, each endeavours to pull the moving piece towards him. A pointer (C), shows on the dial the movement either way and indicates the winner.

For the parts (A) and (B), use wood about $\frac{3}{4}$ in. thick. Plywood will do quite well. If you use a fine fretsaw (A) can be cut from (B), and after cleaning up, be put back in again. But it is essential that the edges are true so that it slides freely in the frame.

Round off the ends of the frame (B),



also the inside edges of the hand holes in (A). Four thin wood strips (D), are screwed on (B), two at each side, to retain piece (A) in the frame.

The completed unit is mounted on a baseboard 14ins. by 5ins. by about 1in. thick. It is glued in place, and strengthened with a couple of screws.

The pointer is cut from $\frac{1}{4}$ in. plywood.

It is pivoted to the bottom edge of frame (B) with a small round headed screw. A slot (E), is cut to engage with a screw in (A), so that any movement causes the pointer to deflect.

A piece of white paper or card is marked with graduations and pasted on the dial, and the woodwork is painted in contrasting colours. (D.S.H.)

BREEDING CATERPILLARS



IT is essential, in rearing caterpillars, to ensure that they have a supply of fresh food. The best way to keep it fresh for as long as possible is to keep the stem of the foodplant in a bottle of water and this is shown in Fig. 1. You should take care to pack the stem into the bottle tightly with a piece of cotton wool as otherwise the caterpillars will crawl down the stem into the water and drown.

Newly hatched caterpillars are best kept in a plastic sandwich box as advised in a previous article. Fresh individual leaves should be supplied daily. Do not try and move the young caterpillars over on to the new leaf; they will soon move themselves and the oldest leaf can then be removed the following day.

During the course of its life the caterpillar changes its skin a number of times and this process is called moulting. The number of moults depends on the species and is usually four or five. When the caterpillar is moulting it should on no account be disturbed.

After the first moult these young caterpillars may be taken out of their

plastic box and the leaves on which they are feeding placed amongst the foliage of a small branch of the foodplant in water. Any that are sitting on the walls of the box should be carefully moved over using a child's small paint-brush to pick them up.

It is a good plan before putting them in the cage (described in the first article) to put a folded newspaper on the floor. This makes cleaning out the cage much easier as it is only necessary to change the paper.

If a species that may pupate on the floor is being reared, such as The Brazilian Bullseye, then the false front should be put on the cage and about a three inch layer of peat placed on the floor.

Fresh leaves

When all the leaves have been eaten or are showing signs of wilting, fresh should be supplied. To do this put the new plant in another bottle and so place it in the cage that it touches the old. The caterpillars will walk over and the old food can then be removed. From time to time the cage should be cleaned out. Caterpillars found on the floor when this is done should be carefully replaced on the food.

As the caterpillars grow larger, more and more food will be required. Just how much is largely a matter of experience and depends both on the temperature and the species. It is better to be on the safe side and give too much. Certain species such as The Eri Silkmoth and The Brazilian Bullseye like to be fairly crowded and do best under these conditions. Others, such as The Indian Moon moth like a little solitude. As these get bigger, therefore, they should be thinned out by transferring some to another cage, or, if this is not possible, it is better to throw them away, since to keep too many will not only lead to the possibility of disease but will also produce undersized moths and these tend to lay infertile eggs. The best way of telling if they are overcrowded is to watch the caterpillars. If there are too many, there will always be a number wandering round the cage searching for food even though there is plenty present.

When a caterpillar is ready to make its cocoon it leaves the foodplant and wanders round the cage for a time. Having selected a suitable site it settles down and spins a mass of silk round itself. The place chosen may be either on the wall of the cage usually in a corner or on the branches of the food. Some

species spin themselves in between two leaves, others hang down on a thick silken thread. A few prefer to cocoon at soil level and for these peat should be supplied.

