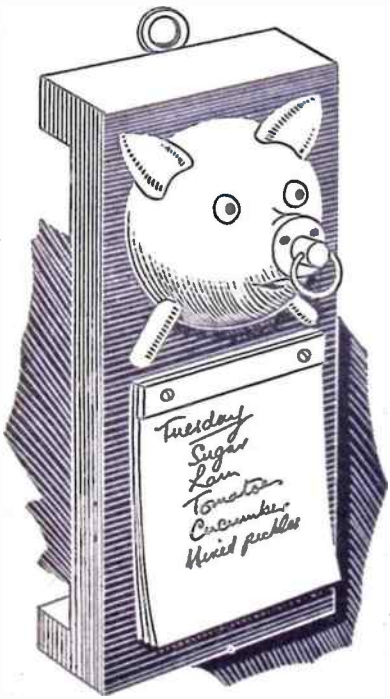
HOBBIES WEEKLY

OCTOBER 10th 1956 VOL. 123 NUMBER 3180

IN THIS ISSUE



★FREE Design inside for this handy reminder

A NOTE-PAD AND PENCIL

For kitchen or desk

A NOTE-PAD and pencil for jotting down shopping requirements and taking note of engagements, etc., is always handy about the house, particularly in the kitchen. The one described here is of a novel animal design, and is made to hang on the wall or lie flat on a desk.

The face is made up from layers of ¼in. wood and the nose of the pig is represented by a pencil which is withdrawn for use. Pads are made from paper cut to size and screwed on to the backboard.

Trace the various parts from the design sheet on to their proper thicknesses of wood, cut out with a fretsaw and clean up thoroughly. Glue pieces 2 and 3 to the main back (1) and then glue together pieces 4, 5, 6 and 7 as shown on the design sheet. When dry, shape to the outline of the pig's face, using a sharp modelling knife or rasp and file.

Now bore holes to take the eyes and legs. The eyes consist of two Hobbies No. 80 knobs which are rounded off with glasspaper and glued in place. The face assembly can now be glued to the main back.

A round pencil must be used and the ring for this is made as shown in detail (C) on the design sheet.

Finish off by painting. A dark background is suggested, with a fleshy pink tone for the animal's face. Screw on the pad and complete with the addition of a bracket eye for hanging up.

Kit only 2/10

All the wood, wire, screws etc. for making this design are contained in Kit No. 3180, price only 2/10. Obtainable from branches etc. or post free from Hobbies Ltd., Dereham, Norfolk

Useful information for model makers

DRIVE RATIOS EXPLAINED

By F. G. Rayer

DOUBT sometimes seems to arise in discovering the ratio which will be obtained from gears, etc., of particular size. In clocks and counting devices, exact ratios may be essential, while in other cases it may be necessary to have an idea of the approximate reduction obtained — as when a motor is used to drive a lathe. In actual fact the determination of drive ratios is very straightforward, and once the method is understood, no future trouble is ever likely.

When exact ratios are necessary, toothed drives are used — gears, chain sprockets or gear and worm. When an exact ratio does not need to be maintained, however, belts are often used, and are simple, quiet and cost little.

Gear wheels

Fig. 1 shows two gears meshing together, one with 12 teeth, and one with 36 teeth. With any pair of gears running together, the ratio equals the number of teeth. In Fig. 1 this is 12:36, or 1:3. The drive can be a reduction, or

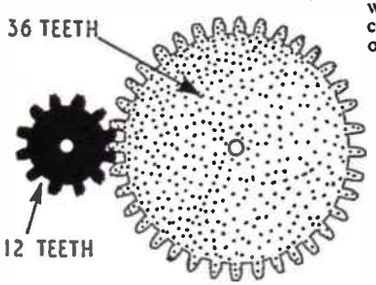


Fig. 1—Ratio and number of teeth

step-up one, according to which gear is driving the other. In both cases the small gear will revolve three times for each single revolution of the large gear.

Exactly the same holds for any other pair of gears, the following being a few examples. (A) is the number of teeth on the small gear, and (B) the number on the large gear.

A.	*B.*	*Ratio.*
6	60	10:1
6	72	12:1
12	72	6:1
15	45	3:1
15	30	2:1
25	25	1:1

In gear-driven mechanisms where no exact ratio is wanted, the number of teeth may be such that they cannot be cancelled down to a simple ratio. For example, 16 teeth and 32 teeth would give 16:32, or 1:2 (which is the same as 2:1), but if a 17-teeth gear were used, the ratio would be 17:32. This cannot be cancelled down, but tends to equalise wear on the gearwheel teeth.

When only a rough idea of ratio is wanted, the diameter of each gear can be measured. Gears of 1in. diameter and 3ins. diameter would provide roughly 3:1. A ¼in. gear meshing with a 2ins. gear would provide 4:1, and so on. This is exactly the same as with belt drives. Measurements will not show if an extra tooth is present, so that the teeth must be counted if an exact ratio is required, as in a clock.

Worm drives

Most worms have only a single thread, and one revolution of the worm turns the gear one tooth. The ratio thus equals the number of teeth on the gear. In Fig. 2, 24 teeth are present, giving a ratio of 24:1. With a 50-teeth wheel, the worm would revolve 50 times for each complete revolution of the gear, and so on.

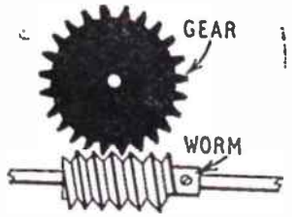


Fig. 2—Worm drive

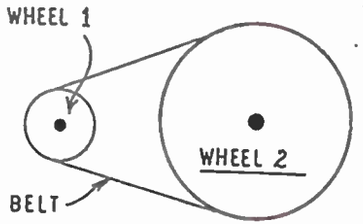


Fig. 3—Belt drives

If the worm should have more than one thread, the ratio is found by dividing the number of teeth on the gear by the number of threads on the worm. A 50-teeth wheel and 2-thread worm would thus give 25:1.

The ordinary type of worm can only be used for reduction, the worm driving the gear. A somewhat similar type of gear exists in which the worm has many threads, and with this either 'worm' or gear may be the driving member. However, this will always be found to provide much lower ratios, seldom over 5:1.

Belt drives

The approximate ratio will be found by measuring the diameter of the wheels at the point where the belt runs. A typical drive is shown in Fig. 3. Division in the way described for approximate gear ratios will give the belt-drive ratio, and a few examples will make this clear. Here, (A) is the diameter of the small wheel (1 in Fig. 3) and (B) the diameter of the large wheel (2 in Fig. 3).

A.	*B.*	*Ratio.*
¼in.	2¼ins.	5:1
½in.	2ins.	4:1
¾in.	2¼ins.	3:1
2ins.	6ins.	3:1
3ins.	6ins.	2:1

With V-pulleys the diameter at which the belt runs will be rather less than the overall diameter of the wheels, and this must be remembered. The length of the belt has no effect whatever on the ratio.

Finding suitable ratios

Suitable ratios for particular purposes may easily be found. For example, a 3,000 r.p.m. motor is to drive a lathe, and a turning speed of about 1,000 r.p.m. is required. The ratio is thus:—

$$\frac{1,000}{3,000} = \frac{1}{3} \text{ or } 3:1.$$

A wheel of 2ins. diameter on the motor, and 6ins. diameter on the lathe, would thus do, or, for smaller work and power, a pair of wheels with ratio still remaining at 3:1, such as 1¼ins. and 3¾ins.

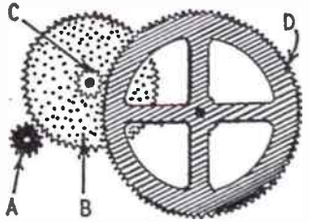
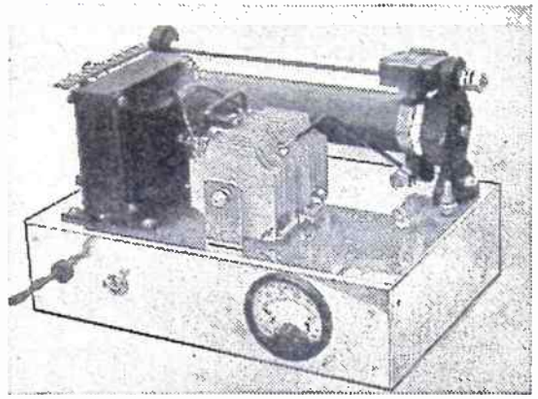


Fig. 4—A gear train

Light belts provide a ready means of reducing the speed of model electric motors, to prevent stalling, and allow the motor to run correctly. With very small motors, the belt drive should be very light — a tight or heavy belt may waste much power, here.

