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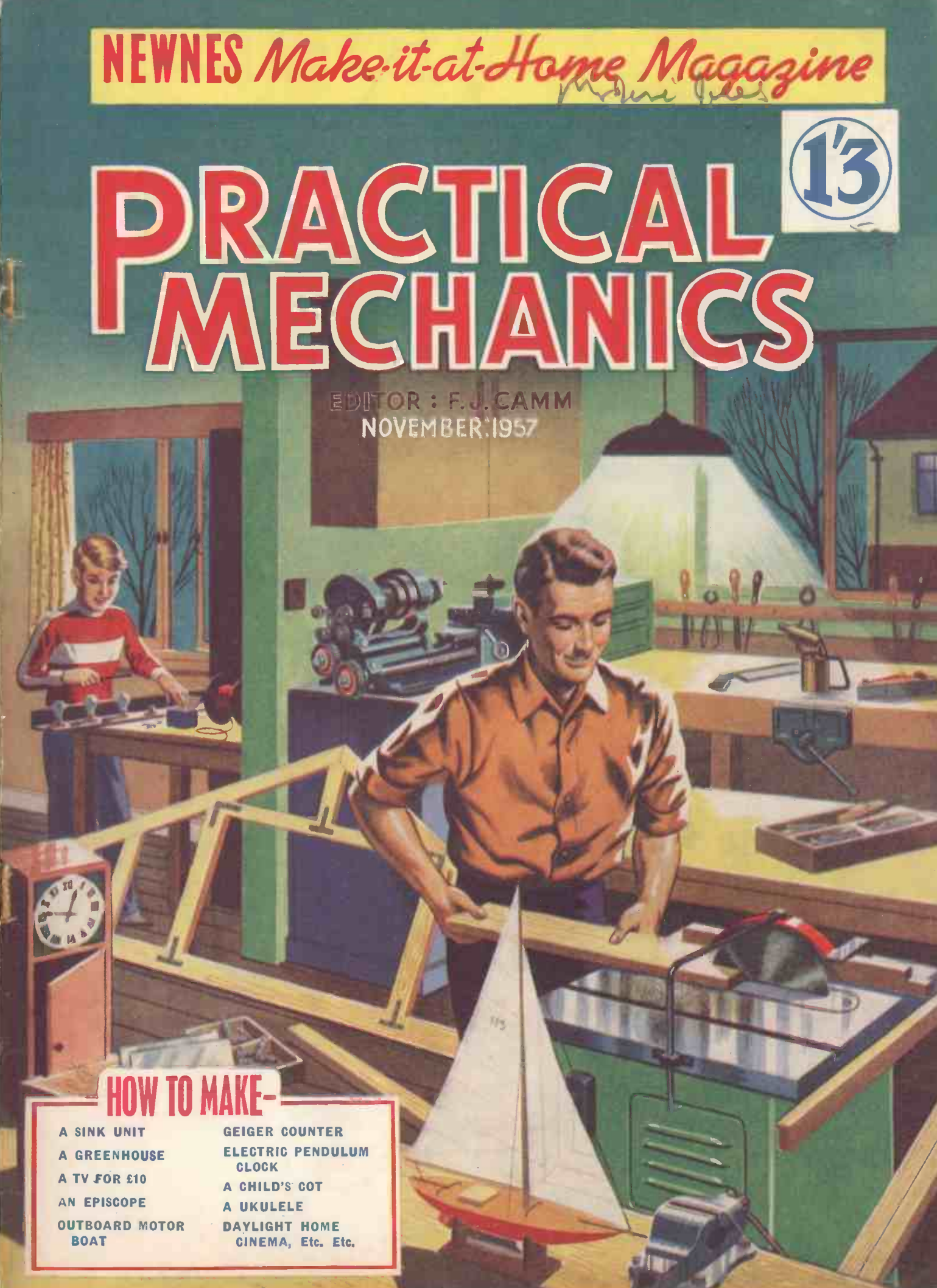
PRACTICAL MECHANICS

EDITOR : F. J. CAMM

NOVEMBER 1957



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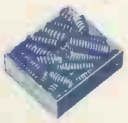

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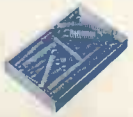

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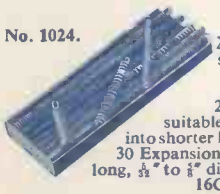

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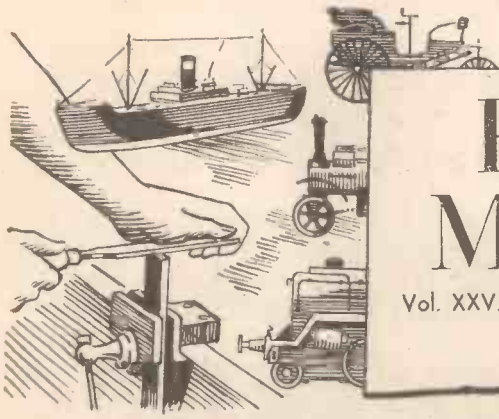

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CONTENTS

CONTRIBUTIONS

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Mechanics." Such articles should be written on one side of the paper only, and should include the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, "Practical Mechanics," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

FAIR COMMENT

OUR 24th BIRTHDAY

WITH this issue we enter the 25th year of continuous publication, with the exception of the issues missed owing to the printing dispute which, of course, affected most other publications as well. This issue is being widely advertised in the national press, and many thousands of new readers will join our ranks as a result. For their benefit, and as a refresher to those tens of thousands of older readers to whose service we have dedicated ourselves for the past 24 years, may we say that this journal exists to serve that ever-expanding public interested in making things, whether it be furniture, models, household appliances or experimental apparatus, in fact in anything which can be made at home. The scientific experimenter, the inventor, the photographic enthusiast, those interested in telescopy and microscopy, in scientific and mechanical developments, look to this journal for the very latest designs and information. The interests of this journal are wide and its circulation world-wide.

Our free advice bureau, staffed by experts in the various fields, gives advice on every topic within our compass. Every year thousands of letters are dealt with, and it is a source to which every reader can turn when he needs advice. This feature alone is worth far more than the annual subscription.

Readers will have seen the developments of the ideas born over 25 years ago for the production of a series of practical journals to cover the entire range of modern interests. Our first was *Practical Wireless*, and PRACTICAL MECHANICS followed a year later. Each was an immediate success, and the fact that one has passed and this one approaches a quarter of a century of service to readers confirms the accuracy of our judgment in embarking upon this venture in publishing. Other journals followed, until to-day there are six "Practicals"—*Practical Television*, *Practical Motorist and Motor Cyclist*, *The Practical Householder* and our recently launched *Practical Home Money Maker*, the second issue of which is now on sale and which, judging from the enormous demand and the fact that the first issue rapidly sold out, is an indication that once again we have produced a paper for a large market, hitherto not catered for. For there is no competitor for the *Practical Home Money Maker*.

We have pioneered this field and, of course, have created the inevitable imitators. Our Practical journals, however, maintain their premier positions in their respective fields, and continue to maintain the largest circulations. To new readers, therefore, a cordial welcome to this enthusiastic readership. To older readers, our gratitude for the loyal support you have extended to us for so many years.

A browse through past issues will indicate how the editorial policy has kept readers abreast of developments with exclusive information collected by our correspondents all over the world. I hope that new readers will follow the practice of the old and place a regular order for the delivery of this journal.

FREE 24-PAGE TROUBLE-TRACER FOR MOTORISTS

INSIDE every copy of the November issue of the *Practical Motorist and Motor Cyclist* is given a 24-page illustrated book on trouble-tracing for motorists and motor cyclists, and if you are a motorist you will find this book a useful guide to the tracing of faults in the engine, carburetter, ignition system, and the other parts of the mechanism which occur when you are on the road.

INDEXES AND BINDERS

INDEXES for Volume 24 will shortly be available at 1s. 3d. by post, and self-binders for 11s. 6d. When ordering the latter, please state the volume number you require to be blocked on the spine. We can supply binders for any volume of this journal, and indexes for most. Address your orders to the Publisher, address as on this page.—F. J. C.

BUILDING A GREENHOUSE

A Simple and Cheap Method of Construction

By J. H. TAYLOR

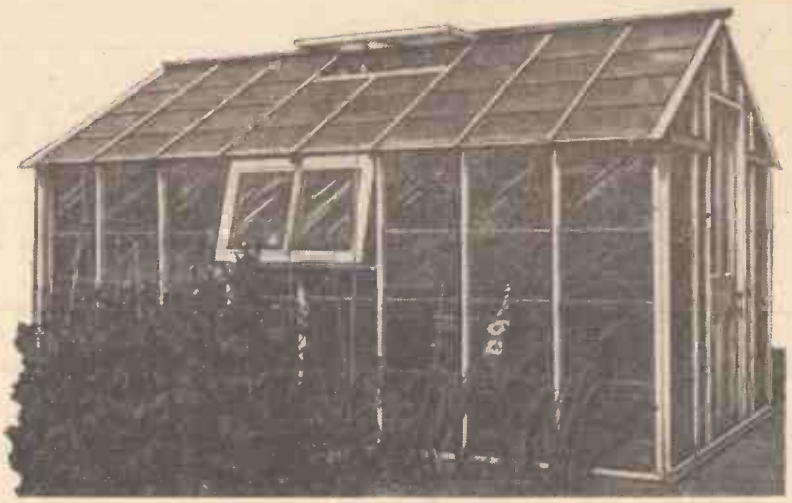


Fig. 3.—A three-quarter front view.

THIS glasshouse shown in Figs. 1, 2 and 3 is 13ft. × 8ft. on plan, 5ft. high to the eaves and 8ft. high to the ridge and was built by an amateur who had neither the skill nor the time to make a large number of properly framed joints.

The original idea was based upon certain fundamental considerations which apply to any size of glasshouse built by this method. They are (a) speed; (b) prefabrication; (c) standardisation; (d) cost, all of which are inter-related.

Speed

All joints are made with standard 3in. × 3in. × ¼in. steel flat angle and tee "repairing" plates, which can be obtained from any ironmongers, and 1in. *brass* screws. The screws *must* be brass. The use of a brace with screwriver bit saved a great deal of time.

Prefabrication

The four sides and two gables were constructed on the garage floor, but the roof was built *in situ*. All painting was carried out inside the garage before erection. Working drawings were not prepared, but it was necessary to have some sketches with the principal dimensions marked.

Standardisation

The glasshouse was constructed from timber of only two sizes, viz., 2in. × 3in., once rebated and 1½in. × 3in. standard greenhouse bar (this is sold ready prepared, twice rebated and twice chamfered). If a smaller glasshouse is contemplated, 1¼in. × 2in. standard bar can be obtained, in which case 1½in. × 2in. once rebated timber could be used for the other members.

