

HOBBIES WEEKLY

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JULY 13th 1955

VOL. 120

NUMBER 3115

For the Child's Bedroom—

A NOVEL LOW-CONSUMPTION MAINS NIGHT-LIGHT

THIS decorative light is ideal for a child's bedside, and is intended for operation from A.C. mains, though a battery can be used, as will be explained. The bulb, fitted in an ornamental lantern, is of low-voltage type, drawing current from a small transformer in the base of the night-light. This results in a fairly subdued light, ideal for the purpose, and the current consumption is so small that the bulb will burn for several hundred hours from each unit of electricity.

Making the Standard

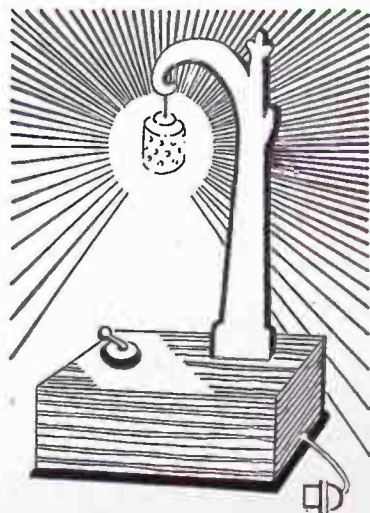
Fig. 1 shows the shape of the standard, and this may be copied by ruling lin. squares lightly upon the wood, or upon a sheet of paper, which may be pasted to the wood for-cutting. Two pieces the same shape are required, $\frac{1}{2}$ in. plywood being ideal. With a fretsaw, used carefully, both pieces may be cut together, movement during cutting being prevented by small

By F. G. Rayer

screws or tacks driven through the sheets outside the design. The outside grain of the plywood may best be vertical.

Cut a 'Channel'

When the pieces are cut, they should be separated and a narrow 'channel' made up the centre of the pillar and round the curved member. This can be done with a sharp knife or small chisel. This channel is cut in both pieces, on the meeting surfaces, and only needs to be quite shallow. Two thin insulated wires (20 to 22 S.W.G. is amply stout) are then placed in position and the two pillars glued together. The wires should project a few inches from the bottom of the pillar, and also an inch or so at the end of the curved member, where the lantern will hang. When the glue is dry



the whole pillar may be glasspapered smooth.

Base and Transformer

A sectional view of the base is shown in Fig. 2, and the actual dimensions will depend to some extent on the transformer used. For an average transformer of this kind, the base will require to be $1\frac{1}{2}$ ins. deep inside, about $2\frac{1}{2}$ ins. wide, and $3\frac{1}{2}$ ins. from back to front. Thin 3-ply may be used for top, bottom and sides. Both back and front may be of somewhat thicker wood, so that the other pieces may be screwed or

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*For Modellers, Fretworkers
and Home Craftsmen*



PRICE 2.5

nailed to it. The bottom is left off until construction is complete, and afterwards fitted in place with four small screws. The completed pillar is fitted into a rectangular cut-out in the top of the base.

The transformer can best be a small radio 'heater' type, and this will have an output of 6.3 V 1 amp. The primary is suitable for 200/250 V mains. If tags are fitted, one is connected to the switch and the other to one mains flex lead. If wire leads are provided, however, these should be joined to the respective points as shown, and the joints covered with several layers of insulating tape. The

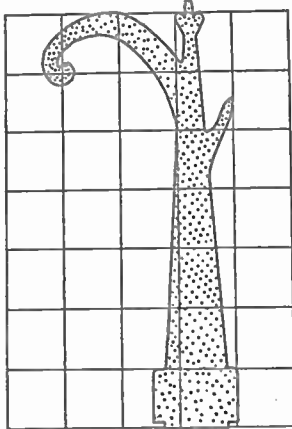


Fig. 1—The standard ruled in 1/4 in. squares to show dimensions

primary goes to switch and mains. The secondary is connected to the leads which pass up the standard. The switch is a small 250 V toggle type, such as sold by radio component stockists.

Small bell transformers can also be used, and usually have output terminals giving 3 and 5 volts. In each case the mains leads should consist of good-quality twin flex, terminating in a plug suitable for the mains outlet socket which will be used. If other items are to be operated from the same wall socket, then a 2- or 3-way adapter can be employed.

Lantern and Bulb

The lantern is made from two pieces of thin aluminium or tinplate cut as shown in Fig. 3. The hole in the centre of the circular piece should be drilled to suit the bulb-holder—the latter is the simple type with two tags sold as a 'dial light' holder for radio receivers. The long piece has a series of 1/16 in. holes drilled in it, and it is curved round a suitable object to form it into shape, after which the 1/16 in. diameter top piece can be slipped into position and the four small projections turned up, after

passing through the slots shown. A strip of coloured celluloid, glued inside the lantern, completes it.

The leads descending from the pillar are cut to suitable length and soldered to the bulb-holder tags. The bulb should be chosen to suit the trans-

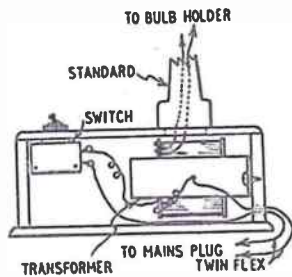


Fig. 2—Electrical connections

former voltage. With the 6.3 V transformer, a 6.3 V dial light will be suitable. With a 3 V transformer, a 3.5 V torch bulb can be used. If the transformer has a 5 V secondary, then a 6.3 V bulb will be suitable.

In common with all apparatus using a mains transformer, the lamp cannot be operated from D.C. mains. All the mains voltage connections will be protected when the bottom of the base is screwed on. The bulb connections are only of very low voltage, and are totally isolated from the mains, when a transformer with separate primary and

secondary windings is used, as it must be.

Battery Operation

If no mains are available the light may be used for short periods from a dry battery. A 3 or 4 1/2 V dry battery such as used in hand and cycle lamps would be suitable. Wiring would be as follows:

One battery tag to bulb. Second bulb lead to one tag of switch. Second tag of switch to remaining tag on battery.

The bulb should be suitable for the

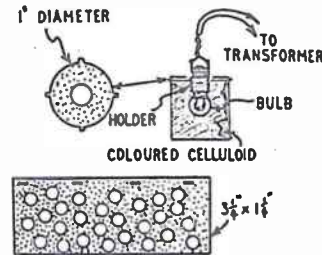


Fig. 3—The Lantern

battery voltage, just as with a torch. Most economical running of all will be achieved with a 6 V .06 amp. bulb such as used with cycle-dynamo rear lights. (The usual torch bulb consumes about .3 amp.)