● **Continued on page 36**

ELECTRO-PLATING UNIT



Described by R. H. Warring

A CIRCUIT diagram for a suitable transformer-rectifier unit forming the power supply for electro-plating, and adjustable for the range of voltages and current densities likely to be encountered with the different electrolytes employed, is given in Fig. 1. The basic components and materials required are:

Components:
- one 0–5 ammeter (or suitable ex W-D ammeter or voltmeter with external shunt, as necessary)
- G.E.C. 1·5 amp. bridge type rectifiers
- one 33 ohm 3 amp. variable resistance
- one switch

Materials:
- one ex W-D transformer of suitable size (laminations only used) or standard 3½ins. by 3½ins. laminations (·020in.). Magnetic and Electrical Alloys Type No. 4A.
- 14 by 12 by 16 (or 18) s.w.g. aluminium sheet.
- 8ins. 'L' section aluminium (for reinforcing corners of chassis (optional)).
- 500yds. (approx.) 30 s.w.g. enamelled copper wire
- 25yds. (approx.) 16 s.w.g. enamelled copper wire
- terminals, mounting screws, connecting wires, etc.

A schematic drawing of the completed assembly is given in Fig. 2. If preferred, the whole may be enclosed in a suitable casing, although it is necessary to have access to the resistance slide for ready adjustment of the current. The primary coil of the transformer in the unit described is wound with tappings for 200, 230 and 250 volts, to meet local requirements. For operation off a given mains voltage, of course, the appropriate winding only can be used, with no alternative tapping points.

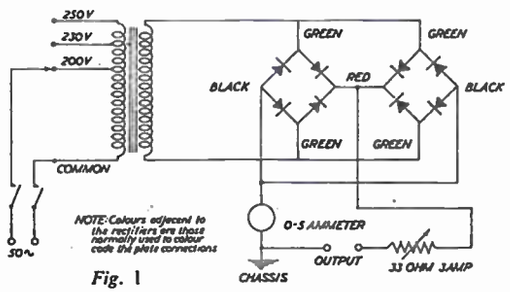


Fig. 1

The chassis as constructed for the original model was rather more bulky than is necessary, primarily because it was decided to mount the ammeter in one of the sides. In point of fact the only components underneath the chassis are the meter, and the on-off switch with appropriate wiring. Both switch and meter could be mounted on top of the chassis together with the other components, when a wooden base could be used, with resulting saving in labour and cost. For those who prefer the metal chassis, layout dimensions are given in Fig. 3, the material employed being 16 or 18 s.w.g. aluminium. All the smaller holes for mounting, etc., should be drilled before bending to shape. The large cut-out to house the meter should be made after bending to shape — e.g., by drilling around the periphery with a large number of small diameter holes and opening out into a continuous circular cut-out with a small file. The corners of the chassis are reinforced by angle strips, riveted in place.

The transformer is the other major component which has to be made. Source of the laminations in the original example was an old ex-W.D. transformer of quite useless rating which was dissembled carefully, rejecting the actual windings, etc. A transformer of suitable physical size can be picked up for a shilling or so in many shops specialising in Government surplus sales. The new coils are wound on a fabricated bobbin made from ⅛in. paxolin sheet to the dimensions given in Fig. 4. Parts for the bobbin are cut to size carefully and assembled with 'Beetle' cement. It is imperative that good cement joints be made, otherwise there is every likelihood of the bobbin collapsing at a later stage when winding the coil. When the bobbin assembly has set, round off all square edges neatly.

The cross section of the bobbin is 1sq. in., calling for 8 turns per volt for

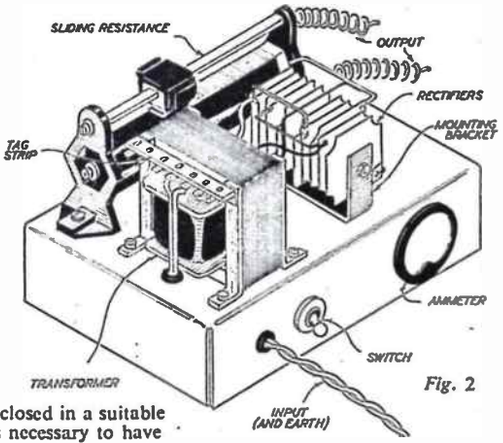


Fig. 2

the primary winding. For the primary coil, 30 s.w.g. enamelled wire is specified, with windings interleaved every layer with ·003 paper. Before starting to wind, drill a hole through one end of the bobbin near the centre through which the inner end of the primary coil can be fed. Holes to pass the tapping points (end windings) of the coil can be drilled after completing the winding just above

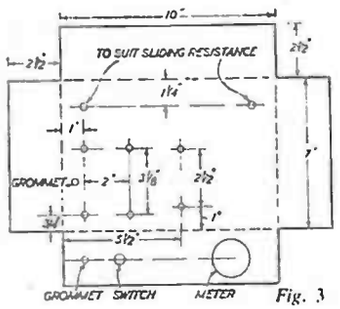


Fig. 3

the depth of the coil, being extremely careful not to drill into the coil itself. Suitable 'pass-out' holes for the secondary wiring can also be estimated and drilled at this stage. The number of turns on the primary winding, relative to the various tapping points, are.—

0–200 volts —	1,600 turns
200–230 volts —	240 turns
230–250 volts —	160 turns

Simple winding machine

A simple winding machine for laying on the primary turns can be constructed as in Fig. 5. The square wooden bar passing through the centre of the bobbin should be a loose fit — or undersize with light packing — so that any contraction of the paxolin assembly due to pressure of the windings does not make it impossible to withdraw the temporary core.

The secondary winding consists of 96 turns of 16 s.w.g. enamelled copper wire, wound on without interleaving, but on three layers of ·003in. paper applied over the primary. This is done by hand, an assistant holding the wire taut as the bobbin is rotated slowly to draw on the required number of turns. The bobbin can then be completed with a wrapping of insulating tape covering in the secondary winding. The laminations are then pushed into place, one at a time from opposite ends and finally assembled with mounting brackets at each end locked in place with 4 B.A. screws 1½ins. long (Fig. 6). As the photographs show, a contact strip was bolted in place along the top edge of the transformer, to which the appropriate primary leads were made off. The secondary leads are led off directly to the rectifiers.

The remainder of the assembly is then quite straightforward, wiring up as per Fig. 1. Any wiring passing through holes drilled in the metal chassis should be protected with appropriate rubber grommets and all electrical joints properly soldered. A suitable bracket for holding the transformers can be bent from 16 s.w.g. aluminium, bolted to the chassis. Similar brackets could be used

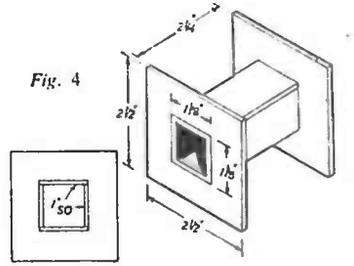


Fig. 4

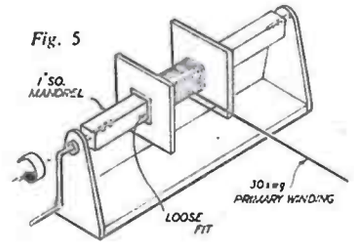


Fig. 5

to mount the switch and meter on a wooden base, securing with woodscrews. A fairly generous length of lead should be allowed to plug into the mains so that the transformer unit can be kept adjacent to the plating bath, for general convenience. Output is taken from one end of the variable resistance and a suitable terminal mounted on the chassis. If desired, a voltmeter can be mounted permanently across these points for instantaneous reading of voltage when the plating bath is in operation.

Warning

In the interests of personal safety a good earth connection to the chassis should be made. This can be via the normal 3rd pin of the mains, and then 3 core 5 amp. cable can be used for connection to the mains.

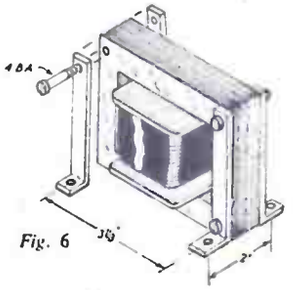


Fig. 6

● Continued from page 34

Understand Drive Ratios

Overall ratio

Frequently a drive consists of two or more sets of gearing. When this is so, each pair of meshing gears should be considered separately, the ratio found, and the ratios then multiplied together (*not* added). Fig. 4 shows a 2-stage gear train, and will make this clear. Here, gear (A) drives gear (B). Gears (B) and (C) and fixed on a common axle, and gear (C) drives gear (D).

If (A) to (B) is 4:1, and (C) to (D) is 6:1, then the ratio from (A) to (D) is 24:1. Similarly, if (A) to (B) were 10:1, and (C) to (D) 12:1, then from (A) to (D) would provide a total ratio of 120:1.

When a worm drive is used, the ratios are multiplied together in exactly the same way. This is also so with belts, chain drives, or any combination of drives.

Large reduction ratios will easily be obtained, especially with worms. A few examples will illustrate this, (A) being the first drive, and (B) the second drive.