Horticultural 24oz. clear sheet glass is sold by the box of 200ft. super in the following standard sizes and number of squares per box, viz.:—

in. in.	in. in.	in. in.
200—24 × 6	100—24 × 12	90—20 × 16
133—24 × 9	114—18 × 14	75—24 × 16
206—14 × 10	103—20 × 14	80—20 × 18
133—18 × 12	86—24 × 14	67—24 × 18
120—20 × 12	100—18 × 16	50—24 × 24

The glass size naturally governs the spacing of the bars and all dimensions of the 13ft. × 8ft. glasshouse were based upon being able to obtain just about the right quantity of glass from two complete boxes each containing 100 squares, size 18in. × 16in.

Fig. 1.—A view of the rear of the completed greenhouse.

Cost

All the foregoing considerations helped to cut down cost. The total cost of materials was approximately £35.

Construction

The first and most important item to be made was a three-ply template of the glass square size plus ¼in. on the width. The reason for this will become apparent.

The two long sides shown in Fig. 4 are identical and sufficient glazing bar was cut to exact 5ft. lengths together with four 5ft. lengths of once rebated timber for the end members.

Metal tees were then screwed to the ends of each glazing bar and metal angles to the end of each end member.

Two 13ft. lengths of once rebated timber were then laid on the ground, to form top and bottom members, and the angle plates of one end member were screwed to same, making sure that the corners were square. The first length of glazing bar was then placed between the long members and the plywood template was placed in position in the rebates, as shown in Fig. 5, and the tee plates at the ends of the glazing bar

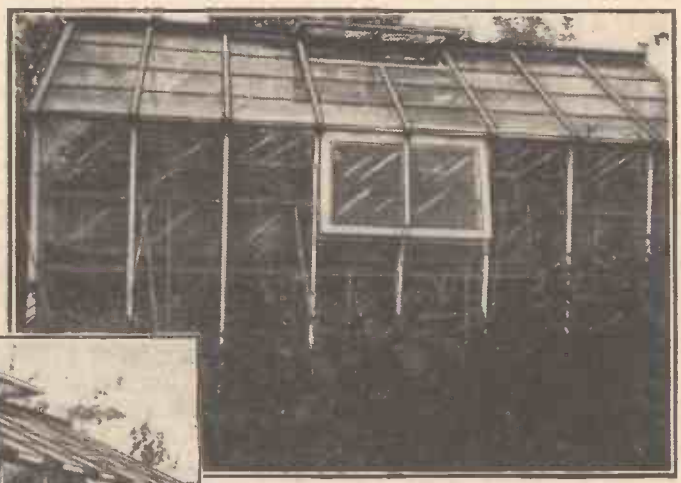


Fig. 2.—A side view of the completed greenhouse.

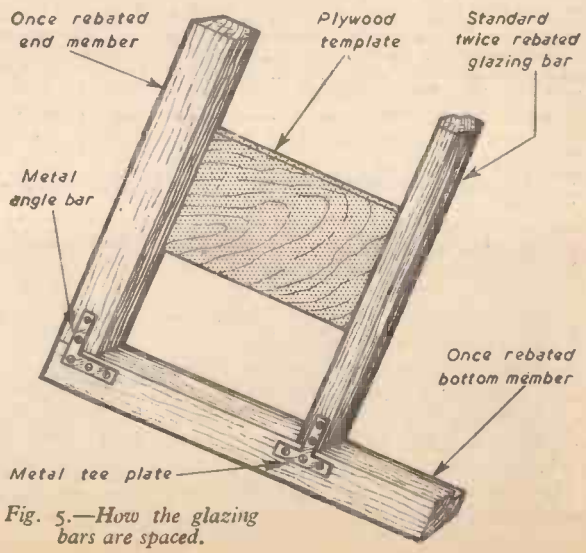
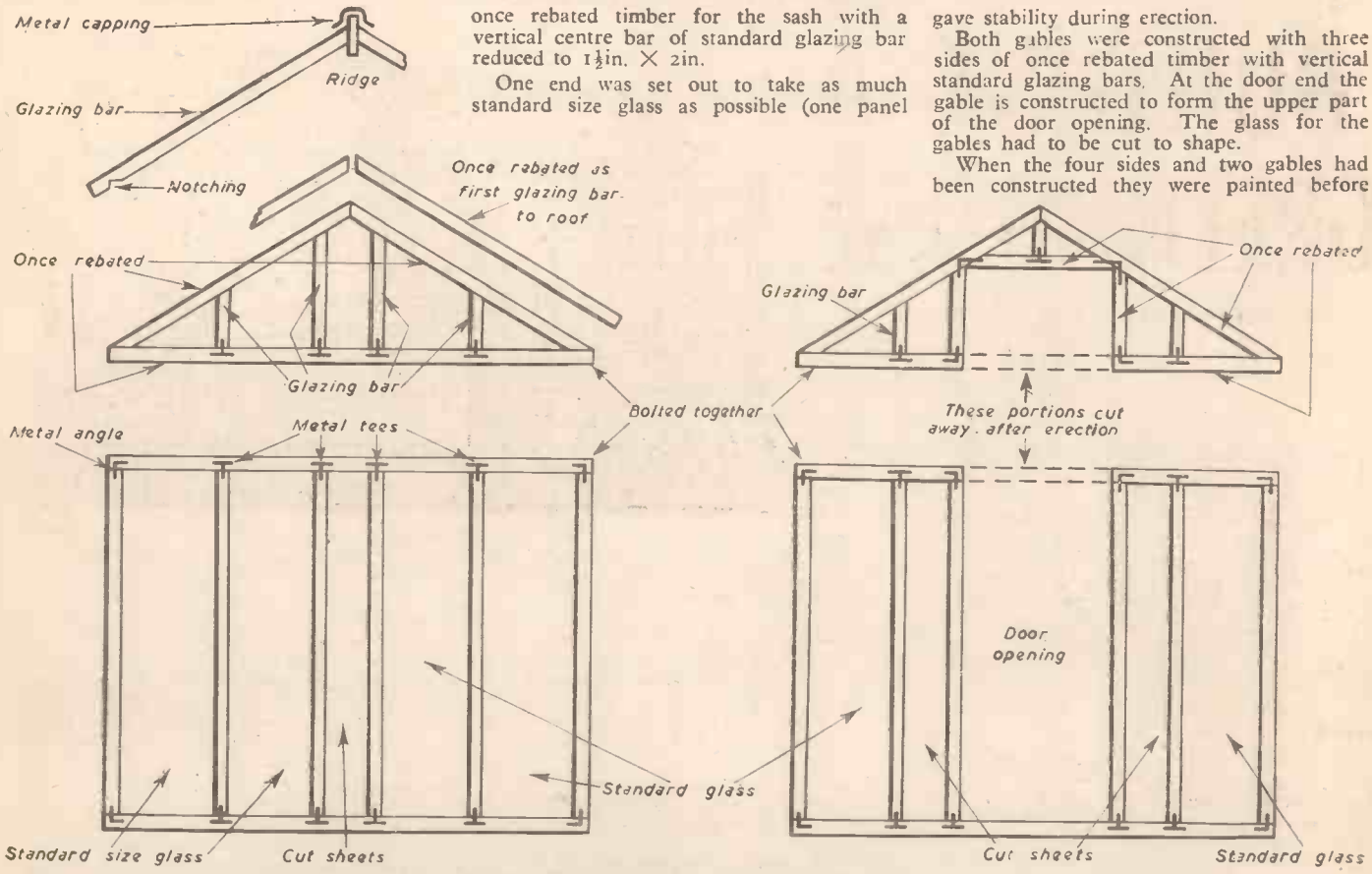
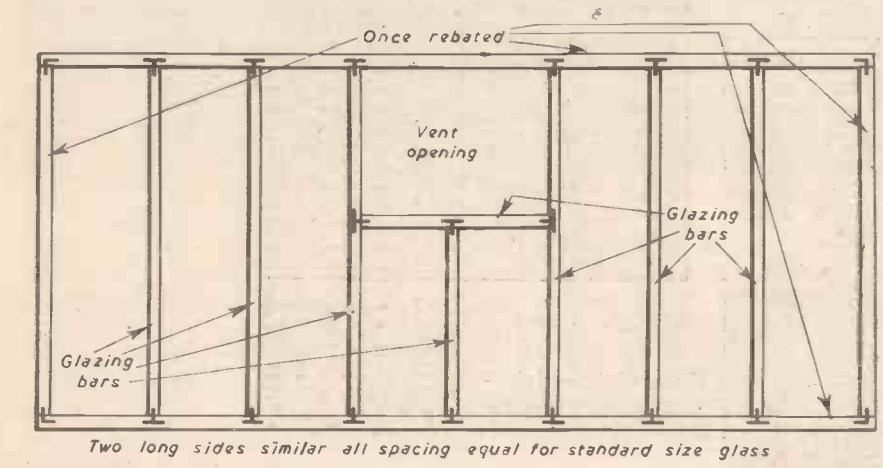


Fig. 5.—How the glazing bars are spaced.





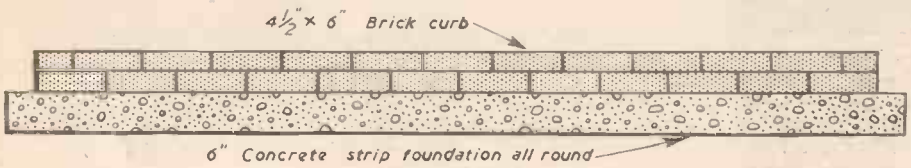


Fig. 4.—Constructional details of the sides, ends gables, concrete strip and brick curb.

screwed to the long members. The other bars were fixed in a similar manner, using the template between each bar, and finally the other end member. The short surplus on the 13ft. lengths was then sawn off. To give additional strength a 3in. nail was driven through the long members into each glazing bar and end member.

Openings for the side ventilators were formed, as shown in Fig. 6, by cutting through and removing a portion of one glazing bar and fixing a horizontal bar with metal tees.

The side ventilators were constructed with normal mortise and tenon joints, using the once rebated timber for the sash with a vertical centre bar of standard glazing bar reduced to 1½in. × 2in.

One end was set out to take as much standard size glass as possible (one panel had to have cut squares) and the other short side was constructed to receive the door. Both ends are shown in Fig. 4.

The door used was a second-hand internal door obtained from a builders' yard for 15s., and the upper panels were cut out and fillets fixed to form glazing rebates.