When the majority of the caterpillars have made their cocoons you will see that those that are left are small and feeble. These should be thrown away as such caterpillars rarely produce worthwhile moths and indeed in many cases fail even to pupate.

~~~~~  
*By B. Gardiner*  
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After making its cocoon the caterpillar rests for several days before shedding its last skin and turning into a pupa. At first this pupa is very soft and several more days pass while it gradually hardens. It must be appreciated, therefore, that cocoons should not be disturbed until about a fortnight after their formation.

Warmth important

There remains the question of where to keep your cages of caterpillars. All Silkmoths require warmth and in summer a greenhouse is ideal. Many of them however start early in spring or extend into autumn; these require to be given some heat and it will often be found that a shed in a sunny position can be kept very cosy with a small paraffin heater which need only be used on dull days and at night. The important point is to keep frost out, but the caterpillars must be kept warm enough to be able to feed. Cold makes them so lethargic that they do not feed and so die of starvation.

Certain of the moths can be bred during the winter and for these either a heated greenhouse or else a room with a fire is essential. Since Silkmoths are not only clean in their habits compared with many moths but are also of great beauty, they by no means look out of place in a sitting-room.

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A free design for making a table lamp with a real 'nautical' flavour will be included in next week's issue. Also many other popular features. Make sure of your copy.  
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R.F. AMPLIFIERS

AUDIO-FREQUENCY amplifiers have already been described. They increase the volume of audible signals, and follow the detector stage. Radio-frequency amplifiers are also used, and these increase the strength of the radio signal before it is detected. The use of a R.F. amplifier has several advantages. It can employ a tuned circuit, in addition to the one already present in the detector stage, so that selectivity is increased, giving more freedom from interference by neighbouring stations. It also provides a stronger signal for the detector, so that weak, distant stations can be heard. For these reasons a R.F. amplifier is often employed in receivers using three or more valves.

Screen grid valve

Valves used in R.F. stages have a screen grid between grid and anode, to avoid stray coupling inside the valve,

The signal, picked up by the aerial, is tuned in with the first $\cdot 0005\mu\text{F}$ condenser. The valve amplifies this, so that a much more powerful signal reaches the detector coil, which is also tuned to the same wavelength by the second $\cdot 0005\mu\text{F}$

ling, but not other forms of detector, because the coil is wired to H.T. positive.

For general purposes, the transformer type of coupling has much to recommend it, being trouble free and inexpensive.

By F. G. Rayer

condenser. This increases volume, range and selectivity.

Other couplings

The circuit in Fig. 1 provides transformer coupling, because a small primary winding is wired between anode and H.T.2. This winding can be the same as that used for aerial coupling, as previously described for 1-valvers.

Volume control

When a R.F. amplifier is fitted, a volume control is often provided, or local stations will be too loud. It is also usual to eliminate the separate screen grid supply (H.T.1 in Fig. 1).

In Fig. 2, the voltage is reduced to a suitable extent by the resistor R1. With a 1T4 and 90V. H.T. battery, this resistor can be 20K. C1 is merely a by-pass condenser, and can be $\cdot 05\mu\text{F}$ or $\cdot 1\mu\text{F}$. With a battery of only $67\frac{1}{2}\text{V.}$, or less, the resistor may be omitted.

Modern valves for R.F. stages have 'variable- μ ' characteristics. This simply means that the degree of amplification

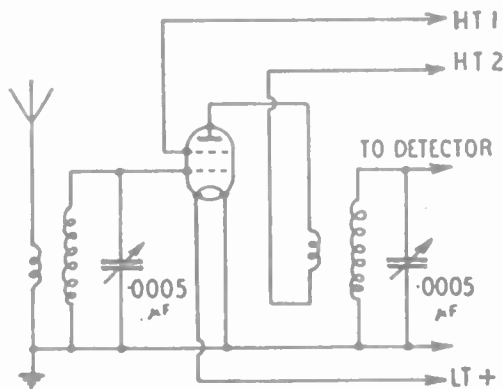


Fig. 1—R.F. stage

which would reduce efficiency and cause oscillation. They are therefore termed 'screen grid' valves. In Fig. 1, the screen grid is wired to H.T.1, and would receive about 60V. Modern valves also have a suppressor grid, between screen grid and anode. This is wired to earth, to improve results further. In many battery valves, the suppressor is permanently joined to the filament, inside the valve itself, and is thus earthed through the filament circuit.

A R.F. stage like that in Fig. 1 requires a further tuning coil, with variable condenser, and the valve, with holder. The second coil and condenser will already be present, serving to tune the detector, which can be a valve or crystal, exactly as in a 1 or 2-valver. For miniature 1.4V. receivers, a 1T4 is suitable.

Choke coupling can also be used. With this, a H.F. choke prevents the radio-frequency signal passing, while allowing H.T. to reach the anode. The R.F. signal then passes through a small fixed condenser (C3 in Fig. 2) to the detector coil. This type of circuit slightly simplifies coil winding, as a coupling primary is no longer required on the detector coil.

A third method is known as tuned anode coupling, and is shown in Fig. 3. Here, the detector coil itself is wired to the high tension circuit, with a by-pass condenser C1 to earth. This is a very efficient method. But as the coil is no longer earthed, difficulties sometimes arise in arranging wachange switching. A valve detector with grid condenser and leak can be used with this type of coupling.

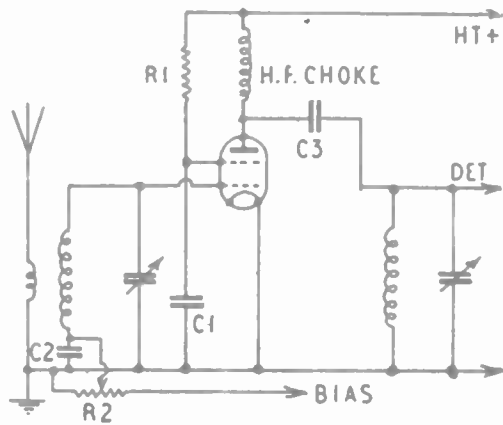


Fig. 2—Volume control and choke coupling

of the valve can be adjusted by modifying the grid bias applied.

In Fig. 2, the volume control potentiometer R2 is wired from earth to grid bias negative. The control slider (arrow) is wired to the tuning coil, C2 being a by-pass condenser, again of about $\cdot 05\mu\text{F}$ or $\cdot 1\mu\text{F}$. When maximum bias is applied to the valve, its amplification is at a minimum. As the control slider is moved to the left, bias is reduced, thereby slowly increasing volume. When the slider is at the earthed end of the control, volume is at maximum.

This type of volume control is nearly always used in 3-valve sets with R.F. stages. The value of the potentiometer is not very important, about 25K or 50K being usual. The potentiometer may have a switch which operates when the knob