The battery can be fitted inside the hollow base, being held by suitable clips of thin metal. The base can be left open at the bottom, if desired, to facilitate replacement.

EASY TO MAKE

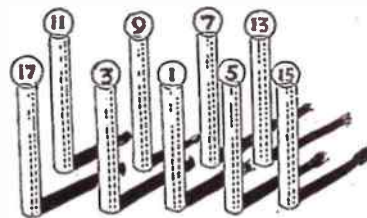
A Game for the Children

PLAYED in the same way as nine-pins, this game provides lots of fun for small children. The pins are made from 1/16 in. diameter round rod, each having a 1/16 in. slot cut in the top.

The numbers are painted on white paper and pasted to 1/16 in. wood the same size. Glue the numbers in place before painting.

Clean up each pin and give two or three coats of plastic enamel paint. The numbers can be coated with clear varnish.

Make your own rules when playing the game, preferably adding up the scores after a certain number of shots. Use a tennis ball or rubber ball and stand well away from the pins. (M.p.)



The numbers are shown full size on page 239

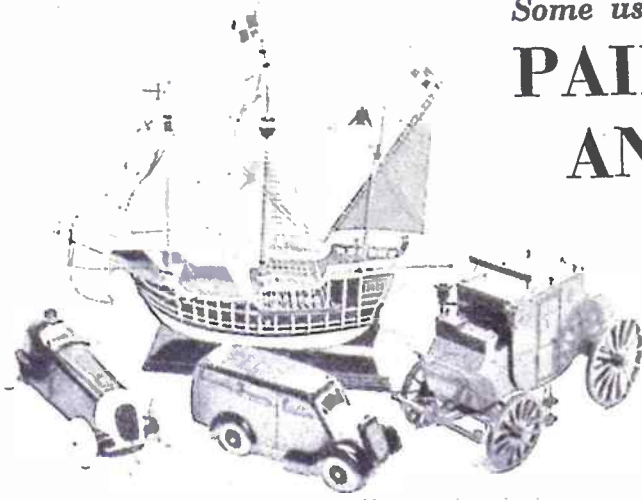


NEXT WEEK

A FREE Design Sheet for a novelty 'Treasure Chest' Trinket Box
Make sure of your copy

Some useful hints on

PAINTING TOYS AND MODELS



Allow the green to dry, giving two coats if necessary and then apply transparent adhesive tape along the line of the join as shown in Fig. 5. Press it well down and trim with a razor blade where necessary. You can now paint the brown side without worrying about it

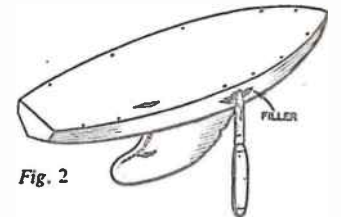


Fig. 2

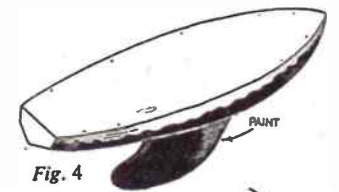


Fig. 4

before rubbing down again with silicon carbide paper as before. Continue this process until a perfect surface has been obtained. We are now ready to commence the final colouring and lining up.

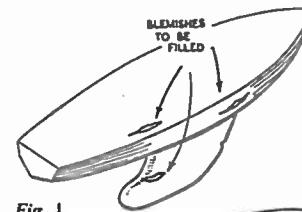


Fig. 1

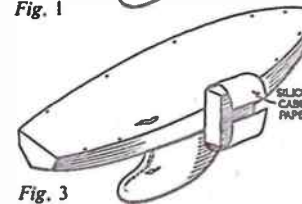


Fig. 3

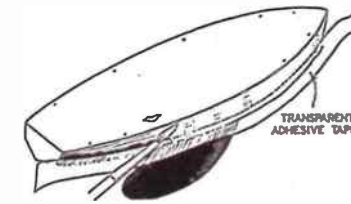


Fig. 5

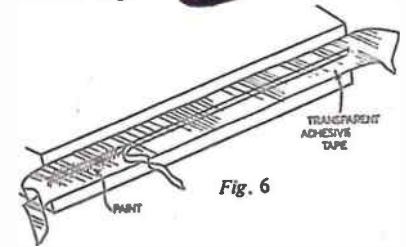


Fig. 6

FROM experience of judging competitions we cannot help noticing that many otherwise expert craftsmen are not so expert in the matter of finishing and painting. The painting can make or mar the appearance of an otherwise perfect model. We hope that these few notes will help you to gain more points in competitions.

White Undercoat

We will suppose that it is necessary to paint a toy yacht, with several defects as seen in Fig. 1. The first thing to do is to clean up with medium and fine grade glasspaper and then give two coats of white undercoat or two coats of Chinese lacquer. The latter is particularly suitable because it dries in an hour or two and another coat can be applied. White is used because it shows up holes, cracks and blemishes.

When the paint is dry and hard, apply a woodfiller or plastic wood to the holes, etc., with the point of a pen-knife as in Fig. 2. Any type of proprietary brand of filler can be used, but we prefer those consisting of white plaster. This will set in a very short time, and can then be roughly glasspapered down to the approximate level required.

Silicon Carbide Paper

The important part now is to finish off with silicon carbide paper used wet. Go over the whole boat, rubbing gently with the fingertips. Where you have a flat surface it is better to wrap the paper round a small block of wood (Fig. 3). A small glasspaper block would be ideal for this purpose. When the surface has been rubbed down sufficiently, clean up with a rag and dry thoroughly, before giving another coat of Chinese lacquer. When dry give yet another coat

The bottom of the yacht is to be coloured green and the sides brown, so the next thing to do is to paint the green, going fairly well over where it should meet the brown, as shown in Fig. 4.

going on to the green. Give two coats and strip off the adhesive tape when the paint has set, but before it has dried hard. You will find a perfect joint between the two colours.

Painting a Thin Line

This method can usually be applied whenever two colours join. The filling also can be used for any type of model or toy. However, where a single thin line of any one colour is required, the method shown in Fig. 6 can be used. Stick a piece of transparent tape in position and cut along each side of the line with a razor blade. Peel away the thin strip of tape as previously mentioned. Remove the tape as previously mentioned. (M.h.)