A	*B*	*Total Ratio.*
2:1	5:1	10:1
6:1	12:1	72:1
20:1	20:1	400:1
4:1	90:1	360:1
100:1	60:1	6000:1

Drives using a pair of worms will always have a high ratio, and can be very powerful, for slow-moving mechanisms.

Gear train

If more than two stages of gearing are used, all are multiplied together in exactly the same way. Individual ratios of 3:1, 4:1 and 15:1 would provide 3×4×15, or 180:1, for example.

A gear train such as in Fig. 4 is often found in a clock, (A) rotating 60 times for each single revolution of (D), for second and minute hands. The required 60:1 is then usually obtained by 5:1 and 12:1 ratios (5×12=60), or 6:1 and 10:1 (6×10=60).

Fireside comfort in this

CHAIR FOR A CHILD

BESIDES being useful in a small home a special chair for the youngster can look very charming; particularly when it is drawn up to the fire alongside mummy's and dad's, its diminutive occupant busily reading. Here is how to make one for *your* fireside.

Some good quality hard timber should be chosen for the job. Oak, of course, is ideal.

The type of joint to be used can be left to the discretion of the individual. But for those who are not particularly expert with a chisel the joints shown in the illustration can be employed. These involve the use of a hand drill and short dowels. Dimensions of the members are given with this joint in mind. Those wishing to use, say, the mortise and tenon joint will have to adjust these dimensions to allow for the longer lengths thus involved.

The back first

The back frame is made first. Two back legs are cut from 1¼in. square stock, trimmed, and the dowel holes are marked and drilled 1in. deep with ¼in. drill in accordance with the drawing. The dowel hole for the arm-rest is only ⅜in. diameter.

Next the two back spacers and the back seat member are cut and their ends are drilled and fitted with ¼in. diameter dowels, as shown, using good melted glue. The dowels must be a tight fit in the holes.

Using the glue again, the spacers and seat member are assembled to the legs, the protruding dowels making a similar neat fit. The back-rest, cut from ¼in. flat ply and notched to allow for the arm rests, is now panel pinned to the front face of the back frame.

In a similar way the three remaining seat members are assembled to the front legs and the finished assembly fitted to the back frame. It is essential here to see that the whole assembly is kept square. The use of an engineer's metal square will prove useful.

By Gordon Allen

The seat-rest is then cut, relieved at the corners to take the four legs, and fitted centrally on top of the seat members, using panel pins.

Two arm-rests are made and fitted last. They are rounded off on their front edges and on their sides at the back as shown.

The hole to take the dowel in the top of the front legs is ¼in. diameter and ¼in. deep. The dowels in the back ends of the arm-rests are ⅜in. diameter and protrude 1in. A somewhat looser fit will be necessary for the arm-rests to facilitate their assembly.

Padding for the seat and back can be anything to hand. Kapok is the ideal, but no doubt the handy housewife will come to the constructor's aid here.

For cheapness a good rexine can be used for covering the padding although a fine leather will naturally give a longer service. A square piece is cut big enough to cover the seat padding and extend down the sides of all the seat members. The corners will have to be cut 1¼in. by 1¼in. to effect a neat fit round the legs. Depth of seat and back padding is not vital. It should be just sufficient for comfort.

To fasten the seat covering in place upholsterer's pins can be used. Alternatively plastic-covered drawing pins can be utilized. These can be obtained in several colours and if a coloured rexine is used and the pins are chosen to tone with the covering a very charming effect results.

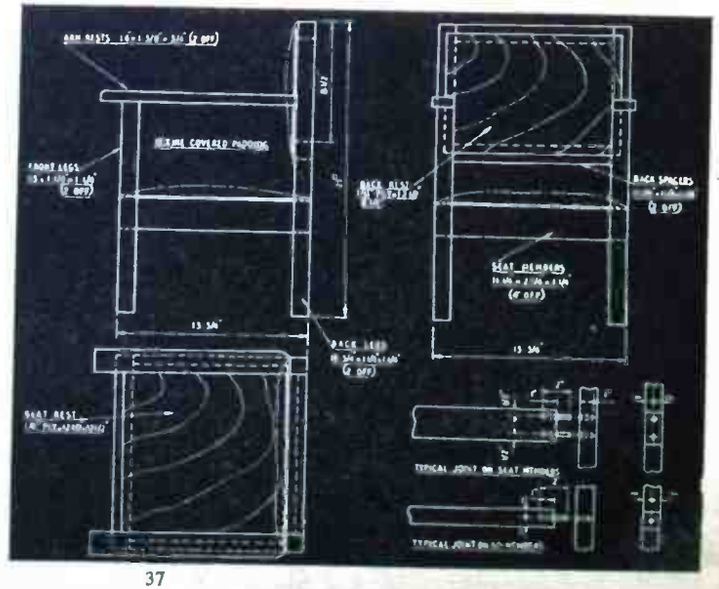
Before the pins are fixed at intervals of about 1in. round the bottom edges of the seat members a reinforced strip, made by folding a piece of rexine ¼in. wide, is placed all round the bottom edges of the seat members on top of the covering. The pins are then pressed firmly into position.

A similar method is used for the back-rest, the rexine finishing on the edges of the two back legs and along the edges of the back spacers.

A piece of rexine is neatly cut and glued to the back of the ply rest between legs and spacers, although this may be done *before* the ply is pinned in position, thus avoiding accurate cutting.

All woodwork can be finished as desired. A good quality stain is suggested since it will stand hard wear. A varnish finish is also a sound method.

Rubber buffers can also be fitted to the bottom of the legs if desired.



Home Chemistry

Beginners' Easy Experiments

MANY terms crop up in chemistry which often puzzle the newcomer. They are actually quite simple. To read or hear what these mean does not always fix their meaning in one's mind. Quite the best way of learning is to carry out for oneself experiments illustrating them. You will have received the knowledge first-hand and that fixes ideas very well indeed.

People often say that sugar melts when it is put in tea. That makes a chemist wince! When a solid melts we mean that enough heat has been given to it to make it flow into a liquid state. Common sense tells us that taking away the heat, such as by letting it cool, will cause the melted substance to become solid again. Sugar does not become solid when the tea goes cold!

Take a cup of hot water — or tea — and put some sugar in a teaspoon. Hold the spoon on the surface of the hot

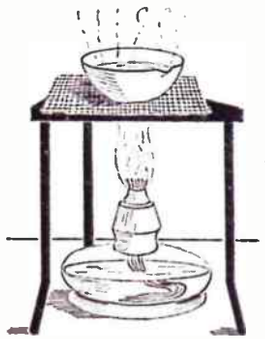


Fig. 1—Evaporation by boiling

liquid, taking care that no liquid flows into the spoon. However long you hold the spoon there the sugar will not melt. That proves the hot liquid is not hot enough to melt the sugar and, moreover, that it does not melt when it is put into the tea.

Tip the sugar on to a small tin lid and heat it gently over a small flame. This time the sugar will melt to a clear liquid. Remove it from the flame. Soon the sugar becomes solid again.

Sugar *dissolves* in hot water or tea. When it has done so it forms a *solution*.

By using a more suitable substance we can find out more about these terms and also add two others. Take half a cup of boiling water. Stir into it a teaspoonful of washing soda (sodium carbonate). The soda disappears. It has dissolved in the water. The liquid which dissolves a solid is called a *solvent*, so that water is here a solvent. The soda can be regained from the solution by driving off the water. To drive off a solvent is called *evaporation*.

Solvents can be driven off either by boiling them away, or leaving them in a warm place, or even by letting them dry up at the ordinary temperature. Boiling is quickest. Pour the soda solution into an evaporating basin (if you have no evaporating basin yet, you can use a deep tin lid). Set the basin on wire gauze supported on a tripod (Fig. 1) and with your spirit lamp or Bunsen burner boil down the solution. Soon the water will all be driven off and only the soda will remain in the basin.

Evaporation brings us to *crystallisation*. By evaporating a solution carefully, so as not to drive off all the water, crystals can often be obtained. A good chemical to use is copper sulphate.

Take a small beaker, half fill it with water and boil it. Stir into it powdered copper sulphate until no more will

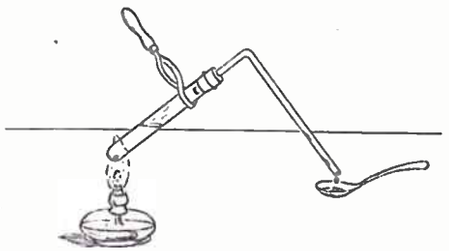


Fig. 2—Extracting pure water from salt water by distillation

dissolve. Pour off the blue solution of copper sulphate from the undissolved *residue* of copper sulphate into another beaker. Let the solution cool and stand overnight. Beautiful blue crystals of copper sulphate will have formed in the liquid.