is turned to the minimum volume position, to switch the receiver off. For most small battery valves, 6V. or 9V. bias will be sufficient, and this is often obtained from the auto-bias circuit which provides grid bias for the output stage.

Matching coils

When a R.F. stage is used, two tuning coils will be present, one in the aerial circuit, and one in the detector stage. Both coils must tune together, to the same wavelength. For this reason, a pair of coils, for such circuits, should be used.

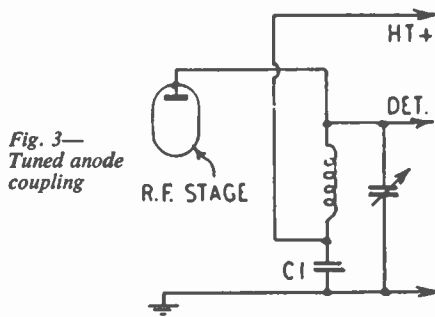


Fig. 3—
Tuned anode
coupling

These may be purchased, for medium waves only, or for dual-wave operation, or other bands.

When coils are to be wound, the insulated tubes must be of the same diameter, and the tuned windings must be wound with the same gauge of wire, and have the same number of turns. A pair of home-wound coils, for R.F. stage and detector, are shown in Fig. 4. With 1in. diameter formers, each tuned section can have 90 turns of 32 S.W.G. enamelled wire, turns side by side. A space of $\frac{1}{4}$ in. is left, and each coupling winding consists of 30 turns of similar or 36 S.W.G. wire.

It will be noted that connections are different with each coil. With the aerial coil, the primary goes to Aerial and Earth. The tuned winding goes to R.F. valve grid (and fixed plates of tuning condenser), and variable-mu bias. Or, if V.M. bias is not applied for volume control purposes, the bottom of this winding goes to earth.

With the detector coil, the primary is wired from R.F. valve anode to H.T. positive. The secondary goes to detector (and fixed plates of detector tuning condenser), and earth, exactly as in the 1 or 2-valver.

Positioning the coils

With valve detectors, reaction will often be used. A reaction winding can be provided on the detector coil, and can consist of 50 turns of 32 S.W.G. or 26 S.W.G. wire, $\frac{1}{4}$ in. from the earthed end of the 90 turn tuned section.

Stray coupling between aerial and

detector coils can cause uncontrollable oscillation. When both coils are above the chassis, they must be several inches apart, or have a metal screen erected between them. Some ready-made coils are fitted in aluminium screening cans, to avoid such stray coupling effects.

It is often convenient to use the metal chassis for screening, placing the aerial coil above the chassis, and the detector coil underneath. With this arrangement, the detector coil is often mounted sideways, from the rear or side runner. The two coils will then be at right-angles to each other, and this further reduces

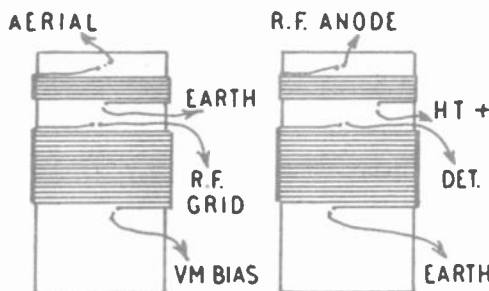


Fig. 4—Aerial and detector coils

stray coupling.

If a receiver with R.F. stage commences to oscillate, when the volume control is turned towards maximum, this shows that stray coupling is arising between the coils. To help prevent this, leads should be reasonably short, and those in the R.F. stage should not run near wiring in the detector stage.

Ganged tuning

It is quite in order to tune each coil with a separate $\cdot 0005\mu\text{F}$ condenser. Doing so gives a convenient layout, and allows each coil to be tuned separately for best results. But it also means that there are two tuning knobs, which have to be operated together. To avoid this, a ganged tuning condenser is usually fitted.

For R.F. and detector, a 2-gang $\cdot 0005\mu\text{F}$ condenser is necessary. This consists of two separate $\cdot 0005\mu\text{F}$ condensers with a common spindle, both working together from the knob, drive or dial. Ex-service gang condensers of this type are very cheap.

With ganged tuning, it will be clear that the pair of coils must be exactly the same, or they will not tune together. This is less important with separate tuning condensers, because each was then tuned individually with its own condenser.

When ganged tuning is provided, stray capacity in the wiring may prevent both coils tuning exactly together, even when the coils are identical. To overcome this, trimmers are fitted. These are small pre-set condensers of about 50pF capacity, either wired up separately, one to

each section of the gang condenser, or built on the gang condenser itself, by the maker. With such trimmers, it is only necessary to tune in a weak station, of fairly low wavelength, and turn the adjusting screws until maximum volume is obtained.

Miniature coils often have adjustable cores. If these are used, a pair of coils cannot tune correctly together until the cores are in the proper position. Adjustment can easily be made by tuning in a station of fairly high wavelength, and screwing the cores in or out until volume is at maximum. An insulated rod,

shaped like a screwdriver, should be used, because the presence of a metal blade inside the coils will have an adverse effect.

Large receivers with several wavebands may have separate trimmers and coils for each band. If so, each pair of coils is trimmed separately. Trimmers are always adjusted with the gang condenser nearly fully opened (low wavelength end of the scale). Coil cores are adjusted with the condenser nearly closed (high wavelength end of the scale). With air-cored coils, only trimming is necessary.

Room Plant from a Pineapple

By Keith Davies

WHILE there is an abundance of pineapples on the market, you may grow a pleasant addition to an indoor plant collection, if you follow these instructions.

Carefully cut off the fresh leafy top of your pineapple, and trim its base with a sharp knife. Place it in a pot of sandy soil, and if kept fairly warm and moist it should soon produce roots. The plant should then be transplanted to a pot containing a more loamy soil.

In the summer months it requires plenty of water, but in winter it should only be watered occasionally.

Besides developing into a handsome plant, if kept in a warm moist atmosphere, by the second year it is possible your pineapple will produce a fruit of its own.

CHEMISTRY IN THE HOME

MICHAEL Faraday, although generally remembered as a brilliant physicist because of his electrical discoveries and inventions, was also an able chemist. In 1825 he discovered a colourless liquid of peculiar odour. This was benzene. Benzene was to have a tremendous future and great industries rest on it. Faraday found it in