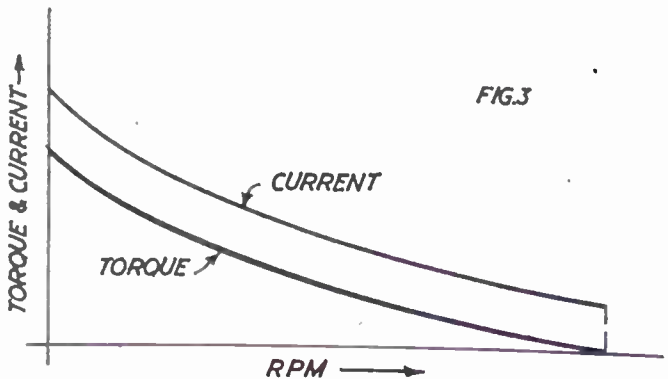
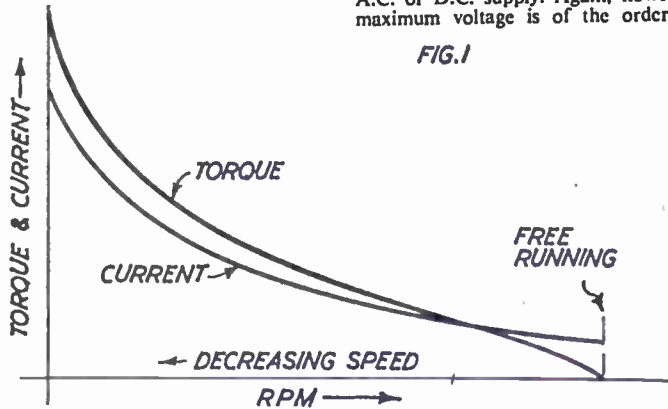
Some interesting information about

ELECTRIC MOTORS FOR MODELS

By R. H. Warring

First let us consider the various types of small model motors. The majority are designed for D.C. operation at between 3 and 6 to 8 volts. They are intended, mainly, for powering by batteries although, of course, the main electricity supply can be used with a transformer and rectifier combined to give the right range of D.C. voltage. Some are designed to operate on either A.C. or D.C. supply. Again, however, maximum voltage is of the order of

ELECTRIC motors manufactured for model use are of essentially simple construction. They have to be, otherwise they would cost far too much to make. Also it is very difficult or even impossible to scale down some of the detail design requirements of larger, precision motors to miniature sizes—and, in a good many cases, unnecessary. As such, many of the lower-priced model motors suffer from certain limitations. Their overall efficiency, as a whole, is generally pretty high, con-



sidering the sizes involved, but certain features, particularly commutation, can often give trouble at some relatively early stage in the motor's life. They may even appear to be 'worn out' whereas, in fact, perhaps, all they really need is a little attention to the brushes to bring them back to full performance once more. Unless the windings are damaged by applying excessive current, the life of the average small motor can be quite long, provided it is properly maintained.

20 volts, or lower than the mains, and so a transformer is still required for mains operation. The alternative is accumulators or dry batteries coupled in series to give the required 20 volts. Although a D.C. supply is more expensive, or cumbersome, to arrange in such a case, generally the performance will be slightly superior for the same applied voltage. Also, with D.C. supply, it will be found far easier to get positive speed control on the motor.

The majority of small D.C. motors are of the permanent magnet type. The field is provided by a permanent magnet and the only windings are on the armature. The smallest size of motors almost invariably employ one of the modern magnetic materials like Alnico or Alcomax, which gives a powerful magnetic field for a small size of magnet. The trend, too, is to make these field magnets in the form of rings which encircle the armature. Those permanent magnet motors employing cobalt steel for the field magnet have to be of larger size to get the same magnetic strength. Usually, too, such field magnets are horseshoe shaped, fitted with separate pole pieces to match up to the shape of the armature and reduce the air gap between field and armature. These pole pieces can be omitted, and the motor will run all right, but its performance will usually suffer as a consequence. In general, they are apt to be particularly bad as regards self-starting under load.

All permanent magnet motors have a 'characteristic' performance. They will run at very high speeds with no load on the motor, speed being limited only by friction in the bearings, windage and similar internal losses. In the free-running condition, as this is called, they will also draw minimum current.

Turning Force

When a load is put on the motor shaft, i.e. the motor is made to drive something, it will slow down. As a result it will draw more current, but will be capable of generating a greater turning force. This turning force is known as torque, and if torque generated and current consumed are both plotted on a graph against r.p.m. as in Fig. 1, it will be seen that both curves are of similar shape. Fig. 2 shows the effect of slowing down a motor by applying additional loading or braking.

The interesting point is that with decreasing speed, i.e. more and more load added to the motor, torque goes on increasing at a progressively greater rate until when the motor is 'stalled' or the armature locked, it is very high indeed. At the same time, of course, the current consumed is also quite high, perhaps ten times that of the free-running current.

A high stalled torque means that such a motor is readily capable of starting up under quite heavy loads. Also its possible speed range is considerable, depending on the amount of load put on it. However, with heavy loads, corresponding to high torques and low running speeds, the current flowing

through the motor is also high, representing a considerable drain on the batteries. Also, this high current has to be passed by the brushes which, if thin metal strips, may overheat and even melt under the strain.

It is normally advisable, therefore, to operate small permanent magnet motors at as high a running speed as possible. The free-running speed of such motors may be anything between 7,000 and 12,000 r.p.m. They will usually develop maximum efficiency at about 80 per cent of their free-running speed and maximum power at one-third to one-half of their free-running speed.

Gearing Down

As a rough and ready rule, therefore, one should aim at an operating speed under load of at least one-third of the free-running speed. In a good many cases this may mean gearing down. If the motor is installed in a boat, for example, a direct drive could be used to the propeller which may run, in the water, at, say, 500 r.p.m. The motor would tend to overheat under such conditions because of the high current passing through it, to say nothing of the drain on the batteries. If, however, the motor were fitted with a 5:1 reduction gear, it would actually be running at 2,500 r.p.m. The current would be less than one-half of the original demand and the torque would be higher, through the gearing. In fact, to get the same torque a 7 or 8:1 gear ratio could probably be used, putting the motor r.p.m. up to 4,000 and the current consumption something like one-quarter of the direct drive figure.