In the short side with the door opening, the top member and the bottom member of the gable were carried across the opening and then both cut away after erection. This gave stability during erection.

Both gables were constructed with three sides of once rebated timber with vertical standard glazing bars. At the door end the gable is constructed to form the upper part of the door opening. The glass for the gables had to be cut to shape.

When the four sides and two gables had been constructed they were painted before erection. All surfaces were thus protected and the job was far easier than it would have been after glazing. The roof members were also painted before erection. All surfaces were primed and painted with two coats of white lead glasshouse paint. As all glass was backputtied only, no face putties being used, it was considered unnecessary to paint again after glazing.

Whilst waiting for the slow-drying white lead paint to dry the foundation wall was constructed, as shown in Fig. 4. This consists of a 12in. × 6in. concrete (1-8) foundation with a 4½in. brick wall 6in. high. A strip of felt damp proof course was laid on the wall under the bottom timbers of the sides.

Erection

The erection commenced with the four sides being placed in position and bolted together. When glazed their own weight holds them down and they become much steadier. The gables were then bolted on to the short sides and a 1in. × 5in. ridge plate nailed in position.

The roof was constructed *in situ*, each slope commencing from one end with a 5ft.

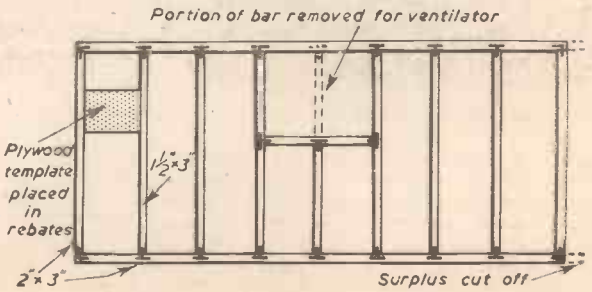


Fig. 6.—Laying out one of the sides and making the ventilator.

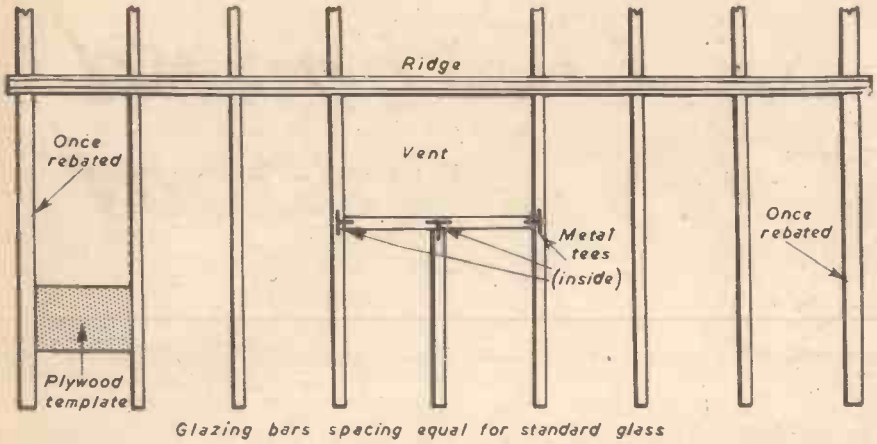


Fig. 7.—A half-plan of the roof.

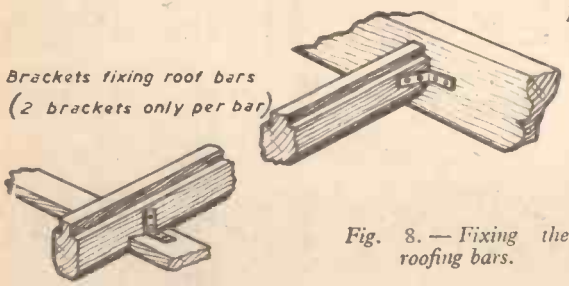
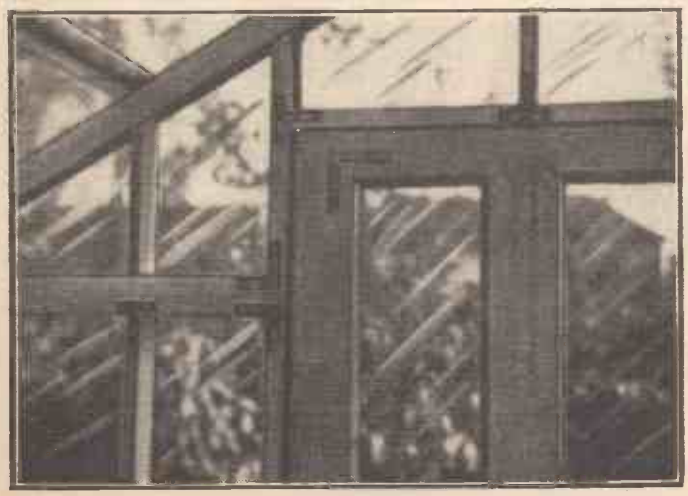


Fig. 8.—Fixing the roofing bars.

length of once rebated timber nailed on top of the gable (see Fig. 7). One 5ft. length of standard glazing bar was then offered up and accurately cut to fit against the ridge and notched over the upper side member.



The first bar was then used as a template to cut the other bars. The bars were fixed with small metal angle brackets commencing from one end and using the plywood template as a guide for spacing. The rebates in the glazing bars are rather small and it was found that the bar could not be nailed accurately enough, so brackets had to be used for fixing (see Fig. 8).

When the roof bars had all been fixed, one bar on each side was cut away and a horizontal bar inserted (with metal tee joints) to form ventilator openings, as shown in Fig. 7. Ventilators were made as previously described for the sides.

The unwanted members across the door opening were cut away and the door hung on three hinges. Battens to form stops were fixed to the door and ventilator frames. A new rim lock was fixed to the door and casement stays to the ventilators.

When the roof had been glazed there was a small gap between the glass and the upper side member and this was filled in with lengths of ¼in. × 2in. batten. The ridge was covered with a strip of thin galvanised iron.

Removable staging in the glasshouse was constructed by using metal angle and tee plates for the joints, as shown in Fig. 9, and the whole construction has proved to be extremely rigid and serviceable. Two further views of the greenhouse are shown in Figs. 10 and 11.

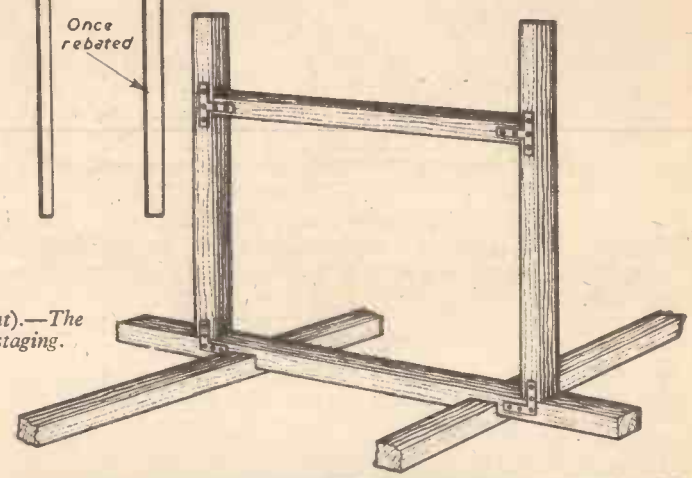


Fig. 9 (Right).—The removable staging.

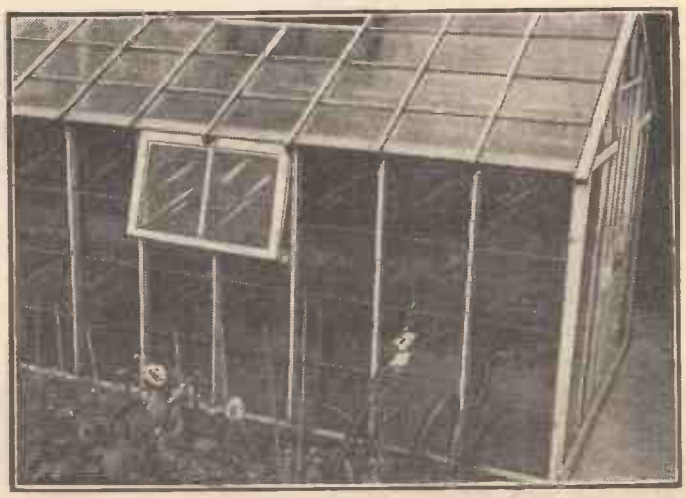


Fig. 11 (Right).—A further view of the completed greenhouse.

Fig. 10 (Left).—A close-up view of part of the door end.

PUZZLE CORNER

AT quite an early age most of us ran into that kind of problem which invariably began "Think of a number . . . double it," and after a series of similar calculations you were told you had the number you first thought of. Here is a rather more ingenious version (worked with an example).

Write down your telephone or house number	4,363
Double it	8,726
Add 5	8,731
Multiply by 50	436,550
Add the year (1957)	438,507
Add the number of days in a year (365)	438,872
Subtract the year of your birth (1933)	436,939
Subtract the number of M.P.'s (615)	436,324

The result is your telephone number and your age this year or in this case the telephone number and age of PRACTICAL MECHANICS.

Can you explain why this should be so?

Only the most elementary algebra is required, with a little rearrangement of the processes which were in the original form purposely mixed up so as to draw a red herring over an obvious sequence of facts.

Let x = telephone number.
Multiply by 2 = 2x
Add 5 = (2x + 5)
Multiply by 50 = (100x + 250)
Add days in the year (365) (100x + 615)
Subtract M.P.'s (615) = 100x

Add 1957 and deduct birth year (which is the same as adding age).

Thus we have the telephone number with two noughts at the end (having multiplied it by 100), and these two noughts are replaced by the figures of our age, or in the case of the example the age of PRACTICAL MECHANICS.

Practically all of the "think of a number" problems can be solved by this simple means.

Building an Outboard Motorboat

A Sturdy All-wood Craft, Ideal for the Week-end

THE method employed in building this craft is technically known as seam batten carvel, that is to say, the planks do not overlap as in the clench-built method, upon which most small craft are built.

Fig. 1.—The motor, rudder bar and propeller assembly.

In this method the planks butt edge on, but owing to the thinness of the material it is not possible to caulk them as would be the case in larger craft.

The seams are therefore rendered watertight by means of a batten running along them inside the boat, and to which the edges of the planks are nailed. This is known as a seam batten, hence the term seam batten carvel construction.

The craft, unlike a round bilge clinker boat, is not built on moulds and subsequently timbered, but is built up on a series of simple frames.