it to a flame. The benzene takes fire and burns with a smoky luminous flame. Now you have seen that it is inflammable, you will know it should be handled with due care. In the open air, pour a few drops of benzene on to some water in a tin can. Drop in a lighted match. The benzene burns even in contact with water. Why is this? Pour a few drops of benzene into a test tube containing water. You will see that the benzene floats on the surface of the water. Because it does not mix it burns. Benzene fires are therefore treated the same way as petrol and oil fires. Namely, by smothering with sand. Water merely spreads the fire.

While benzene does not mix with water it will do so with a number of other liquids, two notable ones being petrol and alcohol. Added to petrol, it gives 'boost' and has been used in motor racing fuels. Mixed with methylated spirit (which is, of course, principally alcohol) it yields a highly efficient paint stripper. A supply of this will be useful at some time in the home. It may be made by warming $\frac{1}{4}$ pint of benzene in a

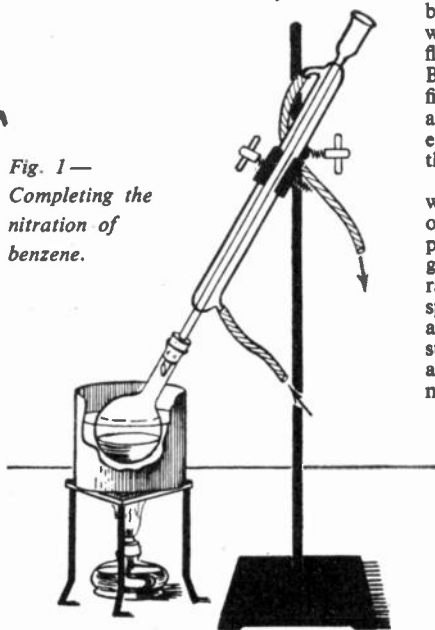


Fig. 1—
Completing the
nitration of
benzene.

illuminating gas made from oil, but adequate supplies of benzene came from its later discovery in large quantity in coal tar.

Chemists found benzene to yield many useful products. Dyes, medicines and solvents all stem from this raw material.

Let us take a look at the more immediate properties of benzene. When buying benzene for these experiments, by the way, you should specify *benzene* and be sure you are not sold *benzine*. Benzine is a petroleum product consisting of a mixture of hydrocarbons and it is useless for the present purpose. Benzene is a single substance, whose molecule is made up of six carbon atoms and six hydrogen atoms.

Dip a glass rod into some benzene, carry it across your laboratory and hold

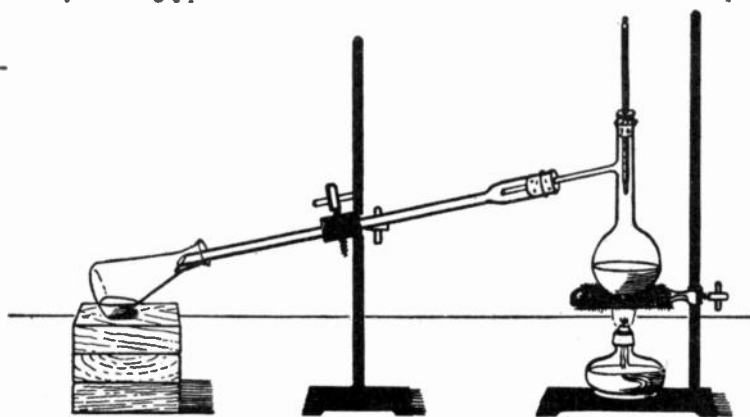


Fig. 2—Purifying benzene by distillation

vessel standing in a pan of hot water (no flame) and dissolving in this $\frac{1}{4}$ ounce of paraffin wax (candle wax will serve). Add $\frac{1}{4}$ pint of methylated spirit and allow to cool. To use it, brush it on to the paint, let it act for a few moments and then scrape or rub off the softened paint.

Benzene is also a useful rubber solvent. Cut a few small and thin pieces of crepe rubber, put them in a small dry

EXPERIMENTS WITH BENZENE

bottle, pour in some benzene and cork the bottle. Leave it a day or two with occasional vigorous shaking. The rubber swells and dissolves forming a syrupy solution. By adding 2 to 3 per cent by volume of methylated spirit to this solution to cut the viscosity somewhat, the product may be used for puncture repairing.

Grease and oil are readily dissolved by benzene, too. Because of this it is much used for stain removing. Put a drop of oil on to a piece of cloth and then rub with a rag dipped in benzene. The oil stain is easily removed. An even more effective product can be made by mixing 1 volume of alcohol with 3 parts of benzene.

Stamp collectors commonly use benzene for detecting watermarks. Benzene is equally effective, and more easily obtained from a pharmacist. Soak off a stamp from an envelope, let it dry and place it face down on a black plastic or pot surface. The watermark, if any exists on this particular issue, may or may not show faintly. Let a drop or two of benzene fall on to the stamp. The watermark shows up in grey.

Scarcer and thus dearer stamps are

sometimes the object of fakers. Should such a stamp be thinned or torn it has not been uncommon for these to be repaired by paper grafting. Such grafts may be so cleverly done as to be quite invisible to the eye. Benzene will usually show up the graft by using it in the same way as for detecting watermarks, the joined papers standing out plainly.

The main starting material for the

many useful and interesting chemical derivatives of benzene is nitrobenzene. To make it, measure out 30 c.c. of concentrated nitric acid and pour it into a 250 c.c. round bottomed flask. Also measure out 30 c.c. of strong sulphuric acid. Use a measuring cylinder in both cases and take care to keep the acid off the skin. Should some come in contact with your fingers, rinse it off at once with water and dab on a paste of sodium bicarbonate and water.

Dangerous fumes

Add the sulphuric acid in very small portions at a time (about 1 to 2 c.c.) to the nitric acid, swirling the flask after each addition and cooling it in water. Put the mixed acid into a separating funnel held in a retort stand. Pour 25 c.c. of benzene into the emptied flask. By means of a cork, support a thermometer in the flask so that the bulb is immersed in the benzene. The experiment is best conducted in the open air on account of the fumes.

Momentarily removing the thermo-

meter each time, gradually add the mixed acid to the benzene in portions of about 1 to 2 c.c. Swirl the flask after each addition. Heat is given out. Keep the temperature not higher than 50 to 60 degrees Centigrade by adjusting the rate of acid addition and by cooling by partially immersing the flask in cold water. The acid addition should take about 30 minutes.

A brownish layer of nitrobenzene separates above the mixed acid. Now heat the flask in a water-bath to 55 to 65 degrees for 20 minutes to complete the reaction (Fig. 1). Swirl the flask occasionally. Remove the flask from the bath and let it cool. Pour the contents into a separating funnel and run off the lower layer of waste mixed acid into a beaker. To get rid of the waste acid, gradually pour it into a large volume of cold water while stirring well. It may then be poured away down the sink.

Add 25 c.c. of water to the nitrobenzene and shake well. Run off the lower layer of nitrobenzene, empty the funnel, return the nitrobenzene to it and shake

it with 25 c.c. of 5 per cent sodium carbonate solution. Run off the nitrobenzene and return it to the funnel, after rejecting the sodium carbonate solution, and shake with 25 c.c. of water.

Purification by distillation

Dry the nitrobenzene by running it into a small bottle containing 3 grams of calcium chloride. Shake occasionally during half an hour and then decant the nitrobenzene into a dry distilling flask fitted with a thermometer and air condenser (Fig. 2). Add a couple of small pot chips to promote even boiling. Now distil and collect the fraction passing over between 206 to 210 degrees. Do not let the temperature rise higher nor distil quite to dryness.