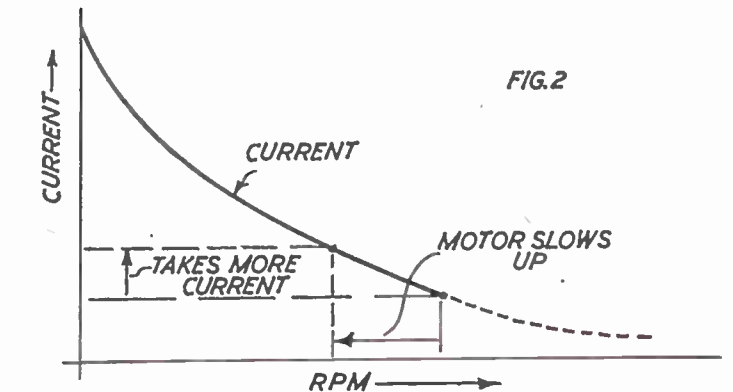
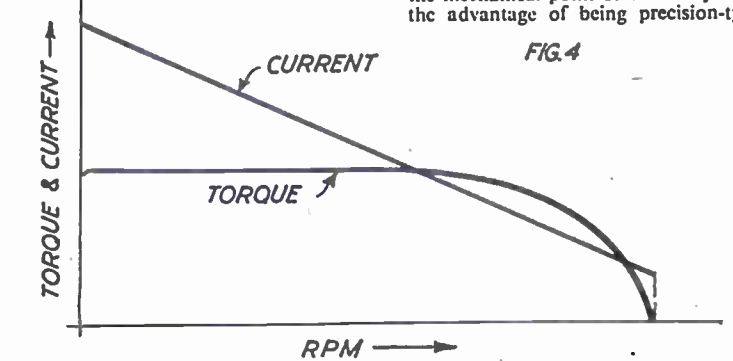
The simplest way of varying the speed of the motor for a given fixed load is to vary the supply voltage. Drop the voltage and both speed and torque will also drop. However, this brings up another factor not widely appreciated, regarding normal operation with a battery supply.

As the batteries begin to run down they will deliver less voltage to the motor. The motor will thus gradually start to slow up. However, this makes matters worse. At slower speeds it is drawing even more current, hastening the discharge of the battery, so the position rapidly gets worse and worse. That is why batteries often appear to give up quite suddenly when they are approaching the end of their useful life. Connecting weak batteries to a motor is just asking for them to be flattened in a hurry!

Maximum current is drawn when the motor is stalled, which raises another point. Working models powered by electric motors can often be 'stalled', representing a quite unnecessary drain on the batteries, and even running the risk of the motor windings burning out. Thus, for example, switching on the motor in an electric-powered boat and

then holding the propeller is causing the motor to drain the battery three, four or five times faster than it would when running. Just because the motor is not running does not mean that it is drawing no current.

Other types of D.C. motors may show different characteristics, although all draw maximum current when stalled. The series-wound motor in which the field magnetism is provided by a wound coil, connected in series with the armature winding, has much flatter torque and current curves (Fig. 3). Such a motor can be operated at lower speeds without a prohibitive



rise in current. But even so the current may be high enough in the stalled or near-stalled condition to overheat and burn out the windings.

Shunt-wound motors are also used for model work—a wound field coil, as above, but connected in parallel with the armature. Again the characteristics are different, the current curve being approximately straight and the torque curve convex rather than concave (Fig. 4). There is not that same peaking of the torque as the stalled condition is approached and the shunt-wound motor does, in fact, tend to have 'constant speed' characteristics. In other words it needs quite an appreciable change in

load to produce a marked change in running speed, because the change of torque with speed is relatively small over a wide working range.

Shunt-wound motors are uncommon, produced specifically as model motors, but there are a number of ex-W.D. motors of this type which are very suitable for model work. Small ex-W.D. motors available for D.C. operation are generally designed for 24-volt operation, although some are 12-volt models, but will generally operate quite well on 12 volts without modification, or even lower voltage, if sacrifice in performance is not too important. From the mechanical point of view they have the advantage of being precision-type

motors with carbon brushes, a proper commutator, balanced armature, etc. and often ball races for the armature spindle.

Commutation is often a source of trouble with small motors. In the tiny sizes, phosphor-bronze strips are often used for brushes, rubbing against a copper commutator (drum or disc type). The main sources of trouble are lack of contact pressure, poor electrical contact, and excessive wear.

The former can often be identified by erratic running. If changing the attitude of the motor changes the speed, then almost certainly brush pressure is

Continued on page 234

A. Fraser tells you how to make

Fretwork and Inlaid Radio Knobs

TO some people the designing and making of such a small item as a radio control knob may appear unimportant. But this is a mistaken attitude, for it is often the small items which make or mar the larger design. Moreover, small things need just as much skill and taste in their creation as large ones.

A survey of the radio knobs available today shows that, while some efforts are being made to improve design, there is generally a lack of imaginative application and creative originality. The need for fresh vision to overcome the prevalent poverty of design is imperative, and so it behoves the hobbyist to make his own contribution.

may be divided into two parts—the outer face (on which appears the main decorative note) and the drum or shaft which holds this and which fits on to the spindle from the set. Again, the knobs fall into two main categories—in the first, the outer face is more or less the same diameter as the drum or shaft; in the second, the face is actually a larger disc overhanging the smaller shaft. These are shown in Fig. 1.

Cotton Reels are Useful

The shafts can be sawn from dowel, or made specially. Cotton reels are often useful in making shafts. To attach the shaft to the spindle, the easiest way is to thread or screw through tightly. Where

in Fig. 3(b), while a round file will produce (c) and (d). A composite effect, more interesting in appearance, is seen in Fig. 4(a). This consists of square saw cuts, with a round file used in between.

A more radical rim pattern is seen in Fig. 4(b). Here, a series of holes is drilled within the perimeter, and the rim is broken through to the holes with a round file.

In Fig. 4(c) is shown a rim effect which may be obtained either directly by a fretsaw, or by a triangular file, finishing off with flat file to make the round. In either case, care is needed.