Although falling into a class of craft known as the "flattie," this boat is given a flare on its sides forward, and a tumble home stern which makes it resemble orthodox launch practice. The bottom, too, is curved in a direction fore and aft.

The first job to be taken in hand will be the frames, of which there are six, and numbered consecutively from bow to stern. The frames are made in three simple parts, namely two side members and one floor member.

The sides are made from 2½in. × 1in. mahogany and the floors 2in. × 1in. of similar material. The construction of these frames is a straightforward job, but calls for accuracy and care.

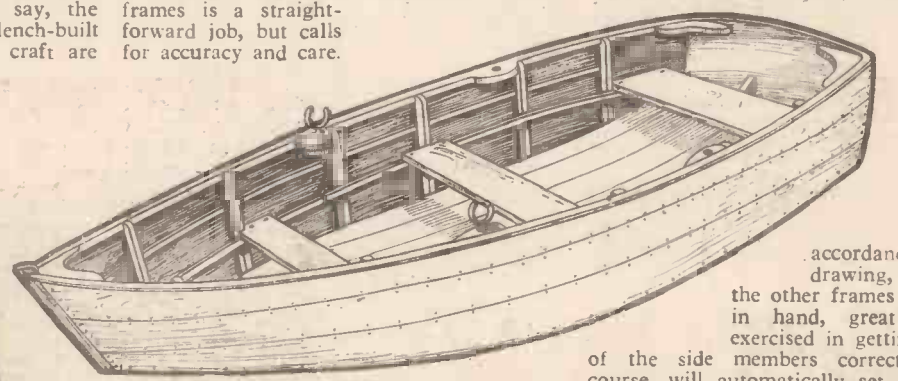


Fig. 2.—A perspective sketch of the finished hull.

The Side Members

The side members are screwed to the side of the floors with brass countersunk head screws, 1¼in. long and number 8 gauge.

Before assembling them, however, it is as well to paint the surfaces which touch in order to preserve them and eliminate rot.

From the drawings of these frames it will be noticed that the sides are not at right angles to the floors, but at varying angles according to their position.

Reference to the drawings will also show that these frames are notched at various points, and it is here that the builder must be most careful to follow the plans, for the ease with which the boat can be subsequently assembled, and its ultimate shape, will greatly depend on the care exercised at this juncture.

Fig. 6 shows the first or No. 1 frame, which can be assembled and notched in accordance with the drawing, after which the other frames can be taken in hand, great care being exercised in getting the angles of the side members correct, which, of course, will automatically set themselves if the width at the top and bottom of the frame is correct.

In setting these side members, it must be borne in mind that the dimensions of the top and bottom of the frame can be correct, and still have the angles wrong, if the structure is, as it were, "askew."

To prevent this, it is as well to tack a batten on to the floor member at its centre and at right angles, and measure from this. To make sure that the angles are correct, it is obvious that each side of the batten will produce equal dimensions, thus we are

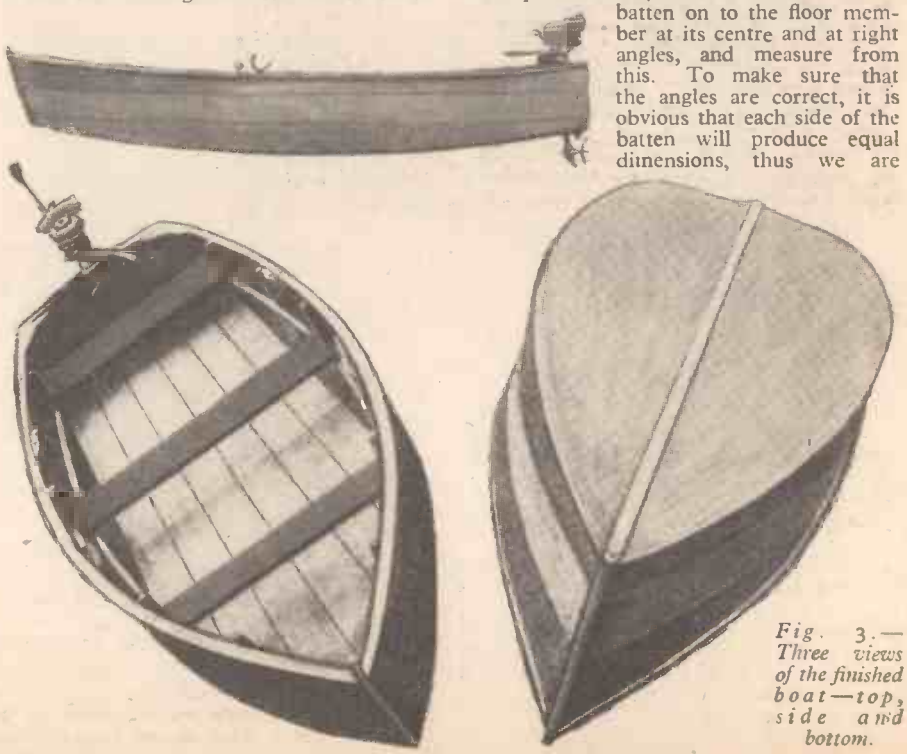


Fig. 3.—Three views of the finished boat—top, side and bottom.

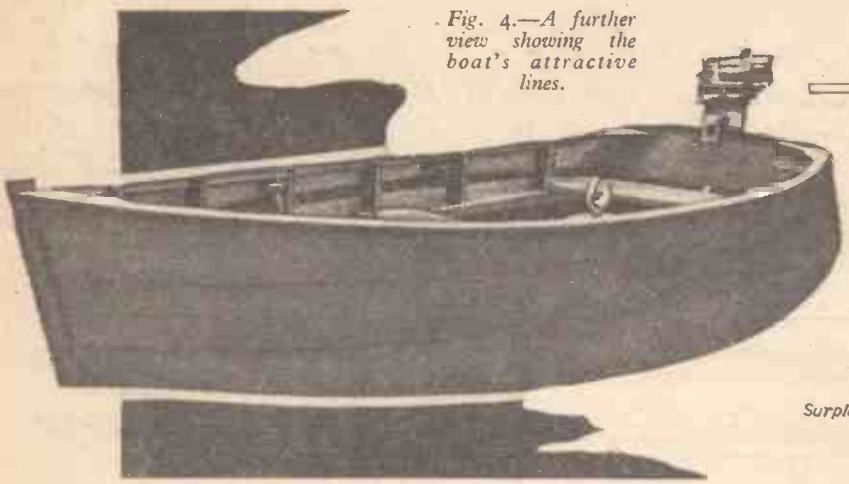


Fig. 4.—A further view showing the boat's attractive lines.

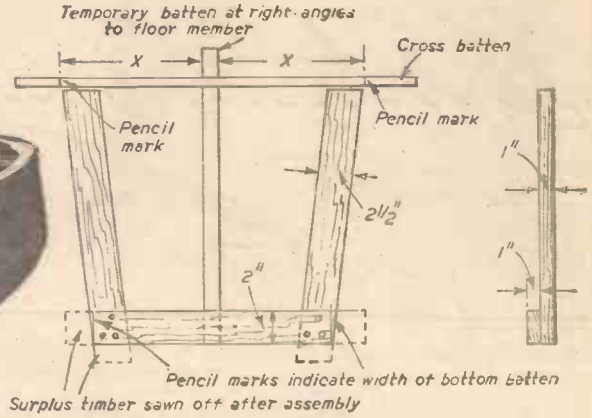


Fig. 5.—Details of the floor members.

working virtually in half-breadths, which is really the customary way in the boat building industry of showing dimensions which refer to the beam or width of a boat.

Fig. 5 shows how this is done, and also shows a simple way to make the frames up without error. It will be noticed that owing to the angles made by the side members with the floors, the ends of any of the pieces used are not square, and therefore to avoid the necessity of marking off all these angles, which differ with each frame, it is better to use pieces of timber a few inches longer than necessary in the following manner.

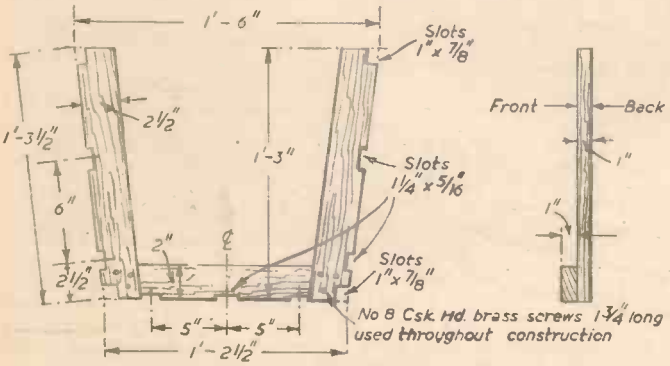


Fig. 6.—Dimensions of frame No. 1.

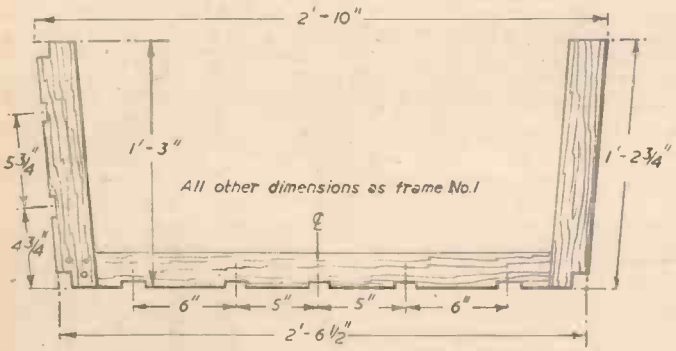


Fig. 8.—Constructional details of frame No. 2.

The Floor

On the floor member mark off the bottom dimensions, which in the case of frame No. 1 is 1ft. 2½in. Mark this off in two half-widths of 7½in. each from a line marked on the centre of the piece of timber. It will now be possible to erect your temporary guide batten at right angles to the floor, and centrally on this line. Next lay the floor member and its batten flat on the bench or other level surface, and mark a point up the batten equal to the depth of the frame, measured, of course, from the extreme bottom of the floor member, which again, in the case of frame No. 1, is 15in. Now tack another batten with its lower edge on this line, at right angles to the vertical batten and, consequently, horizontal to the floor member. If you measure along this batten the width of the frame on top, which it will be seen is 1ft. 6in., again working in half-breadths, and mark these points with a pencil, it is obvious that the outer edge of the side members must cut these pencil marks. In the case of the floor, however, the outside edge of the side batten should cover up the pencil mark, except just at the bottom edge, whilst at the top the edge of the side member should just touch the part of the pencil mark on the lower edge of the cross batten (see Fig. 5).

The side members may now be screwed on to the floor, and any surplus timber sawn off.