This happens because more copper sulphate will dissolve in hot water than in cold, or, as chemists say, it is more *soluble* in hot water than in cold. The blue solution above the crystals — or *supernatant* solution — still contains a lot of dissolved copper sulphate. You can crystallise most of this out by evaporation.

Pour the solution off the crystals into your evaporating basin. Boil down the liquid as you did the soda solution, but not so far as to drive off all the water. Every so often dip a cold glass rod into the solution, remove it and hold it a moment. When the drop solidifies almost at once on the rod, turn out the flame under the basin. When the solution does this it is said to be at the *crystallisation point*. Crystals begin to form in the cooling solution, and after standing a few hours, many more will be found.

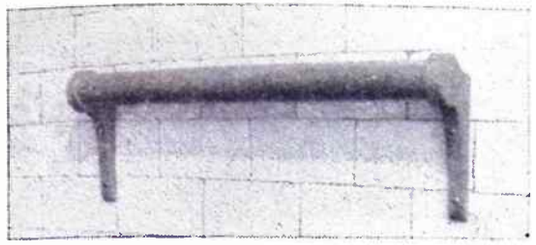
Evaporation and crystallisation are useful when we wish to obtain the dissolved solid. What do we do when we want the solvent? Suppose you were on board ship and ran out of fresh water. There would be plenty of water in the sea around you, but it contains so much dissolved salt that it would be unusable. How could you extract the water? By *distillation*. Sea water is in fact often distilled aboard ships to obtain the fresh water.

Dissolve a spoonful of salt in about half a cup of water. Fit a test tube with a cork and glass delivery tube, as shown in Fig. 2. One third fill the test tube with salt solution and drop in a small piece of broken pot to help steady boiling. Hold the test tube with a test tube holder, or clamp it in a retort stand if you have one. Hold a spoon under the end of the delivery tube. Boil the salt solution. The steam condenses in the delivery tube and drips into the spoon. When a few drops have collected in the spoon, taste the liquid. It is not salty. It is in fact plain water which you have extracted from the salt solution, thus illustrating distillation.

Efflorescence and *deliquescence* are two more queer terms. Let us see what they mean. Leave some washing soda crystals in a warm room for a few days. The crystals become white and powdery on the surface and if left long enough will be entirely turned to a white powder, the crystals being destroyed. Soda and many other chemicals contain combined water. Some of them — like soda — lose it when exposed to the air, turn powdery and lose their crystalline form. This is what is meant by efflorescence. The soda has *effloresced*.

Take a heaped teaspoonful of cream of tartar. Place it in a tin lid and heat it over a flame. It will give off fumes and finally settle down to a black mass. Scrape this off into a test tube about one third full of water and boil the mixture. Filter the liquid from the black powder you will see. Let the filtered clear liquid (or *filtrate*) fall into an evaporating basin. Boil this down to dryness as you did the soda solution. The white mass left in the basin is potassium carbonate. Now leave it aside for a few hours. You will then find it has become wet. It has attracted moisture from the air. This is deliquescence.

● **Continued on page 39**



A BATHROOM TOWEL-RAIL

By K.B.

DESIGNED with a view to avoiding the expense necessary in installing modern fittings in the bathroom, this towel-rail is one of a number of fittings made in red beech. The result is pleasing and distinctive, and the cost of materials is small. A lathe is useful, but not essential for making the roller, as it can be made quite well by hand.

LIST OF MATERIALS

Red Beech.	(1)	22½ins. by 2ins. by 2ins.
	(1)	8ins. by 4½ins. by 1in.
Chromium raised-head screws.	(2)	1½ins. (No. 8 gauge).
	(2)	1in. (No. 8 gauge).

Beech is the ideal wood for the job, as it looks well with a coat of wax polish and it is perfectly suited to lathe work. if it is intended to paint the finished article, however, a cheaper wood could be used.

Plane one side flat on the piece of wood for the brackets, gauge the thickness to ⅞in. and plane the other side. Plane both edges straight and square with the face-side. If these edges are not perfectly square, the brackets will not be square when screwed to the wall.

Transfer the shape shown in Fig. 1 to a piece of paper divided into ½in. squares. The circular part can be drawn with a compass for greater accuracy. Cut round the shape, and from it mark out the two brackets on to the wood. The centre point of the circular part should also be marked on the wood.

Cut round the lines with a saw, leaving about 1/16in. for trimming off later. Make sure that the blade of the saw is kept quite horizontal during this operation. To trim down to the line, use a spokeshave on the long 'stem'. The rounded parts are finished by placing the wood on the bench and using a chisel and scribing gouge vertically downwards. For the final smoothing, use successively finer grades of glasspaper.

Mark the chamfers with a pencil at a distance of ½in. from the edge, rubbing a finger against the side of the wood to act as a guide. These chamfers are best worked by careful chiselling, using the chisel in the directions indicated by the arrows in Fig. 1. Alternatively, a fine half-round rasp can be used.

Bore two ½in. holes to a depth of ¾in. in each bracket at the point marked as centre. It is important to realise that, once the holes are bored, the brackets are not interchangeable, so that the holes must be bored on those two surfaces which will face each other when the rail is secured to the wall. Drill two 7/32in. holes for the screws in the positions shown by dotted lines in Fig. 1.

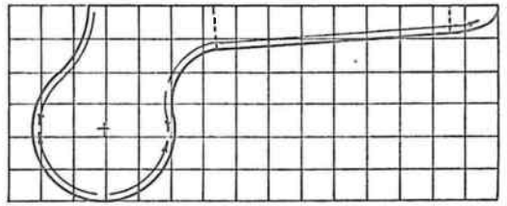


Fig. 1

Countersink these holes so that only the raised part of the screw heads lie above the surface of the wood.

If the roller is turned on a lathe, finish to a diameter of 1¾ins. and the pegs at the ends to ½in. If you wish the roller to be free to turn, the pegs must be made slightly smaller than this. The length of the roller is 21ins., not including the pegs.

If you are making the roller without a lathe, cut the wood to a length of 21ins., squaring off the ends carefully. Draw a circle of 1¾ins. diameter at each end, and plane off the corners of the wood until the circle is reached. Then plane off the resulting corners. Repeat this process, using a finely-set plane to finish, until the circular shape is obtained. Use coarse glasspaper first, continuing with successively finer grades. To make the pegs, bore holes at the ends to take short lengths of ½in. dowel.

Before fixing to the wall, finish the three pieces with wax polish.

The plugging of the wall to take the brackets is made a simple matter if a drill made specially for the job is used. A No. 8 masonry drill is the one required for our purpose, and it is a size which can be used for almost any job the householder is likely to tackle.

Drill for one of the lower screws first, and insert the plug. If the wall is tiled, remember that the plug should be a little shorter than the depth of the hole, so that it is ½in. or so below the surface of the tile, otherwise there is a danger of cracking the glaze. Put in the first screw, make sure the bracket is vertical, and drill through the screw-hole in the wood for the second plug. Swing the bracket out of the way and insert the plug. Put the roller in position, and fix on the second bracket in the same way.

● **Continued from page 38**

Easy Chemistry Experiments

If you leave the potassium carbonate long enough the solid will entirely disappear, because it has attracted enough moisture to dissolve and form a solution.

Sublimation is easily seen if you have a moth ball. Ordinary moth balls consist of naphthalene, which is obtained from coal tar. Crush the ball and drop a tiny piece into a dry test tube. Heat the tube over a flame. The naphthalene gives off vapours and farther up the tube a white film of tiny leafy crystals forms on the glass. The naphthalene disappears from the bottom of the tube. Heat has made it pass into vapour and as the vapour met the colder glass farther up the tube, it condensed again to a solid. That film of solid is still naphthalene. It has sublimed.

Sublimation is often used to purify chemicals which can be sublimed from impurities which cannot be sublimed. Powder another small piece of the moth ball and mix it with some dry sand. Heat the mixture in a dry test tube. Finally, you will have all the naphthalene on the wall of the tube and only sand in the bottom. They have been completely separated by sublimation. (L.A.F.)

Model Railways

SPLIT POTENTIAL CONTROL

Described by H. G. Forsythe

MANY model railway owners tend to overlook the importance of having a really satisfactory power supply. At first, a single accumulator or transformer-rectifier and one simple controller seems perfectly adequate. But layouts have a habit of growing and, sooner or later, the stage is reached when it is desired to run two or more trains on the layout under independent control. For example, on the main line an express could be running while shunting operations are in progress in the sidings. On the larger layout with double-track main lines, two trains could be running in opposite directions, each being controlled independently of the other. As soon as these types of operation are considered it becomes clear that more than one controller will be needed.