We may now turn to the decoration of the front face of the knobs. It must be noted here that not only are the shapes

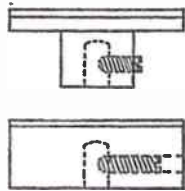


Fig. 1

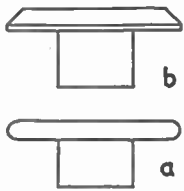


Fig. 2

In the designing of radio knobs the craftsman will find a hitherto unexpected outlet for his imagination and skill. The creative possibilities are extensive, while the results are highly gratifying. Attractive designs are not difficult to produce, and they lend a distinctive appearance to the radio cabinet.

The making of knobs through the arts of fretwork and inlay is dealt with in this article, for it is this method, no doubt, which will appeal to most hobbyists.

Few Tools Required

It will be seen from the start that no specially bought material is really necessary, for the needs are so small. There will almost certainly be sufficient scraps of wood lying around the work-room. All small odds and ends of wood, plywood and veneer should be collected and their possibilities weighed up. Tools are few, consisting mainly of fretsaw, drills, a knife to cut veneer, and one or two files. When dealing with round-shaped knobs, a lathe is useful but not indispensable, as the clever craftsman can devise his own methods of keeping a true round shape without using a lathe.

For descriptive purposes, the knob

the drum is the same diameter as the face, then the screw head should come well below the surface so as not to touch the fingers of the operator.

The side profile of the knob is worth great consideration. In Fig. 2(a) the sides of the face disc are shown rounded, while in (b) a bevel is adopted. Similar treatments are applicable where the outer face and drum are the same diameter. Many variations are possible.

So that the fingers may grip the knob and prevent slipping, the rim of the knob must be serrated or 'broken' in some way. Here again there are numerous possibilities. A square or hexagon-shaped knob is easily gripped, but for round ones some kind of indentation is necessary.

A square tooth effect can be produced by using a fine saw at regular intervals round the rim. A narrow square file will also do the job (Fig. 3(a)).

A triangular file will give the effect as

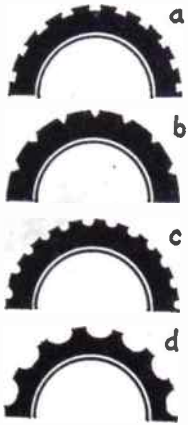


Fig. 3

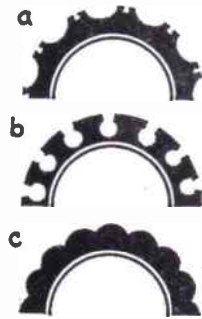


Fig. 4

in the pattern important, but also the tone value of the shapes considered one against the other. Most attractive designs are produced if we use only a few tones—say, three or four. In this way, the effect is striking yet interesting. The woods or veneers should be chosen to give maximum tone contrasts, as well as being congenial colour combinations.

Which Method?

One must decide fairly soon whether all the parts are to be assembled flush and level with one another, in true marquetry fashion, or whether overlaying is to be used. In this latter method, shapes are cut out and glued over underlying parts, thus raising them up above the general surface. The thicker the overlay, the more shadow is cast—this may or may not be an improvement. Designs should be tried out in both techniques to assess the merits of each. In some cases, the design will be more easily carried out in one method than with another. On the other hand, the final effect may be better or worse.

Fig. 5 shows a design that could be carried out in three or four different-toned woods, either in true marquetry fashion (one flush surface) or in the overlay method, plus marquetry, if needed. The smaller holes for the dark-coloured spots between the triangles

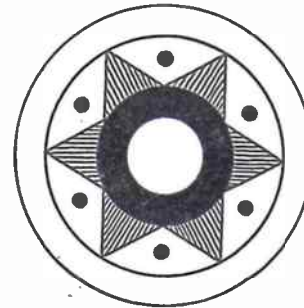


Fig. 5

spots round the outer section could be dowel slices cemented straight on, thus being raised above the face of the knob. The slices should not be too thick. The dark-coloured bars could also be overlay.

The beginner might well try the



Fig. 6

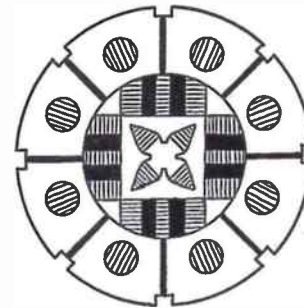


Fig. 7

can be made with a drill, and then filled in. The best way to make the inserts would be to use thin slices of dowel stained with some dark dye.

Glasspaper Thoroughly

When all the parts have been assembled and cemented, the surface can be glasspapered down smooth and treated for finish. In the case of overlay, these parts must be cut out with a fretsaw. In the design mentioned, the middle-toned star could be cut out whole and glued on, then the dark-toned central ring cut out and glued in turn on to the surface of the star. The centre could be an insert of light-coloured dowel slice. There are, of course, plenty of alternative arrangements.

In Fig. 6 we see a design based on a square (light colour) crossed by four arcs, and enlivened by light-coloured dots and medium-toned oblongs. The centre is a medium-toned square in a light circle. Overlay can be put into effect here also.

Fig. 7 may have the following variation. The medium-toned large

design in Fig. 8. It is easier to produce, yet effective in appearance. Overlay need not be attempted here.

Fig. 9 shows a design based on a pentagon. This could be a combination of both methods.

A natural form is used in Fig. 10. This will be best executed in fretwork overlay, either light-coloured animal or dark undersurface, or vice versa.

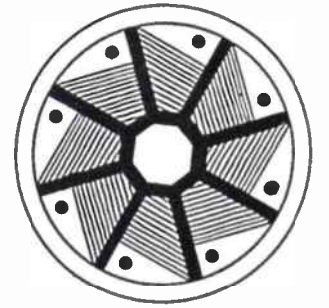


Fig. 8



Fig. 9



Fig. 10

The treatment of the outer rim has been omitted from most of the above examples for ease of illustration.

Labour may be saved in making the knobs by clamping several layers of wood together when cutting out. In this way several shapes will be cut at once.

To the imaginative, various refinements may present themselves. For instance, unsatisfactory toned or coloured wood can be transformed by judicious use of dyes or stains (applied before cutting out).