This procedure is perhaps a little difficult to grasp, but a little study will show that it can be applied to all the frames, irrespective of their angles, and avoids the necessity of complicating the drawings by giving the angles for each piece of timber used.

In Fig. 5 the notches are, of course, left out so that the construction can be clearly seen. In putting in the screws, care must be taken to see that they are not in the way of the chine slot on the extreme corners.

Figs 8 to 12 show the remaining five frames in which the principle of construction is the same, but the dimensions of slot positions and angles differ in each case, so that the drawings must be carefully studied to avoid error.

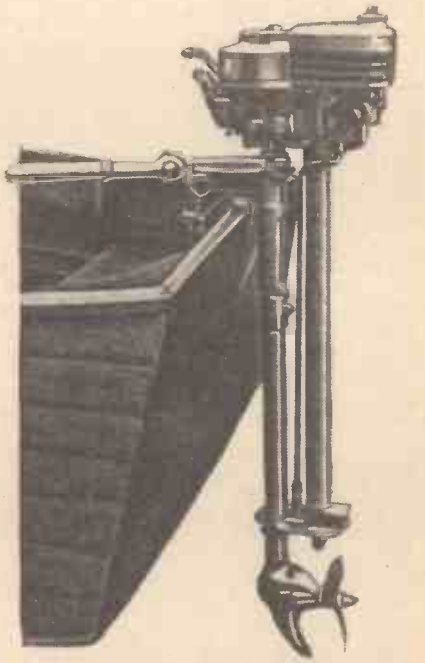


Fig. 7.—Close-up view of the propelling and steering mechanism.

The frames, after construction, may be numbered and laid aside, although a little more work will have to be done on them later on.

(To be continued)

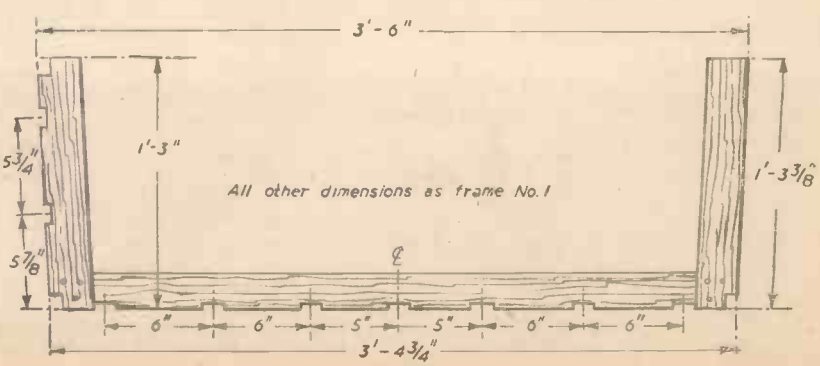


Fig. 9.—Frame No. 3.

A Simple Electric Clock

Details for Making an Accurate Timekeeper

By "HOROS"

AT the outset it will be as well to outline the principle underlying the action of the clock and detail the arrangement of the mechanism and purpose of each part.

Fig. 1 shows diagrammatically the complete mechanism and the way in which the hands, H and H1, receive their motion, whilst Figs. 2 and 3 are intended to give some idea of how the clock will appear when the components have been assembled.

Referring to Fig. 1, A, B and C are three wheels mounted on independent arbors G, N and I. The wheel C rotates once each hour, from whence it follows that the arbor I carries the minute hand H1. Loosely mounted on the same arbor is the "cannon" J, carrying the hour hand H, one end of J is attached to the wheel O, receiving motion through two similar wheels L and L1 and a pinion K; the wheel L is driven by the arbor I. This group of wheels constitutes the "dial wheels."

The wheel C meshes with the pinion E of the arbor N; on the same arbor is mounted the wheel B that meshes with the pinion D carried by the arbor G, to which is secured the ratchet wheel A, driven by the gravity arm Q through the medium of the pawl P. The arm Q is secured to the arbor R, oscillated by a crutch rod S, and which is engaged at every alternate swing of the pendulum T. The combined weight of the arm and crutch rod must be adequate to cause the pawl P to propel the wheel A, whilst returning to their initial position after displacement by the pendulum rod.

Matters are so arranged that when the pendulum swings to the left it displaces S and, consequently, Q in the same direction, simultaneously the pawl P is withdrawn and picks up a tooth of the wheel A. The pendulum commences to swing towards the right, but is now followed up by the crutch rod and arm Q, the energy stored in the arm is now utilised in driving the wheel A one tooth forward, the movement in turn being transmitted through the wheelwork to the hands of the clock.

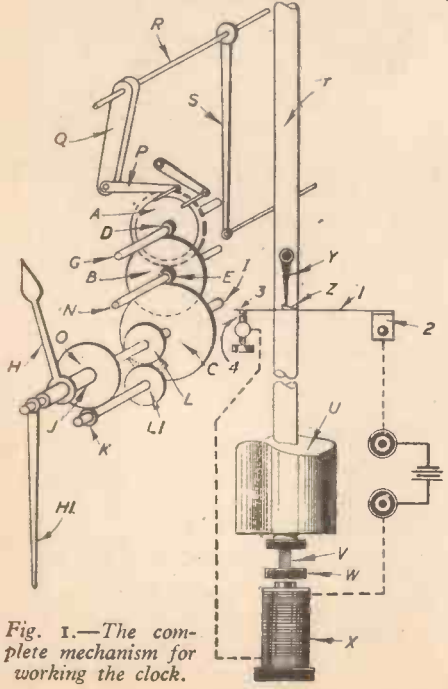


Fig. 1.—The complete mechanism for working the clock.

The Swing of the Pendulum

The scheme for maintaining the swing of the pendulum is as follows. An ordinary wooden pendulum equipped with a heavy "bob" U has a threaded extension V terminating in the armature W. Fixed rigidly beneath the armature is an electro-magnet X, so that the armature just swings clear of the electro-magnet. When, however, the arc of travel becomes reduced to a predetermined value, a small finger or trailer Y, pivoted to the upper portion of the rod T, fails to swing clear of a small, wedge-shaped block Z. This is attached to a light spring (1), one end of which is riveted to a bracket (2), whilst the free end of the spring is equipped with a contact (3), engaging a stationary contact (4). On the return swing of the rod T the finger Y having previously dropped into a nick in the block Z, levers down the spring and momentarily the contacts are closed, and the magnet X is energised. When the contacts close, the leading edge of the armature (W) is just about to pass over the magnet cores, consequently the excitation of X attracts the armature and the pendulum is impulsed. An increased arc of travel of the pendulum results, so that the finger Y is again carried clear of the block Z for several swings of the pendulum.

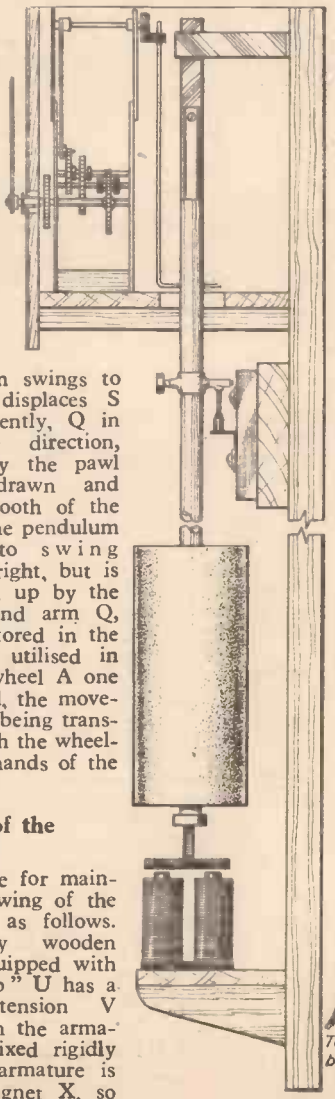


Fig. 2.—A sectional view of the clock.

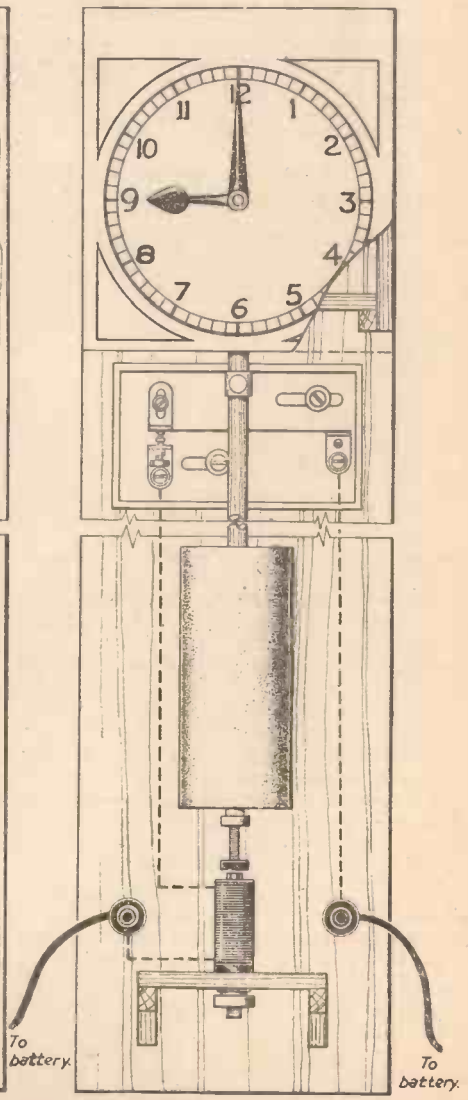


Fig. 3.—A front view of the clock.

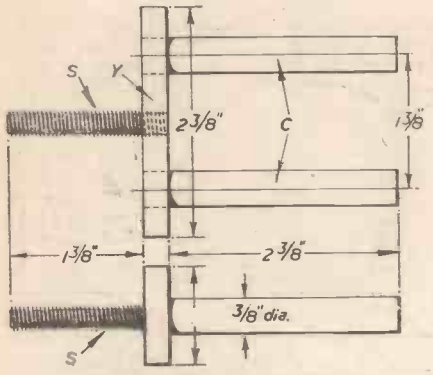


Fig. 4.—The soft iron yoke.

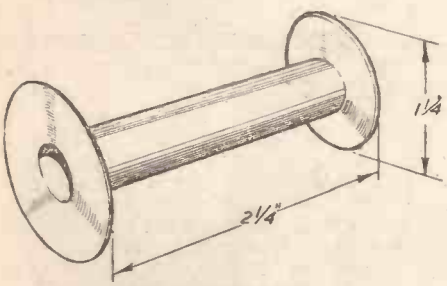


Fig. 5.—The bobbin.