The distillate consists of nitrobenzene, a pale yellow oily liquid. You will note its strong smell of bitter almonds. It has been used to give a pleasant odour to shoe polishes, but its main use is for conversion into aniline and a host of other chemicals important to science and industry.

Hints for Ramble Enthusiasts

TO the growing band of young enthusiasts who prefer to depart from the beaten track to explore the hill-tracks, the heather-clad glens and rugged heights north of the Tweed, or such areas as the Peak Country, or the hills of the Lake District and Wales, the following hints may not come amiss:—

Rock climbing is strenuous work; but the hiker or rambler, as you prefer, who is strong of wind and limb, need not fear to tackle a moderate crag or two. Indeed, on some of the popular hill routes the tracks are now so improved by regular use that they are much easier to follow and to conquer, and even in a mist you cannot go far wrong, provided you stick to the trails.

Foot comfort

Foot comfort is a first consideration, and those young folk intent on scaling rocks should obtain a pair of mountain-eeing boots, stout, easy-fitting, water-tight footwear, which are fitted with large tacks or studs for use when traversing rough ground like the granite Grampians.

Prior to a long tramp, wash the feet carefully, and rub a little vaseline over the heels and in between the toes. Cloth anklets, if properly worn, serve to keep footwear free of grit. By the way, it is not a bad idea to wear your new pair of boots on two or three cross-country walks before attempting to climb the rocks in them, so that your feet may become accustomed to their 'feel'.

Procure, if possible, a supple well-seasoned staff of ash from a game-keeper or other good countryman, though for rock climbing an alpenstock may prove of more advantage; it is foolish for a novice to start mountain climbing or crag scaling on his own — there should be at least one experienced climber in the party.

Carry the minimum of luggage. A light waterproof rucksack will amply hold all necessities — including the waterproof 'mac' — and cloth shoulder straps are preferable to leather, for they



By A. Sharp



fit more comfortably. When rock climbing wear your oldest clothes, for they are bound to meet with rough usage. Some rambles wear gloves when negotiating rocks, thus keeping less friction on their fingers. Remember, too, that scrambling with bare knees often causes badly scarred legs or your limbs may become smothered with abrasions, and cuts.

In the choice of food, tomato sandwiches take some beating. These are excellent, keeping moist in hottest weather. Simply cut good English tomatoes into thin slices, season and garnish, and place between wholemeal bread and butter.

Cheese sandwiches.—Use 3 ounces of cheese grated, the same amount of but-

ter, a little made mustard, and a pinch of salt. Cream the grated cheese and other ingredients. Mix well and spread on your bread as required.

Marmalade is to be recommended instead of jams, which have a tendency to dry up rather quickly.

Ample provisions essential

Obviously, on a long strenuous day's climb it is well to be provided with ample provisions. The youth having with him a small air-pressure stove, and a spare tin of fuel (or Meta fuel in small pieces), will find these very useful when making ready a meal.

Attractive climbs include the Cairngorms, Ben Nevis, and the hills of Skye. The Scottish Guides to these spots will be welcome, as also books and guides to the crags of the Lake District, including Scafell, Great Gable, Pillar and the Buttermere crags, issued by the Rock Climbing Clubs. Snowdonia affords good hill climbing, whilst, in a lesser degree, you may find ample scope in Peakland and the hills of Derbyshire, especially Kinderscout and around Castleton, and in the Manifold Valley.

SOLUTION TO CROSSWORD NO. 18 PUBLISHED LAST WEEK

Across: 1. Decade. 4. Scone. 7. Miller. 8. Canto. 10. Lola. 12. Another. 15. Omens. 16. Iago. 17. Nave. 19. Ousel. 20. Grenade. 21. Siam. 23. Stub. 24. Armada. 25. Screw. 26. Tackle. Down: 1. Dumpling. 2. Calf love. 3. Diet. 5. Chanties. 6. Nutmeg. 9. Ensue. 11. Amenable. 12. Anode. 13. Hall mark. 14. Room mate. 18. Arctic. 22. Aria.

They mean 'big business'

PICTURE POSTCARDS

WHEN sending off your 'having-a-marvellous-time' holiday picture post cards did you ever wonder just how these artistic pieces of paste-board came into being?

The first 'view card' was made by Cesare Bertanza, an Italian, in 1885 and was of Lake Garda, though in the 1870 war a French stationer sold cards to the soldiery stamped with flags, etc.

Plain cards for sending messages through the post had been allowed since 1869 and the idea of putting a picture on one side came in the nature of a brain wave.

Once started, picture post cards caught on, but they got a great lead on the continent because till 1894 the British postal people retained the sole right to print cards that were to pass through their hands.

'Snowdon' issue

The cards too that they used were small, being only 4½ in. by 3½ in., but in 1898 the Post Office suddenly decided to allow the continental 5½ in. by 3½ in. — which is now accepted everywhere as 'post-card size'.

Messrs George Stewart of Edinburgh and other firms started making small cards early on, the very first British card coming in 1894. It was sold on the summit of Snowdon, a picture of the mountain being *pasted* on to it. Several firms waited till the continental size was allowed

however, and then went in for cards in a big way. Of these one was Messrs Raphael Tuck.

Early pictures were lithographed, but the trade was given a huge boost when it became possible to print photographs. Tucks claim the first real photo card. It was of the Tuck family playing cricket on the sands at Filey. The taker of the picture, a Mr Corkett, became manager of the firm's picture post card department.

At the turn of the century picture post cards had a world-wide popularity. Six million passed through the post in one year in Germany alone.

Raphael Tuck started a journal called 'The Picture Post Card' and with big prizes offered came a collecting craze — one competitor piling up no less than 23,000 cards.

But apart from this, cards were collected by many people in albums for their interest and beauty, while strange uses were found for the more artistic, as table decoration, screen making, etc.