Use of Plastic Wood

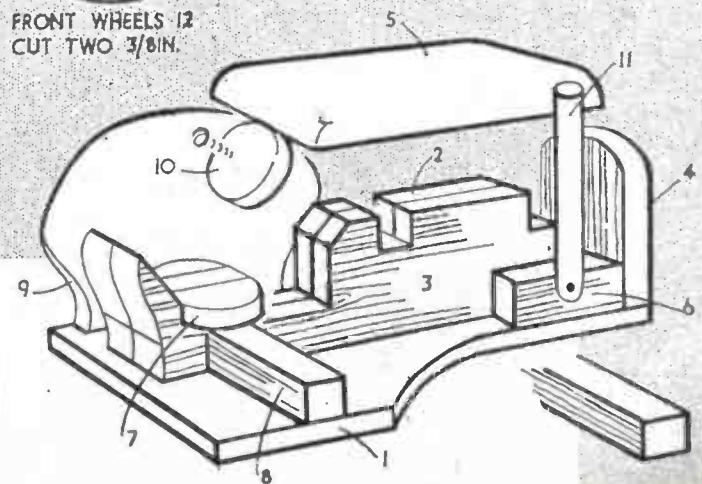
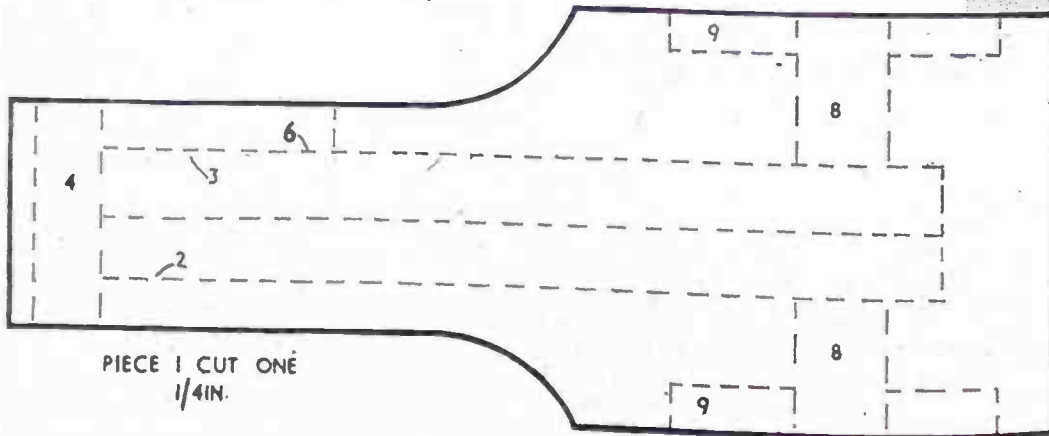
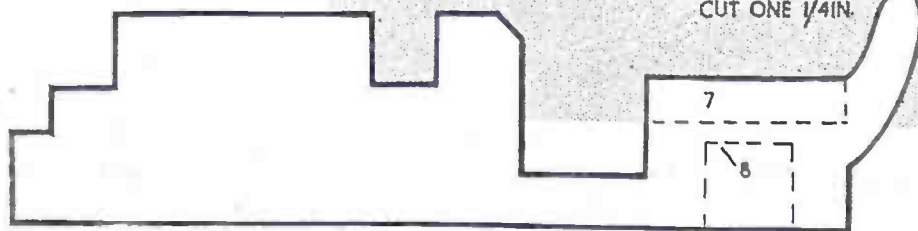
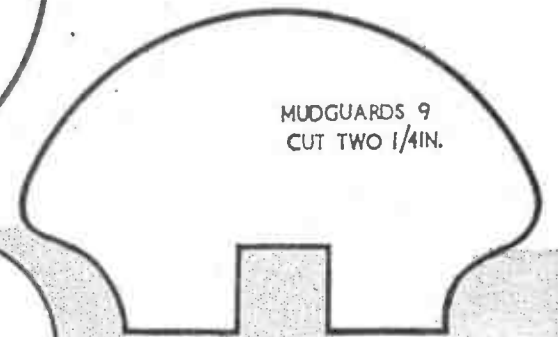
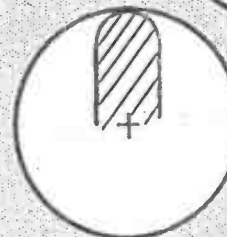
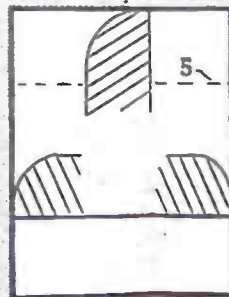
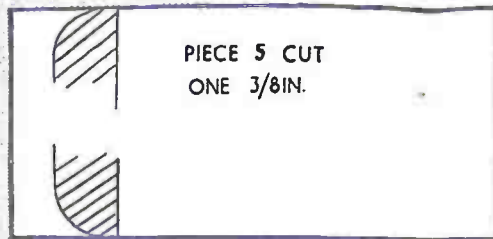
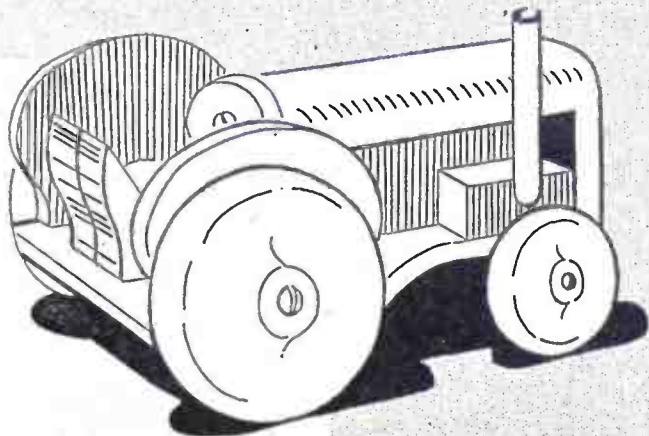
Again, where inserts are difficult to cut, it is possible to fill in the vacant part with some filler, such as plastic wood, and glasspapering this down flat when set hard. This is often very convenient.

The use of lacquer, or plastic, or even pieces of metal, may be inspiring to the original craftsman. Where wood only is used, the 'finish' of the knob is highly

important. After glasspapering smooth, the knob should be treated with wax, or varnish, or cellulose, according to taste.

In conclusion, it is obvious that the drawing or setting-out of the design is extremely important, too. It is best drawn out on thin paper first and transferred by carbon-paper tracing. The surfaces of the woods should be smooth.

A TOY TRACTOR



Here's Magic for You!