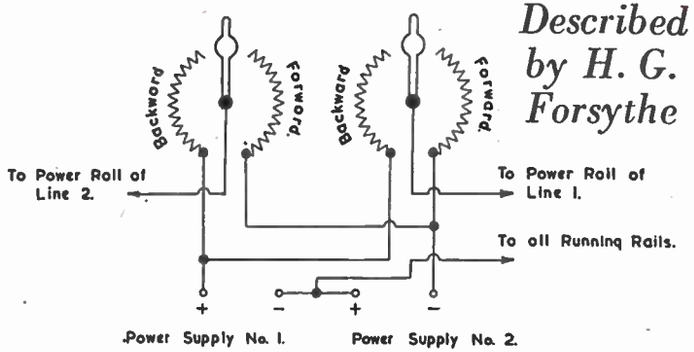
These days, most model railways operate from a direct current (D.C.) supply. Now, if your layout has a single source of supply, certain difficulties arise as soon as more than one controller is used. The root of the trouble is the need for reversing the polarity of the supply in order to change the direction of the train. For instance, if our main line train is running in the forward direction (power rail negative, running rails positive) and a locomotive is required to run in *reverse* in the sidings (power rail positive, running rails *negative*), it is easy to see that a dead short-circuit will result across the source of supply and controllers unless the running rails themselves, as well as the power rail, are cut at the junction leading into the sidings.

With the simple layout this is not a great disadvantage, but as the system increases in size and cross-overs and complex siding formations develop, having to cut the running rails at various awkward points introduces serious weaknesses. Often, too, complicated switching arrangements become necessary to avoid these short-circuits.

The split-potential system gets over all these difficulties. The great advantage is that all running rails may be connected together in a single electrical unit regardless of the number of independently controlled sections of the power rail you may have.

The diagram shows how to set up the circuit. The simplest form of split-potential circuit is shown and it has been assumed that two sections only of the layout are to be supplied. For example, 'Line 1' could be the main line, and 'Line 2' a set of sidings.

It will be seen from the circuit that two sources of supply are necessary and, in the simplest case, two reversing controllers. It is most important that both power supplies be of the same voltage and similar capacities. Controllers too, should be matched as closely as possible. Such equipment can be obtained from most model dealers, the smaller units being quite low in cost. Independent control of further sections of the track may be introduced simply by adding more controllers to the fundamental circuit, care being taken to make the connections as shown in the diagram.



Admittedly, the split-potential system is more expensive to set up in the first place than is the single power supply circuit. However, if you are planning to build up and develop your layout, the initial outlay will prove more than worth while in the long run.

BOOKS TO READ

More Birds to Draw

by Raymond Sheppard

THIS sequel to 'How to Draw Birds' will prove as strong a favourite with all bird artists and lovers and it should tempt many fresh readers to try their hands at putting on to paper the fascinating poses of the little feathered models. Mr. Sheppard's drawings alone are worth the small outlay involved, but in addition, his notes on various birds and his advice regarding how best to sketch them, complete a work which is exceedingly good value.

Published by The Studio Publications, 66 Chandos Place, London, W.C.2—Price 5/-.

Cine Camera Secrets

by Laurence Mallory

THIS new issue of the Elliot Right Way Books is an excellent handbook, especially for beginners, dealing with the fascinating hobby of amateur cinematography. The subject is well covered from fundamentals to projection in colour and with sound. The volume is liberally illustrated and Laurence Mallory's lucid style makes easy reading of what is, after all, a difficult and specialised form of art. This work is a 'must' for any amateur cine society.

Published by Elliot Right Way Books, Kingswood, Surrey—Price 6/-.

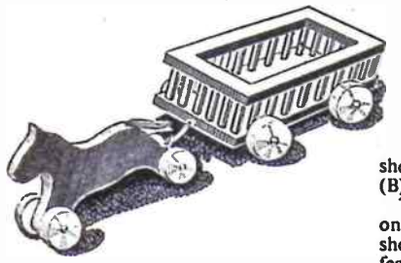
Use Your Hands

by Guy R. Williams

THE author of this excellent work has taught art and handicrafts for some years and his knowledge of his subjects is equalled by the lucid manner in which he imparts it. There are two parts to this volume and we consider Part One which tells the reader how to equip and furnish his workroom at low cost from home-made materials is an excellent introduction to the many hobbies and handicrafts featured in Part Two. From modelling and pottery to marionettes and model theatres, Mr. Williams takes us on an exciting journey through the various methods of using our hands. With its excellent illustrations and easy-to-follow non technical language anyone with average intelligence is bound to find a wealth of practical information in its well bound and printed pages.

Published by Chapman & Hall Ltd., 37 Essex Street, London, W.C.2—Price 10/6.

TOY HORSE AND WAGON



IT'S A GIFT

FOR ANY TODDLER

THIS attractive toy is designed to be made quickly and cheaply, using round rod for part of the construction.

The pieces are shown full size on page 47 and should be cut out with a fretsaw. Piece (A) which forms the top of the wagon is cut to the shape shown, while piece (B) is cut to outline only.

Glue all joints

The holes to take the upright dowels are drilled at intervals of approximately ¼in. It is advisable to drill them in piece (A) before cutting out the centre. Assemble the wagon as shown in Fig. 1, using glue for all the joints. Fig. 1 also shows one axle fixed underneath piece (B).

The horse is a plain shape as detailed on the pattern page and no attempt should be made to put in eyes or other features. The only addition will be a lock of hair or wool tacked in place to represent the tail.

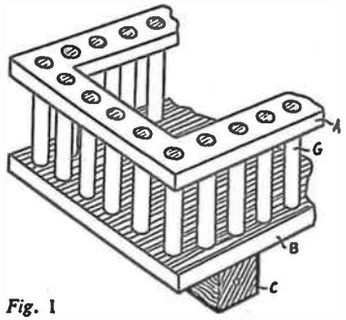


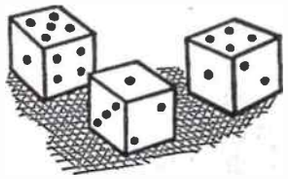
Fig. 1

Wheels are cut from ½in. wood and are screwed to the axles and horse, using roundhead screws. Bore holes in the wheels before cutting them out. The horse is cut from ¼in. wood, allowing plenty of thickness for screwing.

PATTERNS ARE ON PAGE 47

Paint the whole toy in bright colours, using red and yellow freely. Two or three coats should be sufficient for a good finish. Finally, connect the horse and wagon by means of two small screw eyes and a short length of cord. (M.p.)

A TRICK WITH DICE

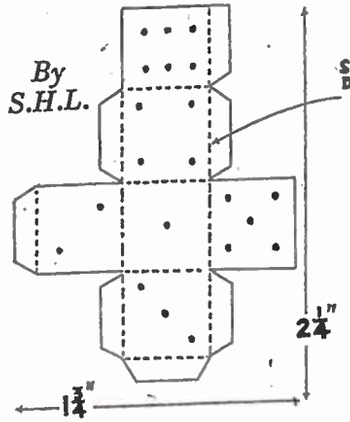


HERE is a trick of the thought reading type with three dice, and if you don't possess three, the illustration will enable you to make them from a postcard.

First of all, you have to instruct your 'victim' in the manner of throwing the dice and the necessary manipulations, or you may employ an assistant to see that these are done correctly. The trick is to give the correct total of the values thrown on sight of the last throw only. The following will explain the procedure.

Totalling up

The three dice are thrown and the numbers totalled. This can be done on a piece of paper. Next, any two dice are completely overturned and the sum of their numbers, now on top, are added to the total. These two overturned dice are re-thrown and the score once more added to our total. One of these two dice is overturned and the number again added. Finally, this last single dice is thrown again and the score added. Although you have not seen, or totalled the other throws you are able to give the correct total by merely glancing at the remaining values on the dice.



The secret is to total the dots showing after the final throw and add 21 to the total. You may therefore appreciate the necessity of showing your victim the operations before doing your thought reading.

A set of dice can be easily made from a postcard by following the diagram shown, making little cubes half an inch in measurement. Mark out your card according to the dimensions, making each side half an inch square. The flaps, for gluing together, should be ¼in. and trimmed away at the corners. Score on the dotted lines with a blunt tool and fold. Before sticking together, it is better to mark out the values of the dice as indicated, drawing diagonals in pencil to obtain the true centre for the single, double and treble dots. Moreover, the card dice may be too light in weight to roll, but this can be overcome by packing in a little paper before sealing.

In this trick, you may go through the procedure quite freely for it is unlikely that the same total will be repeated, but to perform the thought reading part, you should withdraw sufficiently to allow your opponent the opportunity of recording the totals without your knowledge. All you need to know is the sum of the final throw, and then add 21.

Information for photographers

UNDERSTAND FILM SPEEDS

MANY beginners who have not followed photography as a hobby for any length of time do not realise how greatly the 'speed' rating of a film can influence results. This is especially so at present, since some new, high-speed films have appeared during recent years. Beginners with box type and other simple cameras frequently buy film without any regard whatever for its speed, and this must always result in wasted shots or some unsuccessful negatives on each spool.