Early cards did not permit message writing on the address side and so there was often a space left below the view for a few words. This spoilt the effect of the picture and in 1904 our postal authorities relented and gave space for a message beside the address, so that the picture could be left untouched.

Round the first years of the century many novel series came out, one illus-

trating verses of songs of the day with living photographic models. A Continental benefactor issued half a million cards as a temperance drive — his pictures showing 'The Drunkard's Doom' and kindred subjects.

Comic and musical

Picture post cards had been in vogue for nearly 20 years before the idea of putting on comic pictures was thought of. A German artist touched it off and later Tucks and Valentines followed suit. Now the comic card is big business.

In modern times, cards have settled into several well-defined groups, of which the straight view is well to the fore, but years ago manufacturers were ever trying to break new ground. Thus cards were made with material attached, like tinsel, for sparkling snow and other effects, and scent to give pleasant aromas. An unusual idea was the musical card which squeaked when pressed.

But it is in the realm of the straight picture, which you can mark with a cross to show your boarding house, or in the world of the comic, that cards seem to have found their place in the scheme of things, to judge by the colossal number of these two classes that are sold every year.

Holiday resorts are the biggest buyers from manufacturers, though picture post cards can now be found in the smallest village. (H.A.R.)

Circus Lions Cage



Pull-along toy for children

DIAGRAMS AND PATTERNS ON OPPOSITE PAGE

THE Circus comes to Toy Town! Every child loves the Circus, so why not make this gaily coloured pull-along toy complete with prancing tame lions in the four-wheel cage. The wagon has room on top for transporting wood blocks, etc., and a tow cord with handle. When it is pulled along, the two

lions revolve inside the cage.

The top and bottom pieces are of ½ in. wood, measuring 9 in. by 4½ in., and are drilled in one operation for correct alignment of the holes for the ½ in. round rod cage bars. The bottom piece may have an extension as shown, for affixing the tow string.

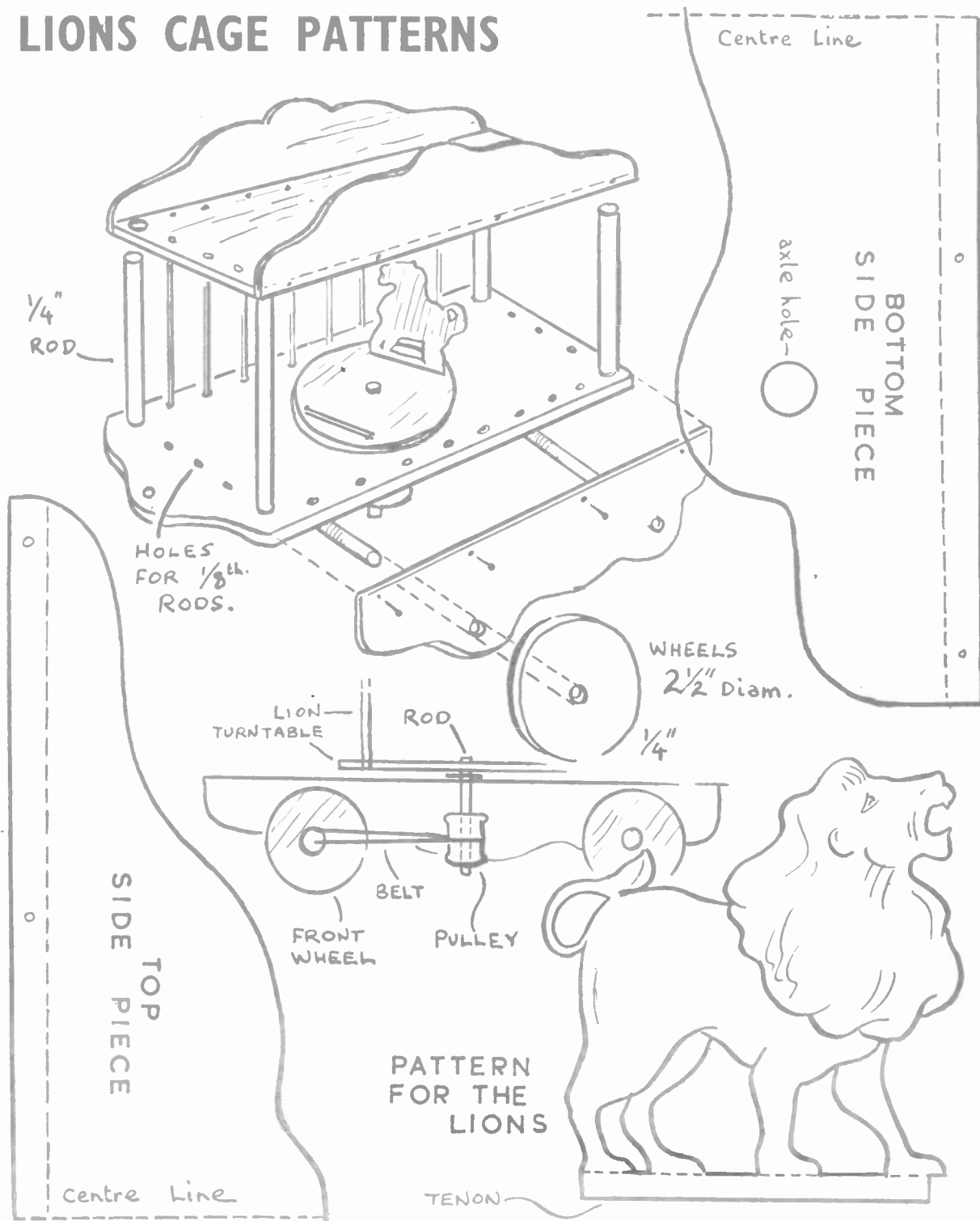
Fretsaw the top and bottom side shapes in pairs from ½ in. plywood. The two lions can also be cut out in one operation, and these have a tenon at the base for gluing into mortise slots cut in the revolving table. The four corner holes are drilled to take the corner support ½ in. rods which should be 4 in. high.

Assemble the truck, linking the back axle rod with an elastic-band driving belt to the pulley (a cotton reel) which turns the animals' revolving platform. Patterns for side shapes and the cut-out lion are shown full-size on page 281, and construction can be followed from the detail sketches.

The diameter of the turntable should not exceed 4½ in. or it will foul the cage bars, and the animals should be correctly placed for the same reason.

Other wagons, with or without the cage bars and roof pieces, could be made by the toy maker, introducing other types of circus or zoo animals. Animal pictures can be obtained from magazines and children's books. (T.S.R.)

LIONS CAGE PATTERNS



For small jobs

ANVIL FOR THE HANDYMAN

AN anvil is a very useful tool and many of the old village blacksmiths turned out some excellent work on it. For small jobs the smooth flat surface of the now pretty well obsolete old flat iron is ideal for the purpose.

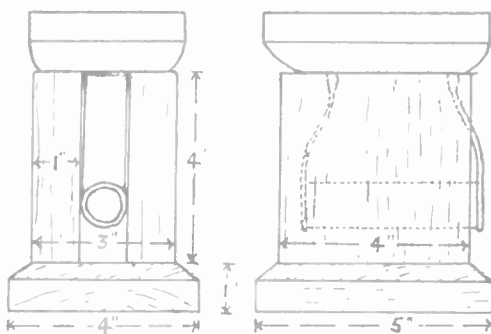
With the increasing popularity of the modern electric iron there must be a large number of old 'flats' which have been consigned to the junk box or attic and which could be reclaimed and made to serve another useful purpose. Such an anvil would be just the thing for the sheet metal worker for flattening and planishing the metal for his various projects. This is just one of its very many uses and it would make a valuable addition to the equipment of any handyman.

Unless the handle is broken off it will be necessary to put the iron into a stand of some sort so that it will be in a suitable position for easy working. Even without a handle there is bound to be an uneven portion that will not allow the iron to lie flat and a stand is therefore really wanted.

It can be quite a simple affair of two substantial blocks of wood fitted on to a baseboard. Size and material are not important so long as the iron is held securely. The sizes given in the sketch are for an average iron but can be amended to suit other sizes or patterns.

The thickness of the wood for both base and supports is 1 in. and should be a good hardwood if possible. Two substantial screws hold each support in position on the base and when fixing them just leave room for the handle to fit fairly tightly between them. Provided the iron is wedged securely no other form of fixing will be necessary.

The wide back part of the iron will be found very useful for forming right-angle bends to sheet metal and for this reason should be left free so that the sheet is not



impeded by the support or baseboard.

If the iron has been stored away it may be rusty and will want a thorough clean. Try to get a smooth even surface, starting with coarse emery paper and finishing off with a finer grade. And once you have got a good polish on it keep it so with an occasional rub over with emery paper and a protective coat of oil.

(A.F.T.)

Using Pastels for Picture Making

THE following simple rules guarantee that the least artistic reader can create a scene in colour that will not only give him pleasure to look at, but may be displayed with satisfaction for the admiration of his friends.

Choose the scene you want to use, and photograph it. This may be cheating, but it is considerably easier to copy a flat picture than the three dimensional original. In any case you may already have a snap of your garden from a favourite angle, which you would like recorded as a coloured picture.

Use pastels. The advantages of these over water-colours or oils, to the beginner, are innumerable, and are only fully realised as one goes along. The main advantage is that one 'draws and paints' at the same time, as outlines may be sketched in at first as with a pencil, but in the appropriate colours, and the washes filled in as one proceeds.