Gradually, however, the swing becomes reduced and the finger again fails to clear the block Z, when the contacts are again closed.

This simple means of impulsing the pendulum is automatic in action and economical as far as current consumption is concerned, and two or three large 1½-volt bell cells should run the clock for several months without any attention whatever.

The Electro-magnet

The soft-iron yoke Y (Fig. 4) has riveted to it the soft iron cores C, the ends of which are shouldered down and are a driving fit in the holes drilled in the yoke.

For securing the electro-magnet in position a screw or piece of threaded rod (S) is riveted to the yoke. Slipped over the cores are the bobbins (Fig. 5), these are wound with the magnetising coils.

The bobbins are easily built up from thin brass tube of a size to fit the cores snugly, and are completed by soldering to the ends of the tube, brass flanges in which a hole has previously been cut for the insertion of the tube. Before winding on the wire, wrap a couple of turns of note paper around the tubes and well brush with shellac varnish. To insulate the flanges, cut some discs of paper, of course, cutting the centre of the disc for the tube; cut through one side so that the discs can be placed on the bobbin and then well brush with varnish. A couple of small holes may be drilled through one flange of each bobbin for threading through the ends of the coil.

Now proceed to wind on each bobbin as evenly as possible about 3½oz. of No. 30 single silk-covered wire; cotton-covered wire may be used. Be particularly careful not to reverse the direction of winding during the process. When the coils are wound, slip them over the cores and connect the finishing end of one coil with the starting end of the other, the two remaining ends of the coils should now be connected to a couple of dry cells to ascertain if there are any breaks in the wire; also, to check the pull of the magnet with a piece of soft iron.

Assuming the test is satisfactory, finish off the coils with a coat of some insulating varnish, and to give a pleasing appearance the coils may be covered with a piece of black velvet.

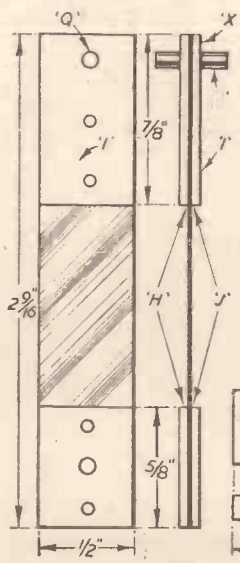


Fig. 7.—The distance piece.

The Suspension Bracket

Two pieces of steel or brass, E and F (Fig. 6) are bent at right angles and drilled with two holes for attachment to the backboard. Inserted between E and F is a distance piece H, a shade thinner than the thickness of the brass at X (Fig. 7). After trueing up the sides of E and F coming against the piece H, the whole is drilled and riveted together, ensuring that the top and bottom edges of the bracket are square and parallel. Carefully cut a "V" notch in the top edge of E and F to receive the suspension pin Q (Fig. 7).

If necessary, file out the cheeks of the bracket until the brass blocks of the suspension spring are a snug fit and will permit the pin Q to rest in the notches.

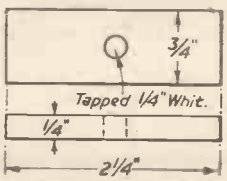


Fig. 8.—The armature.

Armature

For the armature (Fig. 8) use a piece of soft iron. A centrally-drilled hole is tapped to suit the screwed rod attached to the end of the pendulum rod and is locked in position by a nut. It is as well to anneal the iron by allowing it to remain in the fire overnight.

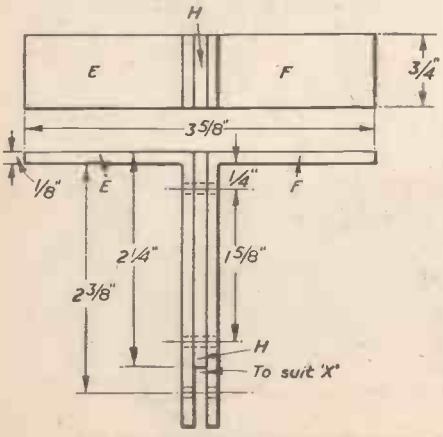


Fig. 6.—The suspension bracket.

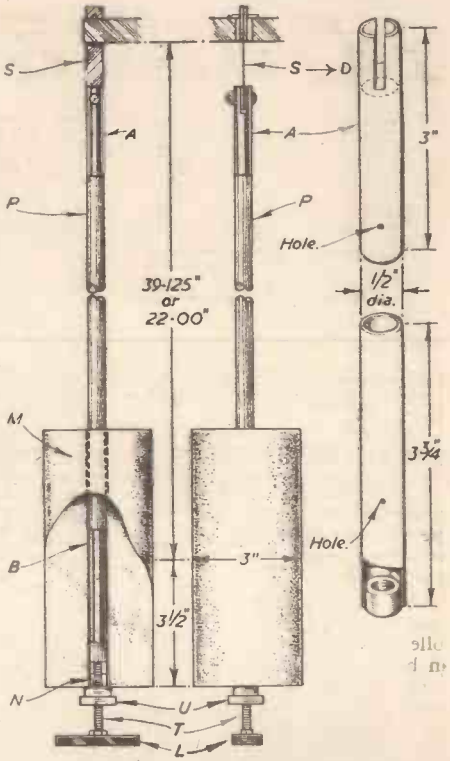


Fig. 9.—Details of the pendulum.

The Pendulum

The pendulum is built up. The main portion P (Fig. 9) consists of a piece of ½in. wooden curtain rod, the ends being fitted into pieces of brass tube, A and B.

The tube A is closed at one end with a piece of brass rod D, slotted to receive the suspension spring S, a small bolt and nut being the means of attachment. The rod is reduced to fit into the tube and a couple of small holes are drilled through the whole to receive rivets made from soft wire.

The tube B is attached to the rod in a similar manner, but before attachment a ¼in. brass collar N (or nut filed down) is driven into the end of the tube and soldered; screwed into the collar is a piece of threaded rod T to carry the timing nut U and the armature L. Sliding freely over B is the bob M which should weigh from 10lb. to 15lb., and may be of iron or lead.

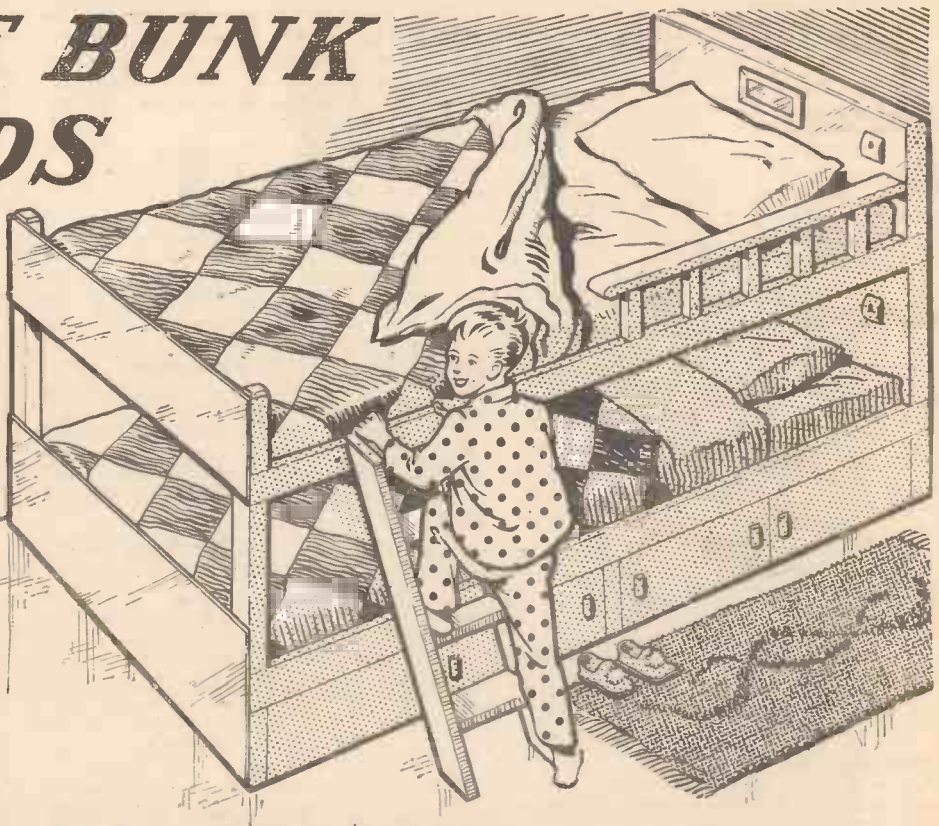
Fig. 7 shows the method of attaching the suspension spring to the brass chocks I by means of small rivets.

(To be concluded)

DOUBLE BUNK BEDS

How to Obtain Increased Space in the Nursery

By C. F. CLARKE



DOUBLE bunks are a great space saver. Children love the novelty, which never seems to grow stale.

The dimensions given in this article were chosen to suit the requirements of a particular room, and each bunk takes the normal 6ft. × 2ft. 6in. single mattress. The measurements may, of course, be varied both as to size of mattress and distance between bunks, but working to the sizes given will ensure a well-proportioned job.

Each bunk has its own electric light, controlled by a switch, so that either or both can be on at the same time. All the wiring connections are enclosed within the head boards, and there is no danger from children's inquisitive fingers.

Soft wood has been used throughout, and the finished work painted to match the bedroom. If hardwood is used, no doubt the thickness of the timber could be reduced, but it should be realised that strength and rigidity are of paramount importance.

The space under the lower bunk can be utilised to suit individual requirements. The writer has simply added four doors on the front, and the space is used for storing suit cases and similar gear, for which there never seems to be convenient accommodation in the average home. Drawers or sliding trays can, of course, be fitted as desired. The main timber requirements are given in the box at the foot of column 1 on the next page.

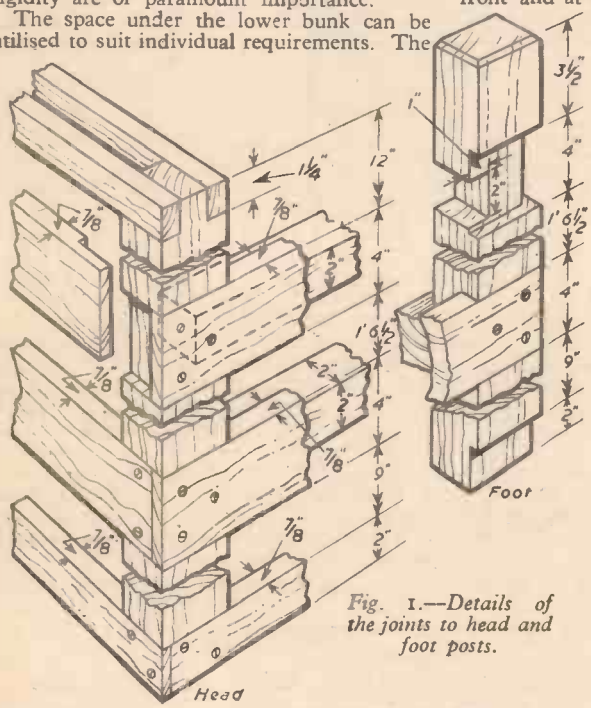


Fig. 1.—Details of the joints to head and foot posts.