By F. G. Rayer

Assuming that from time to time various snaps have 'failed to come out' then it is instructive to look at the negatives. Under-exposure is most usual, and these negatives will be almost clear, or contain such weak images that prints could not be made from them. A faster (more sensitive) film might have been successful here. Other negatives may be very black. These are over-exposed, difficult to print well, and often arise at the seaside, where strong sunshine and reflections from sea and sand give very brilliant lighting. A slower film would have been satisfactory here.

Speed ratings

As it is necessary for professional photographers to know how sensitive a film is, film makers indicate this on the carton. Over a dozen different systems exist, but fortunately one is most often employed, so that other systems can be disregarded. This is the 'Degrees Scheiner' rating, marked with the usual degrees symbol, and other letters and numbers on the box can be disregarded. A typical film is Ilford Selochrome, with a speed of 30° (30 degrees).

On the Scheiner scale, an increase in 3° indicates a doubling in sensitivity of the film. Only one-half as much light is thus required. A change of 6° would be a four-fold change in speed, and a change of 9° would be an eight-fold change in speed. A simple table will show this, films being compared with an original one of 27° Sch.

30° Film—twice as fast, or needing one-half the light.
33° Film—4 times as fast, needing one-quarter the light.
36° Film—8 times as fast, needing one-eighth the light of the 27° Film.

Films popularly on sale everywhere range in speed from 26° Sch. to 37° Sch. The variation between the fastest and slowest is so great that the choice of film can make all the difference. In poor light a 37° film could give a perfect picture, where a 26° film would be useless.

The beginner may feel that it is a nuisance that so many different films are now available. Instead, however, he can make use of them in such a way as to obtain better results than were possible in previous years.

Film to use

Many box type and other simple cameras with a fixed lens aperture and shutter give an exposure of about 1/25th second at F/11, and this is more or less 'standard' for sunshine, and a film of 27° to 30° Sch. With the older box camera, in particular, fast films should not be used in summer, because the camera is not designed for them, and shots will probably be over-exposed. If such a camera is used, then it should be loaded with 27° to 30° film, and snaps only taken in sunshine, or when daylight is very good.

Very many cameras have a slide equipped with two or three holes, which can be pulled in front of the lens. These holes usually give *f*16, *f*22 and *f*32, reducing the light passing through the lens to one- half, one-quarter, and one-eighth. If such a slide is fitted, then a faster film, of about 32° to 35° can be used with advantage. When light is extremely brilliant, the smallest hole (*f*32) is brought before the lens. This prevents over-exposure, and also reduces distortion in the lens, thereby giving sharper pictures. For good, strong sunshine, *f*22 will do, with *f*16 when the sun is low, hazy, or obscured by thin cloud. When the sun is gone altogether, the advantage of the fast film will be seen, because the lens can be used at largest aperture, and good pictures still obtained, until evening when the daylight begins to fail.

If the camera has no means of adjusting the aperture, then the film loaded will have to depend on the time of year. During summer, and by the seaside, a 27° or 30° film will be best. In spring and autumn, a film of about 32° will compensate for the reduced light, while one of the new 37° Sch. films will allow even a simple box camera to be used with success during clear daylight in winter.

The danger of thinking the fastest film is best, and using it all the year round, must be avoided — in summer, with the fixed exposure camera, many negatives will be badly over-exposed.

Stray fogging is another fault often spoiling some of a beginner's snaps. On the prints, fogging will be shown by odd white patches, corresponding to dark patches on the negatives.

If the patch is circular, it is probably from the window in the camera back, through which the film numbers are observed when winding. To leave the camera standing in the sun is asking for such trouble. Furthermore, the red window in older cameras does not protect the modern, fast panchromatic films, which will be fogged opposite the window if the camera is left in strong light for any length of time. To avoid this, many cameras now have sliding covers which conceal the window except when winding on the film. With an old camera, a piece of cardboard held down by adhesive tape will be satisfactory instead.

Load indoors

If examining the negatives shows stray fogging marks along the edges of the film, the camera was probably loaded in bright light. Sunshine, in particular, can strike down between the backing paper and ends of the spool, thereby reaching the film. A film should *never* be loaded into the camera in direct sunshine. If there is no shade, turn the back to the sun to keep it off the camera, and load the film in as quickly as possible. Best of all is to load indoors, away from a window.

If the camera has a case, it will give protection from dust, etc., and also help to keep out light. Very few cameras of cheap type are so perfectly made that carrying them for a long time in sunshine will have no effect on the film. When stray light has once touched part of a film, that area can no longer record an image when a shot is taken.

ENLARGING PLANS

H. D. RANDALL, 8 Victoria Road, Wyke Regis, Weymouth, Dorset, sends the following useful idea to hobbyists for enlarging plans and designs.

'I have a sheet of celluloid on which I have drawn, or rather scratched, squares of ¼in., filling in the scratches with black wax. By laying this over the design or plan to be enlarged, it is not necessary to draw squares on the original, only the comparable sized squares on the sheet which is to carry the enlargement. This keeps the original clean and unmarked, as well as ensuring greater accuracy.'

Replies to Readers
Is this YOUR Problem?

Finish for Furniture

CAN you advise me of a good varnish to use on a light-coloured table and four chairs. (M.F.—Everton).

YOU would find a good quality lacquer about the easiest to work with, and obtain a glossy result. If you like a colour, Robbialac lacquer would do the job. If you prefer a light oak colour, then try Valspar oak varnish stain. To get the best results in either case, you must have a clean greaseproof surface first, so if necessary, wash over the articles with warm soda water. Let dry, and lightly glasspaper, apply lacquer or varnish with a clean brush, and work in a warm atmosphere.

* * *

Changing D.C. to A.C.

I HAVE a battery eliminator D.C. milliamps 25, input 200/250. Can you please explain to me how to change over to A.C.? (W.M.—Belfast).

THE normal type of D.C. eliminator has a smoothing choke and two or more smoothing condensers. To use this with A.C. mains it is only necessary to wire in a rectifier. A 250 V H.T. rectifier is required, and the usual 40mA type would be satisfactory. Wire the eliminator negative lead to the 'earthed' or neutral point on the A.C. mains plug (usually marked with N). Wire positive or line mains terminal (often marked L, or with a red dot, on the plug) to negative on rectifier. Wire positive on rectifier to positive mains lead on the eliminator. The unit should then work exactly as if on D.C. mains. Be absolutely sure you observe the polarity mentioned, or damage may be caused to rectifier or other parts. Take the usual precautions to guard against possible mains shocks, with the receiver employed.

* * *

Laying a Cement Floor

I WANT to make a cement floor for a greenhouse. At the moment the ground is just earth. Can you tell me what to use as a base for the cement? Can you also advise a cheap way of making staging? (P.L.—Brighton).

YOU should remove earth to a depth of 6ins. and lay a 4ins. thickness of crushed cinders, brick or rubble. Tamp or roll well down level. Over this lay a concrete mixture of one of cement to three of damp sand, and level off with a straightedged lath of wood. For staging, why not use lengths of rustic wood with the bark stripped off, and then creosoted for the posts? Lengths of 1in. by 3ins. wood can be nailed over these at back and front, and, perhaps, midway, and these covered with wood slats cut from grocer's boxes. Creosote the lot against water.

* * *

Stain for Pine Wood

CAN I have a recipe for staining and darkening pine wood (5-ply). I wish to darken a dressing table which is very bright in colour, to mahogany or something similar. Also I want to darken a corner of a dinner wagon. This had chipped off and I filled it in with plastic wood. I want now to darken it to the same colour as the rest of the wood. (D.H.—Kenton).

TO finish pine mahogany colour, mix burnt sienna in stale beer and water. Let this dry thoroughly, then add a little red spirit stain to polish and finish off with this. Do not be too liberal in the use of the red stain, as this is apt to impart a somewhat garish finish to the work. If french polish is difficult to employ, you could use brown hard spirit varnish instead. Plastic wood used to fill up any blemishes in woodwork should be coloured with spirit stain first, or the already coloured brand employed. Plastic wood can be bought mahogany colour and may suit your purpose. If the particular kind of pine obtained locally refuses to take ordinary polish or varnish, try brush-on cellulose after staining.

* * *

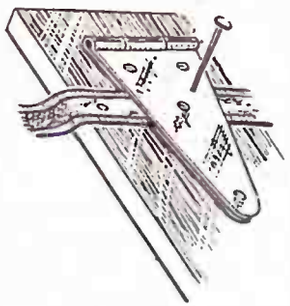
Gramophone Motor Conversion

I HAVE a single speed a.c. 78 r.p.m. (rim drive) gramophone motor which I tried to convert into a 3-speed motor by putting a 800 ohm ·3 amp. mains dropper in series with one of the mains leads, i.e., line main. This seemed to work for about a minute but then the motor resumed its original 78 r.p.m. with considerable loss of power. Have you any idea why this happens, and any suggestions to remedy it? (T.F.—Marsden).