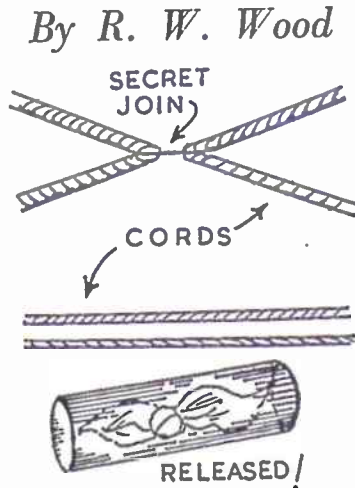
IN this fascinating trick escapo, it appears that solid matter may be passed through solid matter in defiance of all natural laws!

The performer shows two lengths of cord or soft white rope. He also has to hand a glass gas chimney of the common straight-sided type and a silk handkerchief. He ties the cords together at the centres with the handkerchief, using one simple knot. Next he passes the cords through the gas chimney so that the handkerchief is within while the cords hang from each end.

Two Assistants

He now invites two members of his audience to hold the cords so that the gas chimney is suspended between them. The cords should be held quite loosely. Next he invites each assistant to pass him either one of his ends of cord, and these he ties in a simple single knot, passing the ends back to his helpers.

Taking the gas chimney in hand, the performer calls attention to the fact that the cords clearly pass through a solid tube, that they are tied together



with a handkerchief and finally, tied about the tube. The assistants are now asked to hold the cords securely and to

pull when the word is given. On the count of three this is done—and the gas chimney is released from the cords in a flash. The knotted handkerchief remains in the chimney and the cords are seen clearly stretching between the helpers. Everything may be minutely examined, for none of the articles is faked in any way.

The Secret

The secret is explained in the sketch. It lies in the way the two cords are fixed together by a short length of black thread, being then looped away from the joint as shown. The performer merely has to conceal this fact while showing the cords and the trick cannot fail.

A practice try-out with two of his friends as helpers will teach the amateur how to perform this really striking trick in a few moments. Everything works quite automatically, so no special skill is required.

Of course, a metal or cardboard tube may be used if a glass one is not available.

Continued from page 229

Electric Motors for Models

incorrect. Ideally pressure should be the minimum necessary to give good electrical contact. Too much pressure is to be avoided, since it will increase friction and wear on the brushes. It is possible, on some motors, to alter the contact pressure by an axial loading (i.e. an end load) on the driving spindle, and if this can occur, the answer is to take up end play and adjust for the normal running condition.

Dirty brushes are most likely to result from excessive oiling of the motor bearings. Surplus oil finds its way on to the brushes or commutator, or both, and acts as an insulating film, collecting dust as well to make matters worse. While motor bearings need oil, care must be exercised to avoid getting oil on or near the brushes. If the brushes do get oily, then a thorough cleaning with carbon tetrachloride is in order.

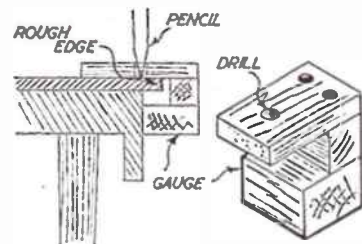
Worn brushes require replacing—when they have worn down so far that they are affecting the running of the motor and cannot be adjusted to compensate. Re-adjusting strip brushes to take up wear may alter the 'timing' of the motor and slow it right up. Carbon brushes, on the other hand, can be used

right down to the point where there is no longer sufficient pressure for good electrical contact.

There is some misunderstanding over whether or not an electric motor improves by 'running in'. In the case of motors with metal-strip brushes, maximum performance is obtained

when new, and performance then gradually deteriorates as the brushes become worn and contact resistance increases. With carbon-brush motors, a reduction in contact resistance, and thus an improvement in motor performance, is likely at first as the brushes bed down to the contour of the commutator. After that a gradual deterioration in performance is likely, as carbon dust contaminates the commutator and the commutator surface itself is worn and, perhaps, pitted by sparking.

An Edge-Trimming Gauge



THIS gauge can be used to mark straight edges for trimming on wood panels finished with a rough or uneven edge. It is assembled from three blocks of wood, held together with screws or nails. A hole is drilled in the top piece, not quite large enough to pass a pencil. Locate this hole exactly over the face of the bottom block.

Refer to the sectioned drawing for use. The panel with the rough edge is laid over the edge of the workbench and a pencil positioned in the gauge and drawn along to mark the required cutting edge. (R.H.W.)

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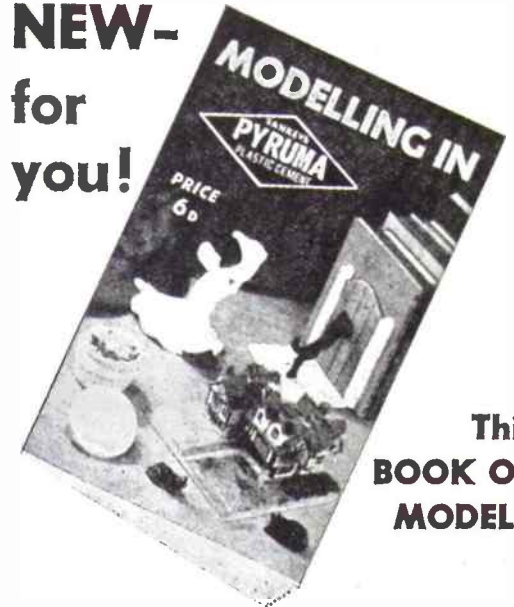
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Growing Cacti and Succulents

By D. H. Matheson

THE growing of cacti and succulents for pleasure and profit as a hobby has become very popular among amateur gardeners. No hothouse is necessary, as these striking plants will grow in parlour, porch, cool greenhouse or conservatory.

Apart from being interesting, one may grow flowers the equal in beauty and magnificence of any to be found in the whole realm of plants, and of a kind rarely seen. Many are also sweetly scented. Size is also in variety, ranging from miniature plants no larger than a gooseberry, to flowers of big dimensions.

Some of the outdoor species of cacti, by the way, attain enormous size. One the writer saw on the south coast of Cornwall, in a garden, was a monster specimen of Agave Cactus. It was about 20ft. high with stems 8ft. in length and 2ft. in circumference. Gorgeous masses of small yellow blossoms covered the plant. A remarkable feature about this species of cactus is that it does not flower until about 100 years old; while after flowering the plant dies. Hence its usual name of 'Century Plant'.