There is no waiting for background colours to dry before painting in the details. A smooth area of colour is more easily obtained, — by the novice — than in the case of water-colour, which as every school-boy knows, has a habit of 'running or streaking'.

Colours may be blended into one another with judicious rubbing by the little finger, and colour harmonies and

variations obtained, as easily — and as effectively — as in any other medium.

When you grow bolder and decide to dispense with the photographic method and sketch direct, the advantages of pastel become even more apparent. It is possible to do a very rough sketch on the spot, in true and accurate colour, to be perfected at leisure in your home, with none of the paraphernalia of the water-colour artist with his easel, stool and paint box. A small box of pastels can be carried in the pocket with ease. Make sure you obtain pastels of good make.

A word about your 'canvas'. Most art shops supply crayon-paper, for the purpose, in convenient blocks of variously coloured sheets. A much more effective idea, however, is to use ordinary glasspaper, of the type known to the ironmonger as grade 0, which has just the right degree of roughness to hold the pastel, and in addition gives a granular 'sparkle' which vastly improves the picture.

Many beginners find difficulty, when transferring a small 'snap' to a large canvas, in the matter of perspective; i.e., in enlarging the foreground detail proportionately to the enlarged background. A help in this problem is the use of a small wire frame, approximately

the size of the photograph, divided into four or more equal sections. Visualise a similar division of your canvas, and note the positions of the objects in the scene in relation to the nearest cross-piece of wire. The frame can also be used profitably when sketching direct, by holding it at arm's length and letting it 'frame' the scene in the same way as it does the photograph.

Do not be afraid to experiment with colours. You may be a realist, and enjoy mixing your colours to obtain the exact shade of the green tree or the blue sky; but the Impressionists have taught us that colours are seldom what they seem, and that shadows are rarely black! Either way your accommodating pastels will enable you to get just the effect you seek.

A complaint sometimes heard about this medium is that it is not permanent, and that the substance of the pastel crumbles off in due course. This may be dealt with in two ways. The first is the use of a fixative supplied for the purpose, which may be sprayed on. I do not favour this personally, as it tends to dull the sparkle of the finished picture. It is far more satisfactory to display the finished product behind glass, which keeps the dust off and holds the powdery texture of the pastel in place. (J.H.L.)

GET SET!



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A THREE-PIECE PUZZLE . . .

IN Fig. 1 we show a three-piece puzzle easily made from cartridge drawing paper or thin carboard. It consists of the pieces shown in the form of a horizontal slot, a hanging box, and a small square which becomes locked between the other two parts. The puzzle is to separate the three pieces without harm to the paper.

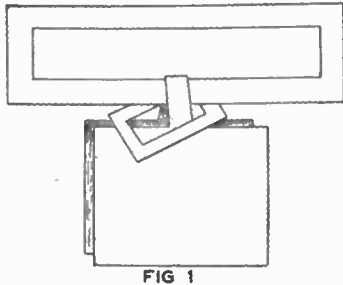


FIG 1

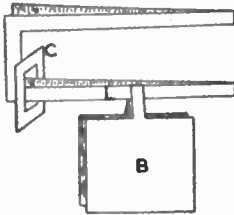


FIG 4.

If you will now refer to Fig. 2 you will see details for the preparation of this puzzle. Take a piece of paper measuring about 8ins. by 10ins. folding down the centre. All the parts are measured from the fold thus making it quite easy to prepare the slotted pieces. You will then have the horizontal panel (A), the box (B) and the small square (C). It may be mentioned that piece (C) can be replaced by a small ring providing it is large enough to pass over the sides of the panel (A), but must not be so large that piece (B) will be too easily removed.

After marking out as in Fig. 2 it is then a simple matter to cut out the pieces with a sharp knife or a pair of scissors and we are ready for assembling the puzzle.

Take piece (A), folding across the centre as in preparation, slipping piece (C) on the right-hand leg (L) as shown in

Fig. 3. See that this piece is passed to the corner so that on turning to the horizontal position it is as in Fig. 4. Now open out the legs of piece (A) a little so that piece (B) can be hung on leg (L) pendant fashion. It will be seen that ultimately the box appears to be suspended by a 'handle'. When these simple operations have been completed, carefully

position as shown in Fig. 1.

From the constructional details described you will realise that the three pieces can be separated quite easily and without damage by the reverse process and perhaps you may care to try this for yourself.

The puzzle is easily made and only simple materials are required but your

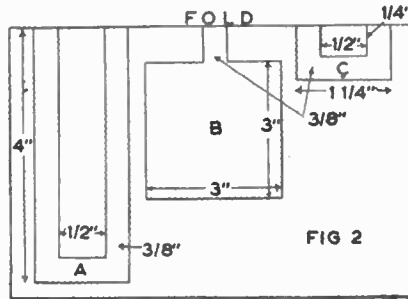


FIG 2

slide piece (C) along the leg (L) and over the handle of box (B), after which piece (A) is opened out into its full horizontal

position as shown in Fig. 1. friends will find the solution quite baffling.

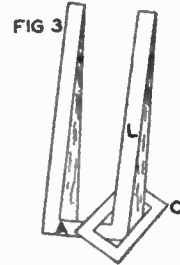


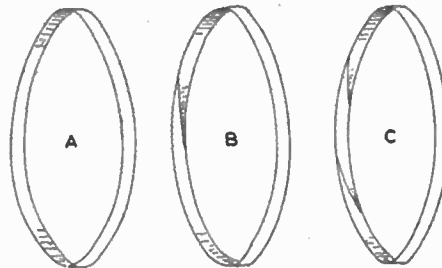
FIG 3

. . . AND A THREE-RING TRICK

HERE we have a simple trick with paper rings which requires three strips of paper about 18in. long, 1in. wide and each joined at the end to make circles. But note the difference in the method of joining as shown in Fig. 1.

width of the first ring, cutting along the centre all the way round the circle and ultimately you will produce two rings of the same size, each half an inch in width.

The same method of cutting is used for the two other rings and although



The first makes an ordinary ring as at (A), while the second is given half a twist before joining as at (B) and the third has a complete twist as at (C). Your three rings should appear exactly as shown in the diagram when completed. Gum should be used for joining.

Now take a pair of scissors, pierce the

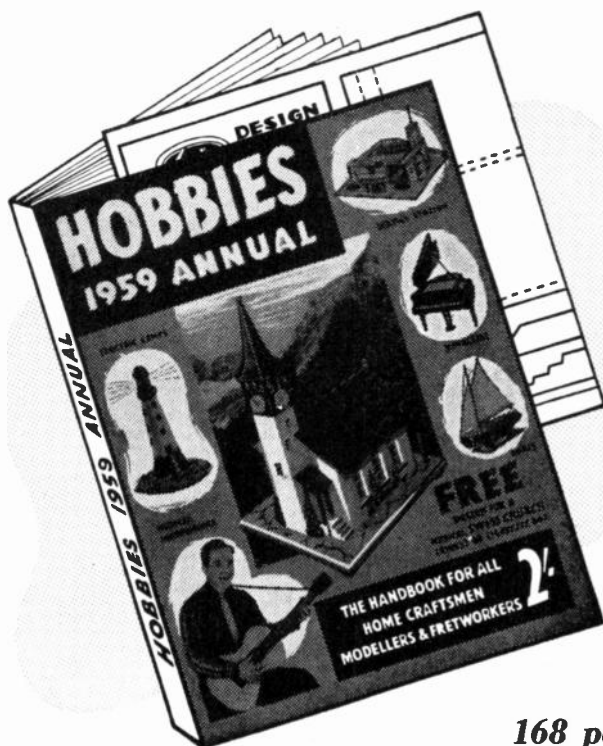
you may expect the same result you will find something entirely different. With ring (B) you will find that after cutting you have only one large ring, twice the size of the original one even though it is only half the width. Now try cutting ring (C) and you will have an even more surprising result!

(S.H.L.)