Construction

The construction is simple, and all constructional details can be seen in the sketches. All the joints shown in Fig. 1 are glued and screwed, using 12 or 14 gauge screws. Countersink the screws and fill the holes.

Note that the 2in. × 2in. rails on the front and at the head are spaced ½in. away from the flat rails to enable the webbing to be pulled through to facilitate straining (see Fig. 3).

Upholsterer's webbing 2in. wide is used, spaced 3in. apart. The webbing should be interlaced and strained to get it as taut as possible; 45 yards of webbing were just sufficient for the dimensions given.

Electrical Requirements

One two-pin 5 amp. plug and socket.

Two single-pole switches (5 amp.).

Two batten lamp-holders with large bases.

Two pieces Crinothene (or similar material) sufficient to cover apertures in head board.

Two 15-watt bulbs.

The Crinothene (colour to taste) is stuck over the aperture on the inside of the head board. The size is not important, but 6in. × 2½in. hole is adequate. A plywood frame can be fixed round the hole for a neater appearance.

Fifteen-watt bulbs are used. They have proved to be sufficient, and do not develop any great heat, which would be detrimental, being enclosed in the head boards.

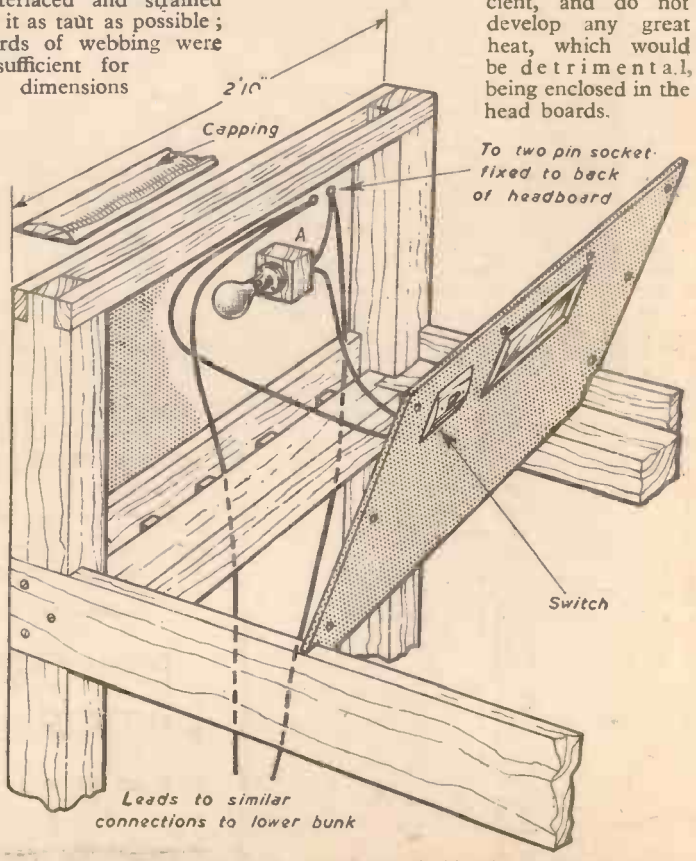


Fig. 2.—The electrical connections inside the headboard.

The wiring is simple, as will be seen from Fig. 2. The two-pin socket and plug allow for the supply to be disconnected when the bunks are moved.

The front side of the head board is screwed on to facilitate bulb changing.

Guard Rail on Upper Bunk

This can be varied to suit individual requirements. The writer used a 1½in. × ¾in. × 3ft. batten for the rail and five ⅞in. square posts 7½in. long. All these joints are dowelled and glued. The position of the rail where it meets the head board should be marked, and the piece of hardboard cut out, so that the head board can be removed.

Ladder

All that need be emphasised here is that care should be taken to get the housings for the steps at the correct angle, and exactly the same on each side. The ladder should be hooked to the side to prevent slipping. Simple hooks can be made from strips of iron suitably bent and drilled (see Fig. 4).

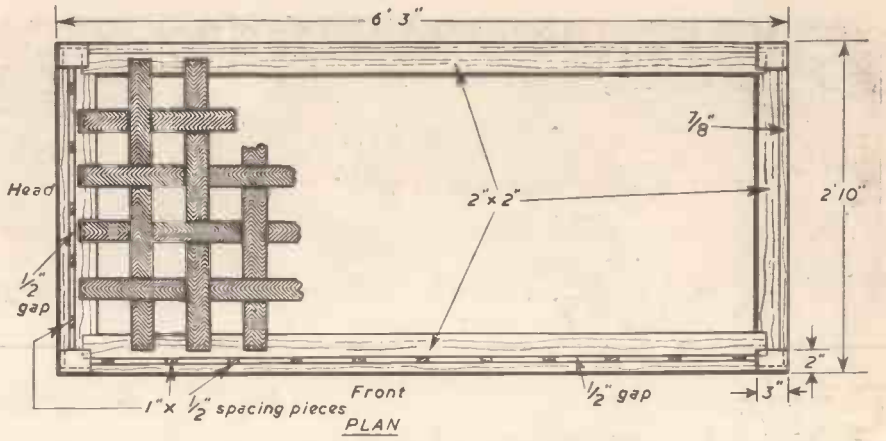


Fig. 3.—Plan of the mattress.

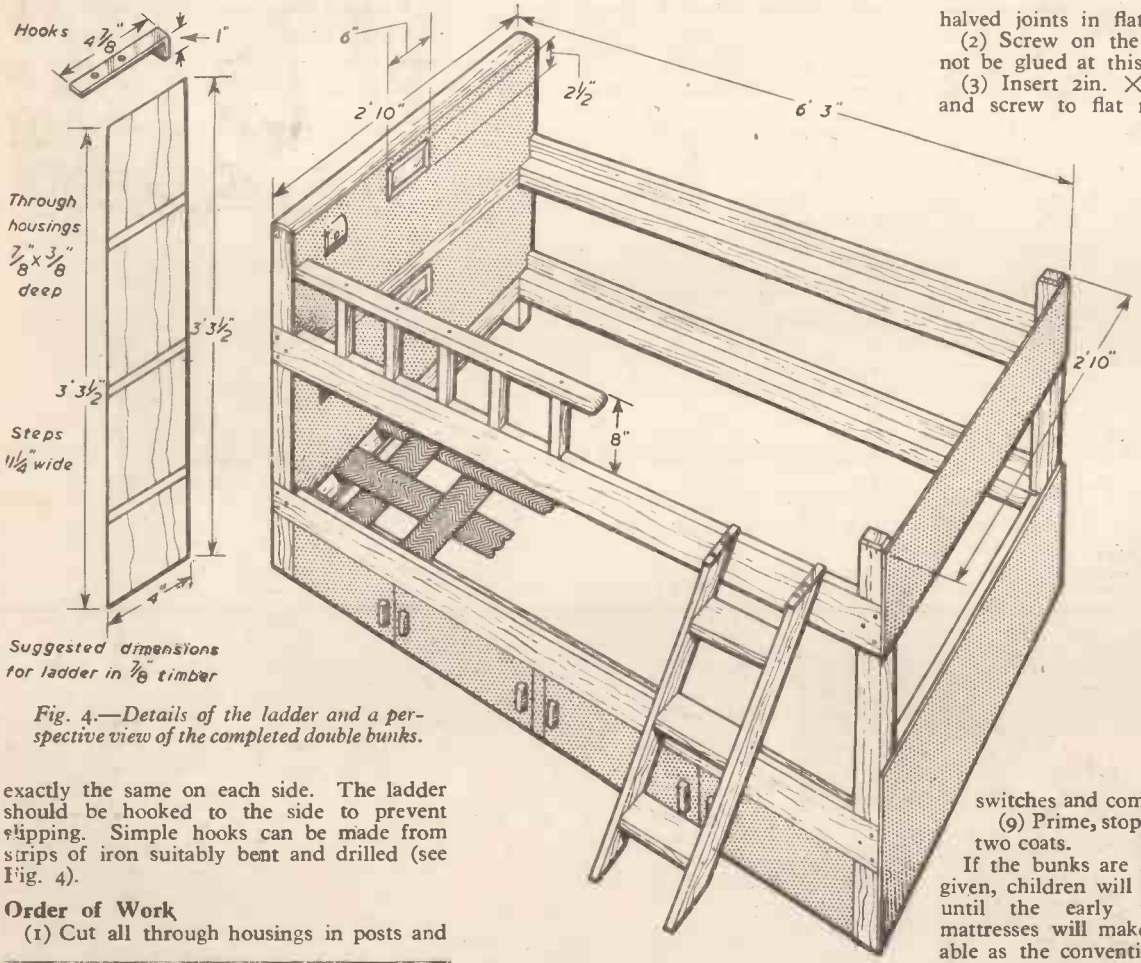


Fig. 4.—Details of the ladder and a perspective view of the completed double bunks.

Order of Work

(1) Cut all through housings in posts and halved joints in flat end rails (see Fig. 1).

(2) Screw on the flat rails (these should not be glued at this stage).

(3) Insert 2in. × 2in. rails in housings and screw to flat rails (with 1in. × ½in. spacing pieces on front and head rails (Fig. 3).

(4) When assured that all the pieces fit, glue all rail joints, taking them off one at a time for this purpose.

(5) Cut hardboard to various sizes and secure in position with panel pins (except front head boards, which should be screwed).

(6) Tack on webbing, using three tacks at each end. Put on long lengths first and then interlace the cross-pieces. All these must be well strained.

(7) Screw batten lamp-holders to wood blocks (A—Fig. 2) and secure to back panel of hardboard.

(8) Cut apertures for lights in head boards, stick on Crinothene, screw on switches and complete writing (see Fig. 2).

(9) Prime, stop all screw holes and paint two coats.

If the bunks are made to the dimensions given, children will be able to sleep in them until the early teens. Good quality mattresses will make the bunks as comfortable as the conventional bed.