Magnificent Blossoms

But for the amateur grower, Phyllocactus are, perhaps, the most free-blooming. Also, the blossoms are magnificent, appearing regularly year by year, and in exceptionally favourable conditions, twice a year. They are very easy to cultivate and will grow even in rooms without any trouble. Thus the growing of these and other cacti, too, is comparatively easy.

Soil is the first consideration, and this should be composed of two parts fibrous loam and one of coarse sand to get best results. A little leaf mould and crushed brick may be added. At least one-third of the pot should be filled with broken-up pot material before placing the soil in the pot, in order to secure good drainage, which is essential.

During the warmer months of the year, cacti plants should be watered more or less every day, dependent upon weather conditions. During the colder months, however, very little water is necessary. Standing the pot in a shallow pan of water is the best method of watering. One should also note extremes of temperature. For in summer if you employ a glasshouse in which to grow your plants and the glasshouse becomes very hot, the floor may be damped with advantage. While during a cold snap in winter, some sacking spread over the top of the glasshouse on the outside will help to retain warmth, especially at

night. The placing of newspapers over the plants themselves will add a further protection. One may also employ a glass-frame, but wherever the plants are grown, and the sun is hot, the turning of the plants to face the sun, should be done gradually. Otherwise sudden heat thrown on the stems may injure the soft tissues. Water should not be permitted to leak or drop on the plants, or the stems will rot. At any time when inspecting the plants, and brown patches are noticed, cut them away with a sharp knife. After which place the pot on a dry shelf where it can get the sunshine. Moss and green slime appearing on the outside of a pot shows that the drainage is defective, and this should be remedied at once, or the roots will rot away. The best plan is to re-pot in fresh dry soil.

The necessary cuttings, off-shoots or seeds may be purchased at any good horticulturist.

Echinocereus, of which there are about thirty species, many of which bear flowers of brilliant hues, and many being sweetly scented, might be bought as a start.

Another very beautiful specimen is the Epiphyllum, a drooping plant which is, therefore, suitable for hanging baskets. But most of this genus flower in winter, and they require a moderate amount of moisture and a temperature of 50° to 55°.

Limitless Range

It is rather peculiar, but a fact, that once one starts cultivating cactus plants, the desire to grow more and in variety increases. For there is always something fresh, something unexpected in growing these varieties, and there is practically a limitless range of plants from which to choose.

One may also experiment by hybridis-

ing, and entering all data referring to the experiment in a notebook. For if one should succeed in producing an unusual hybrid, notes on the procedure will be invaluable for reference.

Some of the most interesting and remarkable flowers in the world grow on succulents, and may be cultivated with cacti, as the same methods apply. No hot-house is necessary, and, indeed, many varieties will thrive outdoors, in spite of our often abused climate.

Sandy Compost

In their native habitat, succulents are to be found where the soil is poor and sandy. Thus it naturally follows that to cultivate them successfully, one should also employ a sandy compost, and as succulents are akin to cacti the same compost will be quite suitable. Drainage, too, is of paramount importance, and should be on the same lines as for cacti.

Practically all succulents may easily be cultivated from off-shoots, or by striking pieces of stems or leaves. See, however, that the cut part is quite dry before planting.

As a start you might try Echeveria Retusa, which flowers in early spring, and possesses spikes of blooms which keep fresh for weeks. Also Crassula Anguinea, a 'hanging basket' type of succulent. Crassula Lactea flowers in winter, its white flowers keeping fresh for weeks if left on the plant.

Mesembryanthemum, an extensive genus with over three hundred different species, have extraordinarily shaped leaves and brilliant-coloured flowers. They are well worth attention. While Euphorbia Splendens, which bears wax-like orange-coloured flowers with leaves of a vivid green, is another succulent well worth growing.

Apart from the pleasure of growing cacti and succulents as a hobby, this can become profitable. For off-shoots, cuttings and seeds may be offered for sale.

Be Careful with Carbon Tetrachloride

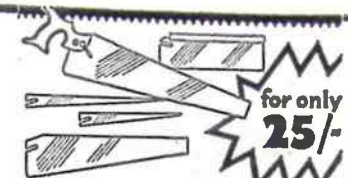
MEMBERS of the Royal Society for the Prevention of Accidents are concerned at the danger relating to carbon tetrachloride when used for hobbies. They point out that some philatelists use it for cleaning stamps, and some craft teachers recommend it as a cleaning fluid and solvent because it has no fire hazard. It is often

used by amateur photographers to clean films.

The fumes of this substance, it is stated, are toxic, producing damage to liver and kidney. People engaged in hobbies may have it in open dishes at their side, and be unaware that they may be breathing deadly vapour. If you can smell the odour, exposure is dangerous.

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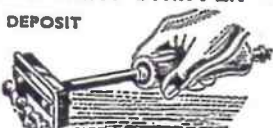
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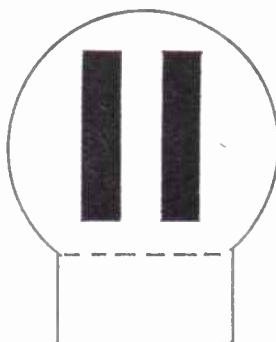
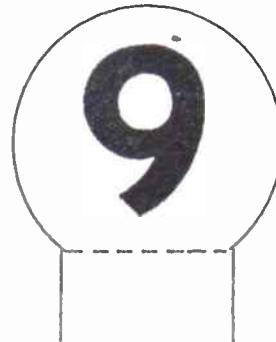
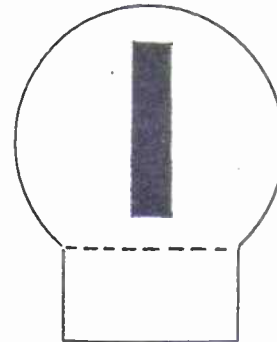
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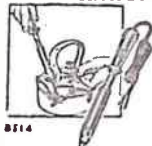
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Guaranteed for six months, voltages 100/110, 200/220, 230/250 Universal AC/DC. Consumption 110 w. Supplied with six feet 3-core cable. 29/- with Standard Bit. 30/- with Pencil or Hatchet Bit.

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THE RAWLPLUG COMPANY LIMITED, CROMWELL ROAD, LONDON, S.W.7



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