REDUCING the motor speed by using a dropper resistance is never fully satisfactory in such cases. Power is much reduced, and the speed actually depends on friction, increasing as the needle approaches the centre of the record. For satisfactory playing of low speed records, it will be necessary to provide alternative reduction drive ratios, so that the motor may run at its usual speed, with no series resistor. The motor speed may be found by multiplying 78 by the present drive ratio. By dividing the motor speed by 45 and 33⅓rd, the new drive ratios will be found. With some turntables it is rather difficult to make such a modification. With others, it may be possible to change the diameter of the reduction drive wheels, or provide more reduction in some other way. With certain induction motors driven from A.C. mains, it is quite impossible to make them run satisfactorily at any speed but that for which they are designed.

* * *

★★★ TIMELY TIP ★★★



Leather Punch

A LONG-ARMED iron hinge can form the basis of a leather punch. Screw one side down to a stout block of wood and drill identical holes through the arms of the hinge. Various sizes of holes can be accommodated on the same hinge for a range of punches. These are made from appropriately-sized nails by grinding the ends square.

* * *

Strengthening Plaster

CAN you tell me a common chemical which will strengthen plaster of Paris to stand up to fairly rough handling? (F.H.—Fareham.)

THERE are several working methods which will increase the strength of plaster of Paris, viz.:—

1. Incorporate 10 per cent of asbestos fibre with the plaster-water mixture.

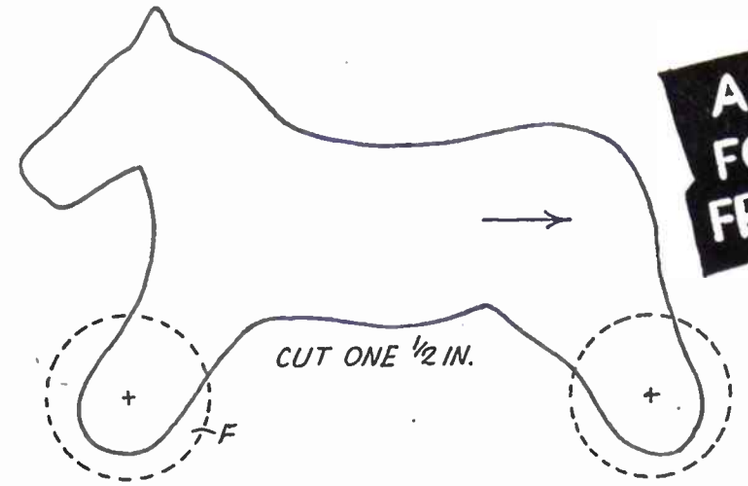
2. Mix the plaster with water containing 3 per cent of gelatine or glue. Increase of the gelatine or glue to 10 per cent gives high strength casts. Use the solutions warm. Setting is delayed.

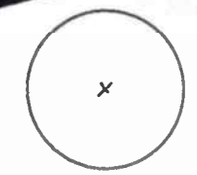
3. Mix 4 per cent of powdered marshmallow root with the dry plaster before slaking with water. This, too, delays setting, but gives a cast hard enough to be carved.

See page 41

Horse and Wagon Patterns

A JOB FOR THE FRETSAW

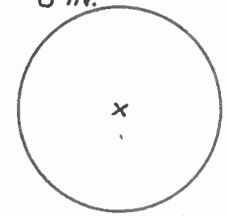




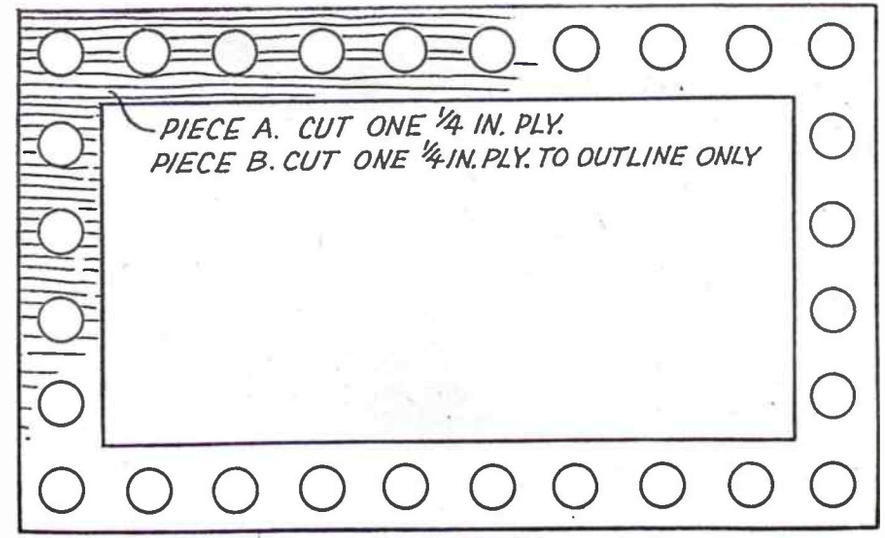
WHEELS F. CUT FOUR ⅜ IN.

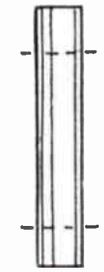
AXLE C. CUT ONE ½ IN. →

AXLE D. CUT ONE ½ IN. →



WHEELS E CUT FOUR ⅜ IN.





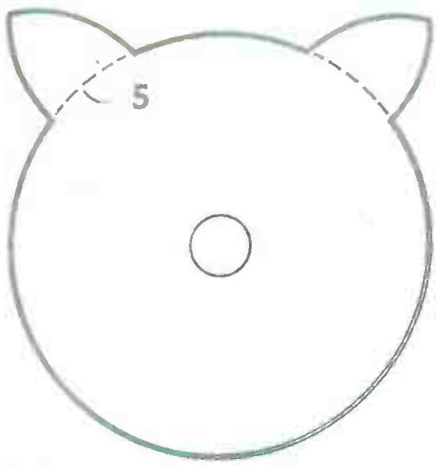
PIECES G. CUT 28 FROM ¼ IN. DIAMETER ROUND ROD

Printed by BALDING & MANSELL, LTD., London and Wisbech, and Published for the Proprietors, HOBBIES LTD., by HORACE MARSHALL & SON, LTD., Temple House, Tallis Street, E.C.4. Sole Agents for Australia and New Zealand: Gordon & Gotch (A'sia) Ltd. For South Africa: Central News Agency Ltd. Registered for transmission by Canadian Magazine Post.

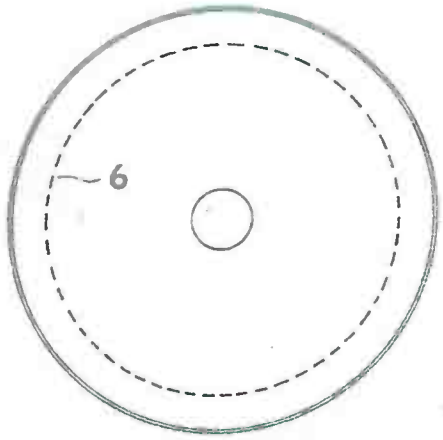
PIECE 2. CUT ONE 1 2 in.

PIECE 3. CUT ONE 1 2 in.

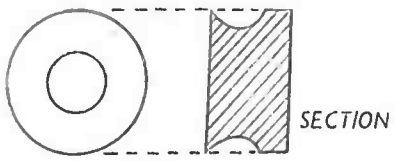
PIECE 6. CUT ONE 1 2 in.



PIECE 4. CUT ONE 1 2 in.