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Replies to Readers

Is this YOUR Problem?

'Silver' in Hypo

CAN you tell me how to make a small 'silver collector', as I do a lot of photography, and I've been told that the hypo used for fixing films and prints contains small quantities of 'silver' which I would like to collect when I pour away the used hypo. (T.H.—Ealing.)

THE following is one usual method of recovering the silver. Add 1 oz. of crude caustic soda to each 1 gallon of exhausted hypo fixer. Dissolve $\frac{1}{2}$ oz. of fused sodium sulphide in a few ounces of warm water. Stir this into the fixer and allow to settle for 24 hours. The liquid is then poured off, leaving silver sulphide. A refiner of such residue is Baker Platinum Ltd, 52 High Holborn, W.C.1. A large quantity of spent fixer will have to be treated to obtain any worthwhile amount of silver sulphide.

Wall Ciné Screen

WE wish to paint a permanent 'cinema' screen on to the wall of our school hall. At the moment the finish is normal distemper — rather dirty. Can you advise on (a) pre-treatment of this surface; and (b) the type, nature, quality, etc. of paint most suitable for this task? The size would be 8 ft. by 6 ft. finished. (W.T.—Birmingham.)

THE rectangle of wall must first be washed clear of all grease, and of the distemper itself if this is loose, which it probably is. Put on two coats of flat white paint and then two coats of alumin-

ium paint, the second not being applied until the first is perfectly dry. The aluminium gives the projection surface. For neatness, finish the rectangle with a black border. To cover the area mentioned, about three quarters of a pint of aluminium paint will be required. It

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★★★★★★★★★★★★★★★★★★★★

would be good if it could be sprayed on, but if brushed on, use a wide brush and work as quickly as possible, stirring the paint frequently as aluminium tends to 'settle'. Although aluminium may look darker than white paint on the wall, it has good reflection properties and this is what is wanted in ciné work. All the so-called 'silver' screens are finished in this way.

Veneer 'Bubbles'

COULD you please tell me how to get rid of two air bubbles which have formed under a walnut veneered radiogram? (L.T.—Southend.)

THE air bubbles are caused by lack of glue and possibly because of dampness in the wood. Slit each bubble with a razor blade. Push down each half in turn so that some thin glue, such as Croid, can be worked under the other half with a knife blade. Try to get an even spread of glue without an excess. Press the veneer down and hold it with a weight. Put paper under the weight, then wipe off any paper that sticks, with a damp cloth.

Finishing Plywood Edges

I AM finding difficulty in painting plywood models — the flat surfaces are quite easy, but the various layers of ply always show through the paint. Could you therefore advise me of some method of preventing this? (R.W.—Enderby.)

PAINTING plywood edges is quite simple if they are filled before the

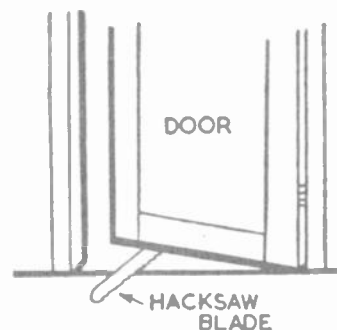
first coat of paint is given. In fact, the whole of the plywood should be filled and rubbed down. Apply the filler with a cloth, rubbing with the grain. Allow a few minutes to dry, say five to ten minutes, and rub off with a cloth across the grain. Finally rub down with the grain, using OO grade glasspaper. To fill the edges, leave a thin film of woodfiller to dry and then glasspaper smooth.

Faulty Damp Course

AFTER several unsuccessful attempts to cure a damp wall, I have come to the conclusion that the damp course is the trouble. Could you please advise me how to repair it? (G.C.—Walsall.)

THE damp course in a wall is a piece of waterproof material going right through. The only way to replace it is to remove bricks in turn above it, and this is a tricky job, even for a professional. We do not advise tackling it yourself. If dampness is coming through the bricks, you can stop it with a proofing solution such as 'Kuro' from a builders' merchant.

A Chafing Door

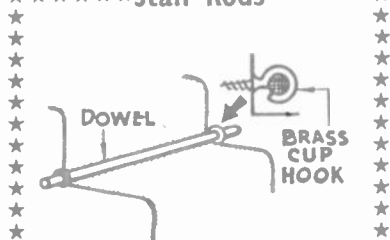


A CHAFING wooden door can be made to give clearance to oilcloth or lino by placing a hacksaw blade under the part of the door that gives trouble.

Lay the hacksaw blade flat on the floor, guide the door over it to the part required. Place a foot on one end of the blade, and work the door gently to and fro a few times. This roughs away the bottom of the door which binds, and there is no need to remove the door to do the job quickly and effectually.

No damage is done to the lino or oilcloth on the floor, since the hacksaw blade is being held stationary by the foot. (G.H.H.)

★★★★★Stair Rods★★★★★



Dowelling (about $\frac{1}{2}$ in.) makes extremely effective stair rods. Fix with inverted brass cup hooks. May be left plain or stained, etc.

★★★★★★★★★★★★★★★★★★★★

Novelty in fretwork

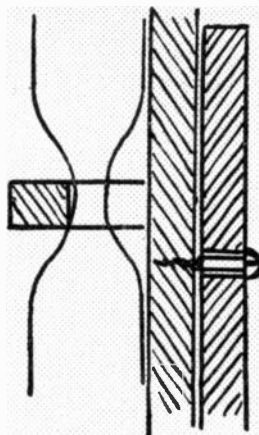
A 'HUNTER' EGG TIMER

THE famous Hawker Hunter aircraft forms the background for this useful egg timer. It can be quickly cut out with a Hobbies fretsaw and assembled in an evening.

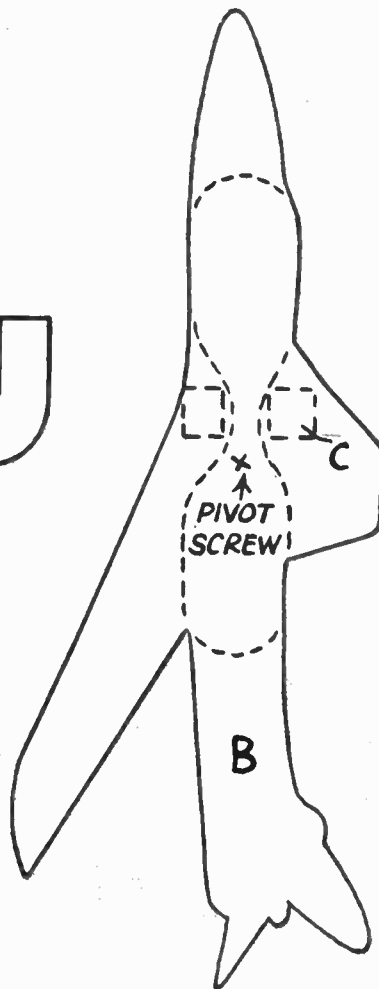
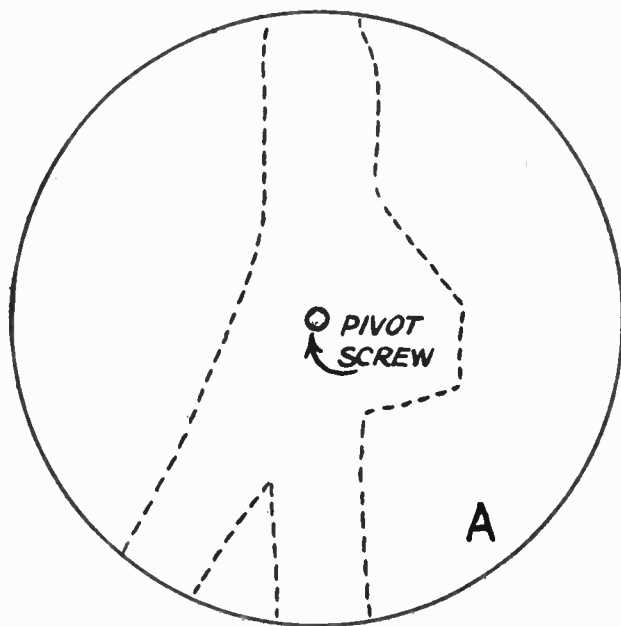
There are only three pieces of $\frac{1}{4}$ in. wood or plywood required (A), (B) and (C) each being shown full size on this page. They are transferred to the wood by means of carbon paper. Cut out piece (A) first and drill a $\frac{1}{4}$ in. hole to take a $\frac{1}{4}$ in. round-head screw. Piece (B), the shape of the aircraft is next cut and cleaned up with glasspaper. Paint piece (A) blue and piece (B) black. Cut out piece (C) and glue to piece (B) with the sandglass in position as shown by the sectional diagram. Remember to scratch away a little paint from (B) before gluing.

Piece (B) is now pivoted, fairly tightly, to (A) by means of the round-head screw. Fix a hanger at the back of (A) for attaching to the kitchen wall.

Sandglasses can be obtained from Hobbies Ltd., Dereham, Norfolk, price 1/- each, postage 3d. (M.p.)

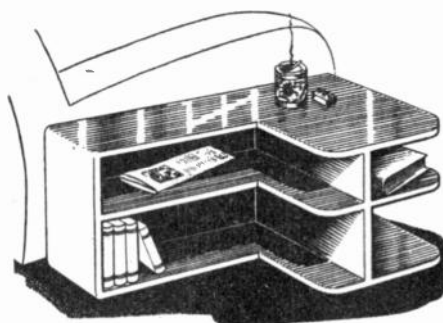


SECTION



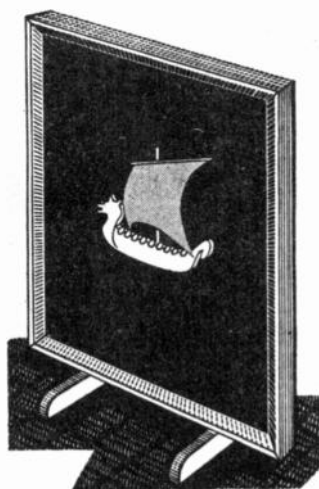
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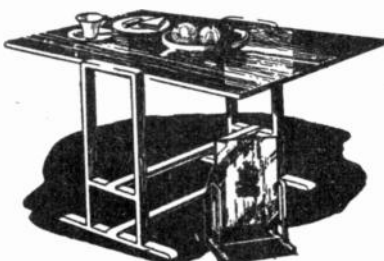
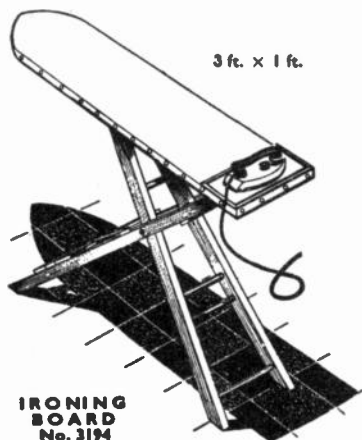


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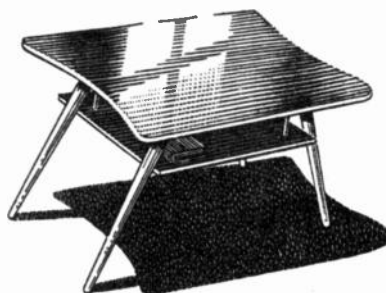


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