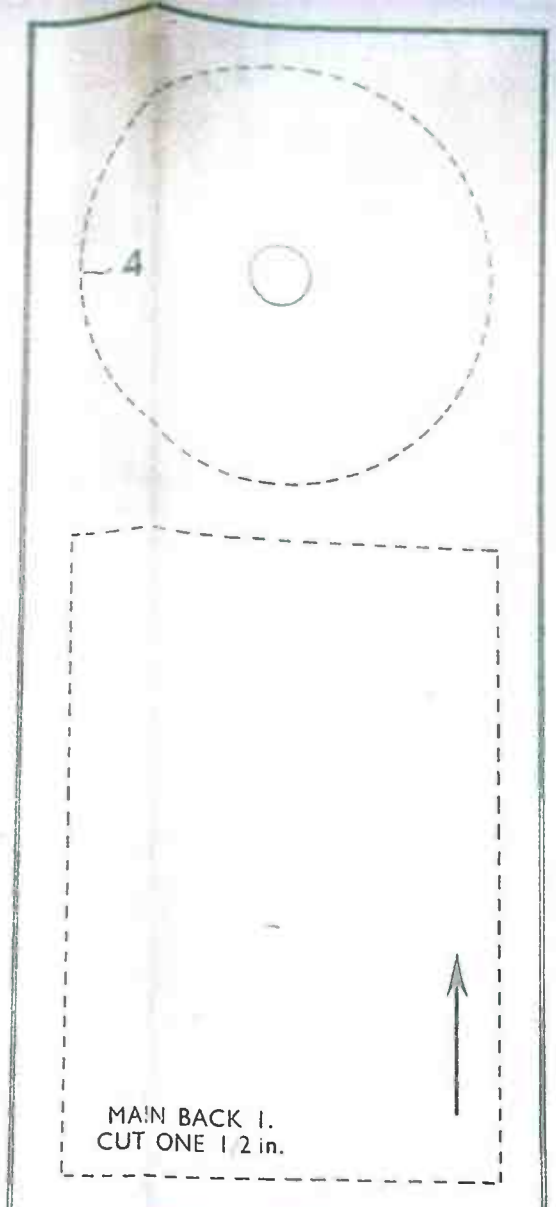


PIECE 5. CUT ONE 1 2 in.



PIECE 7. CUT ONE 1 2 in. SHAPE TO SECTION.

LEGS 8. CUT TWO FROM 1 4 in. DIA. ROUND ROD.

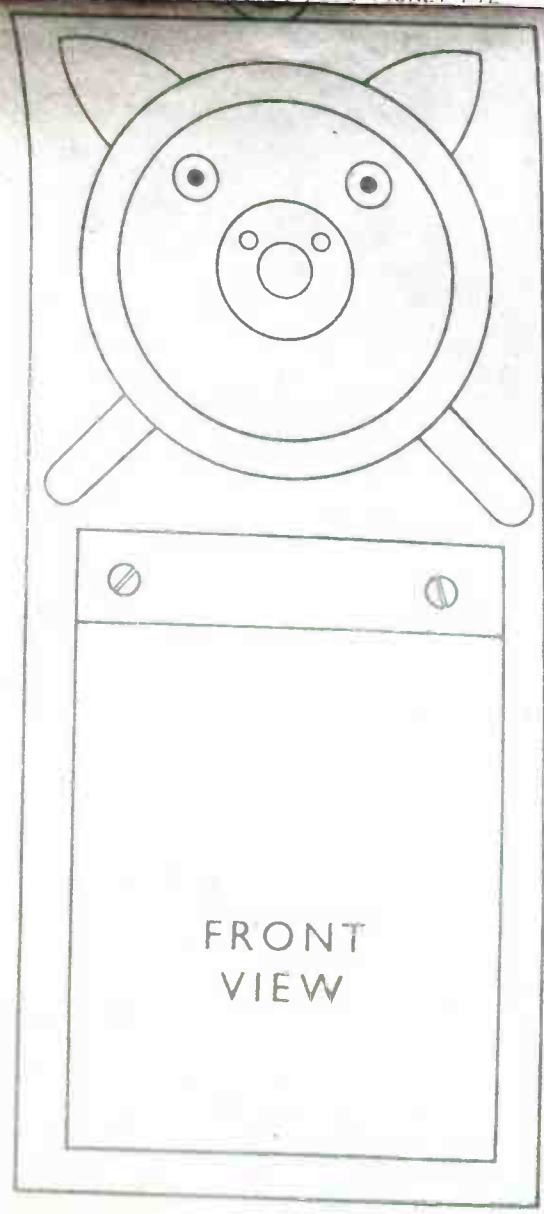


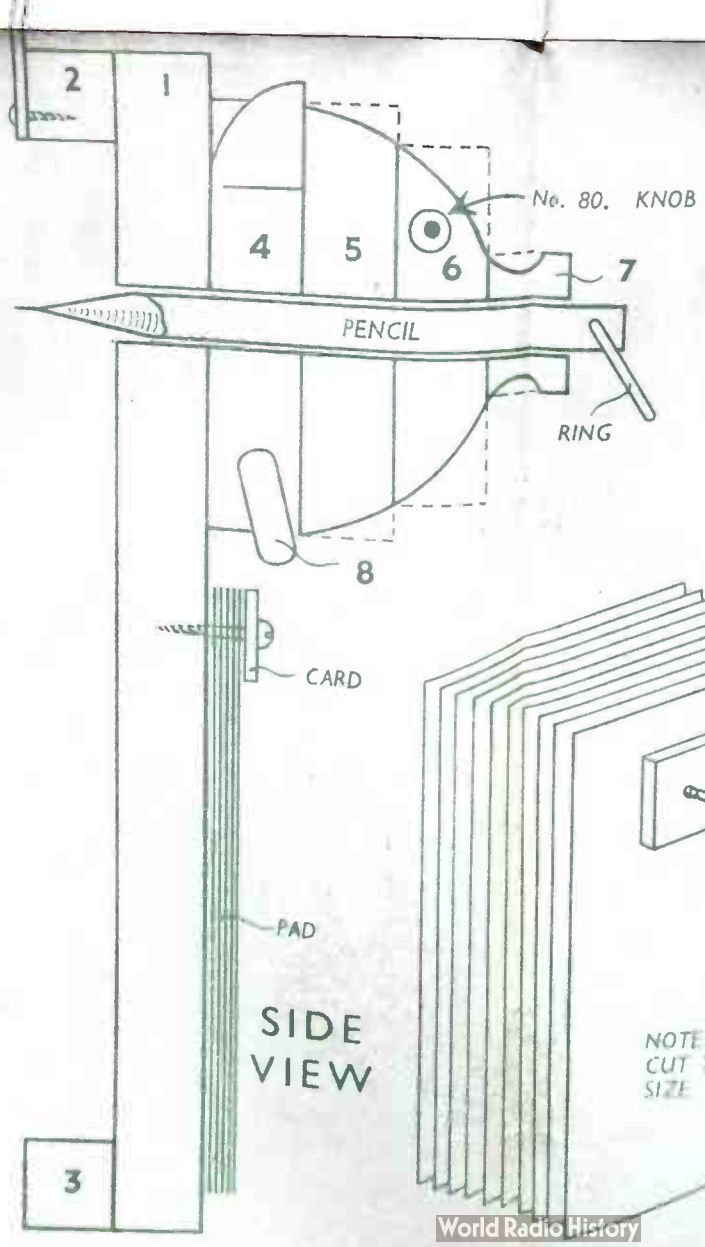
Hobbies DESIGN No. 3180

NOTE PAD & PENCIL

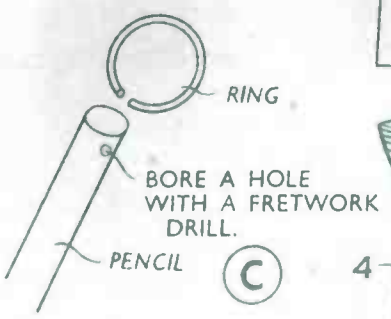
SIZE— 7¼ Ins. HIGH OVERALL. 3 ins. WIDE.

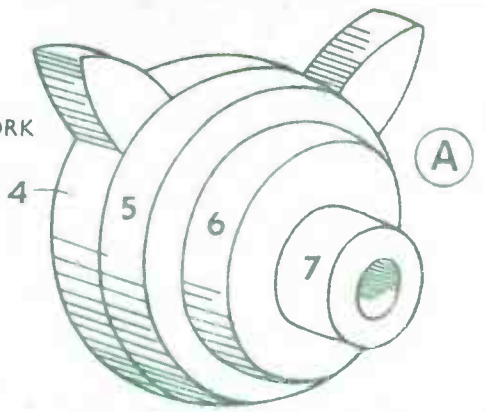
A KIT OF MATERIALS FOR MAKING THIS DESIGN IS SUPPLIED BY HOBBIES LIMITED, DEREHAM, NORFOLK. PRICE ON APPLICATION.





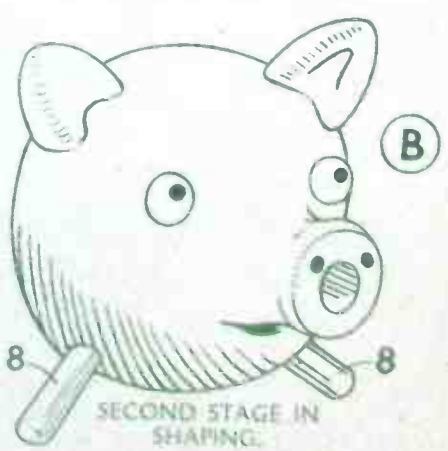
THE ARROWS INDICATE DIRECTION OF GRAIN OF WOOD.





FIRST STAGE IN BUILDING UP THE FACE.

RING. MAKE ONE FROM MEDIUM GAUGE WIRE.



SECOND STAGE IN SHAPING.