Main Timber Requirements

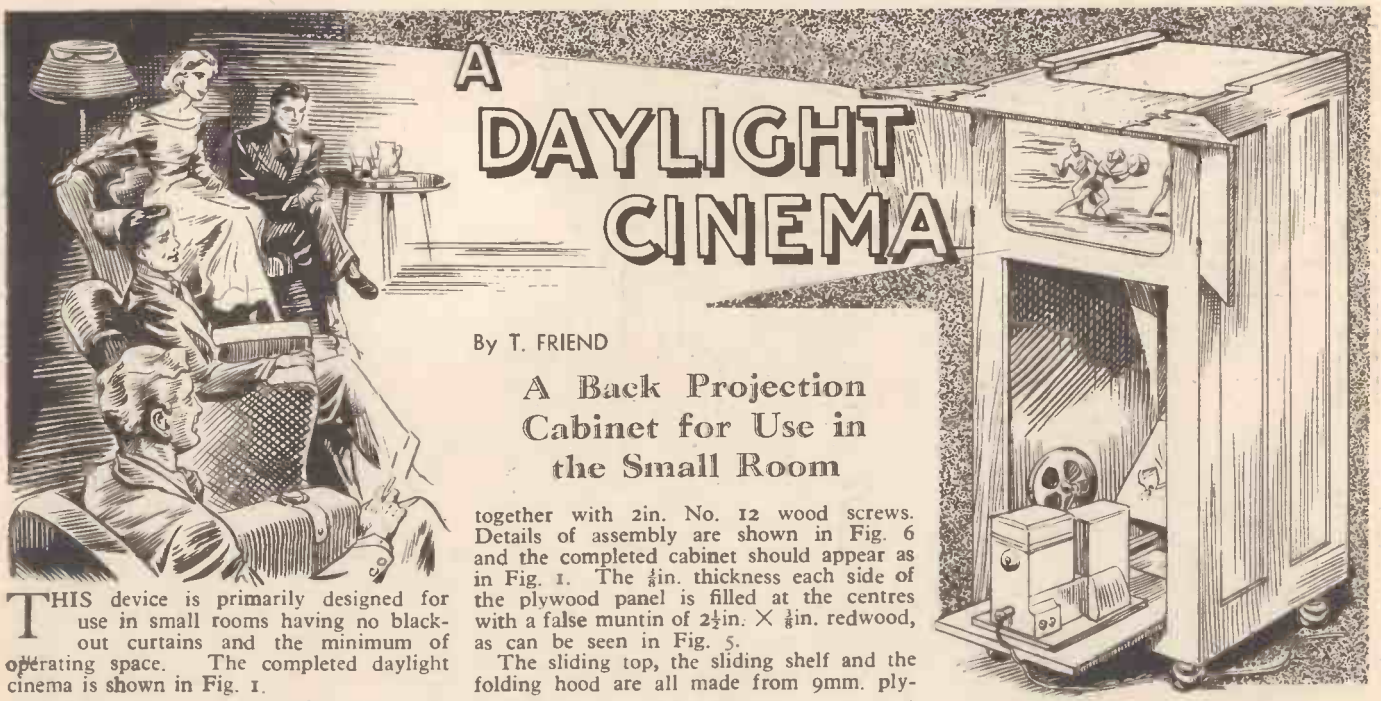
Bunks

2 posts (head)	3in.	× 2in.	× 4ft.	1½in.
2 „ (foot)	3in.	× 2in.	× 3ft.	5in.
4 rails	2in.	× 2in.	× 5ft.	11in.
4 „	2in.	× 2in.	× 2ft.	6in.
4 „	4in.	× ⅞in.	× 6ft.	3in.
4 „	4in.	× ⅞in.	× 2ft.	10in.
2 bottom rails	2in.	× ⅞in	× 6ft.	3in.
2 „ „	2in.	× ⅞in.	× 2ft.	10in.

Ladder

2 sides	4in.	× ⅞in.	× 3ft.	3½in.
3 steps	4in.	× ⅞in.	×	11¼in.

The dimensions for the hardboard to enclose the head, foot and back of cupboard are not given, as they can be measured up when the framework is finished.



A DAYLIGHT CINEMA

By T. FRIEND

A Back Projection Cabinet for Use in the Small Room

THIS device is primarily designed for use in small rooms having no blackout curtains and the minimum of operating space. The completed daylight cinema is shown in Fig. 1.

The Carcase

This is constructed from 3in. × 1in. redwood, dressed to 2⅞in. × ⅞in. and grooved as required on one edge for 3mm. plywood panels. There are seven frames, details and dimensions of which are given in Figs. 2 and 5, and these are fastened together with 2in. No. 12 wood screws. Details of assembly are shown in Fig. 6 and the completed cabinet should appear as in Fig. 1. The ⅛in. thickness each side of the plywood panel is filled at the centres with a false muntin of 2½in. × ⅜in. redwood, as can be seen in Fig. 5.

The sliding top, the sliding shelf and the folding hood are all made from 9mm. plywood to the dimensions shown in Figs. 3 and 4. The knuckles of the door hinges are set back about ⅛in. on the sides of the carcase so that when the door is open the back edge obscures the front edge of the carcase and prevents leakage of light across the screen.

The cabinet is mounted on 3in. solid rubber castors.

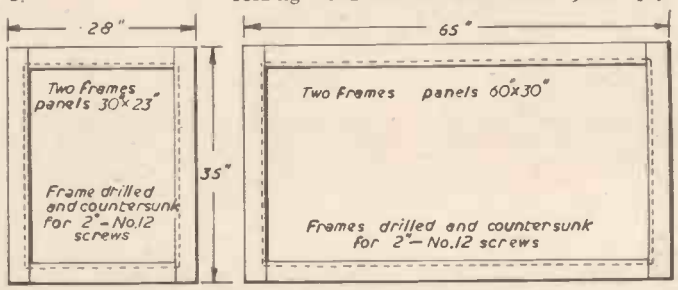


Fig. 2.—Top and bottom and two side frames.

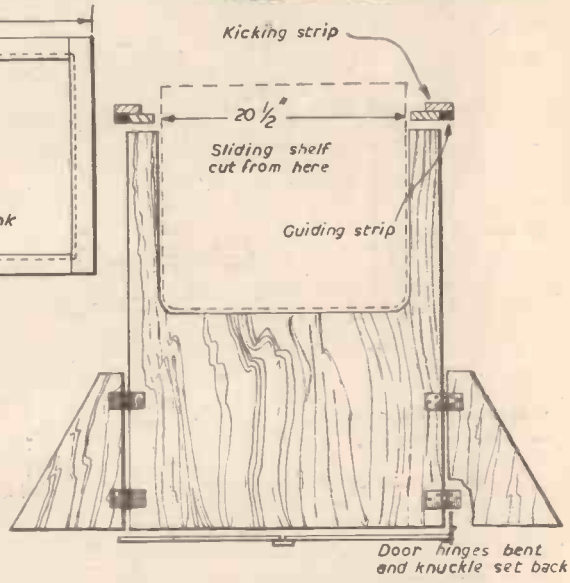


Fig. 3.—Details of the sliding top.

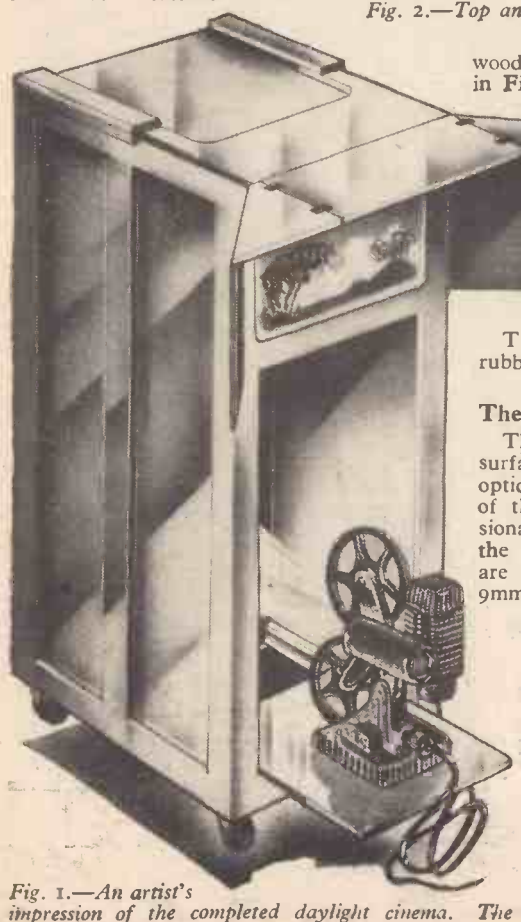


Fig. 1.—An artist's impression of the completed daylight cinema. The sliding top is shown here made in two pieces.

The Mirrors

These are of ¼in. plate glass. They were surface silvered and varnished with an optical varnish made by I.C.I. and the whole of this work was carried out by a professional silverer. The method of mounting the mirrors is shown in Fig. 7. They are mounted on back boards made of 9mm. plywood as shown in Fig. 7 by means of ¼in. thick wood strips. The back boards are fitted with two swivels and four locking bolts each. These fit into the sheet metal

CUTTING LIST

No.		in.	in.	in.	mm.
4	Plainedge ...	65	2⅞	⅞	
6	,, ...	26¼	,,	,,	
6	One Edge ...	65	,,	,,	
8	Grooved ...	35	,,	,,	
4	Centre ...	28	,,	,,	
2	For 3 mm. ...	26½	,,	,,	
4	For Shelf ...	6	,,	,,	
4	,, ,, ...	18	1¼	,,	
2	,, ,, ...	18	2⅞	,,	
4	False Muntins	60	2⅛	⅜	
4	,, ,, ...	30	,,	,,	
1	Plywood ...	60	60	—	9
2	,, ...	60	60	—	3

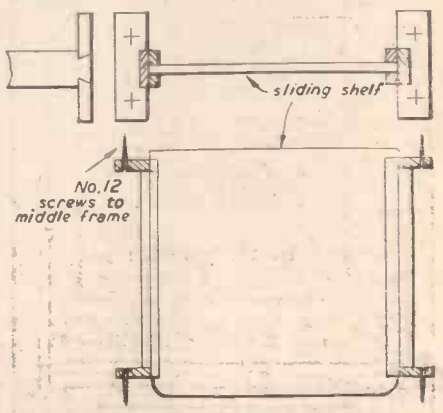


Fig. 4.—Plan and elevation of the sliding shelf. 1 piece 20½in. x 20in. x 9mm. 4 pieces 6in. x 2⅞in. x ⅞in. 2 pieces 18in. x 2⅞in. x ⅞in. 4 pieces 18in. x 1¼in. x ⅞in.

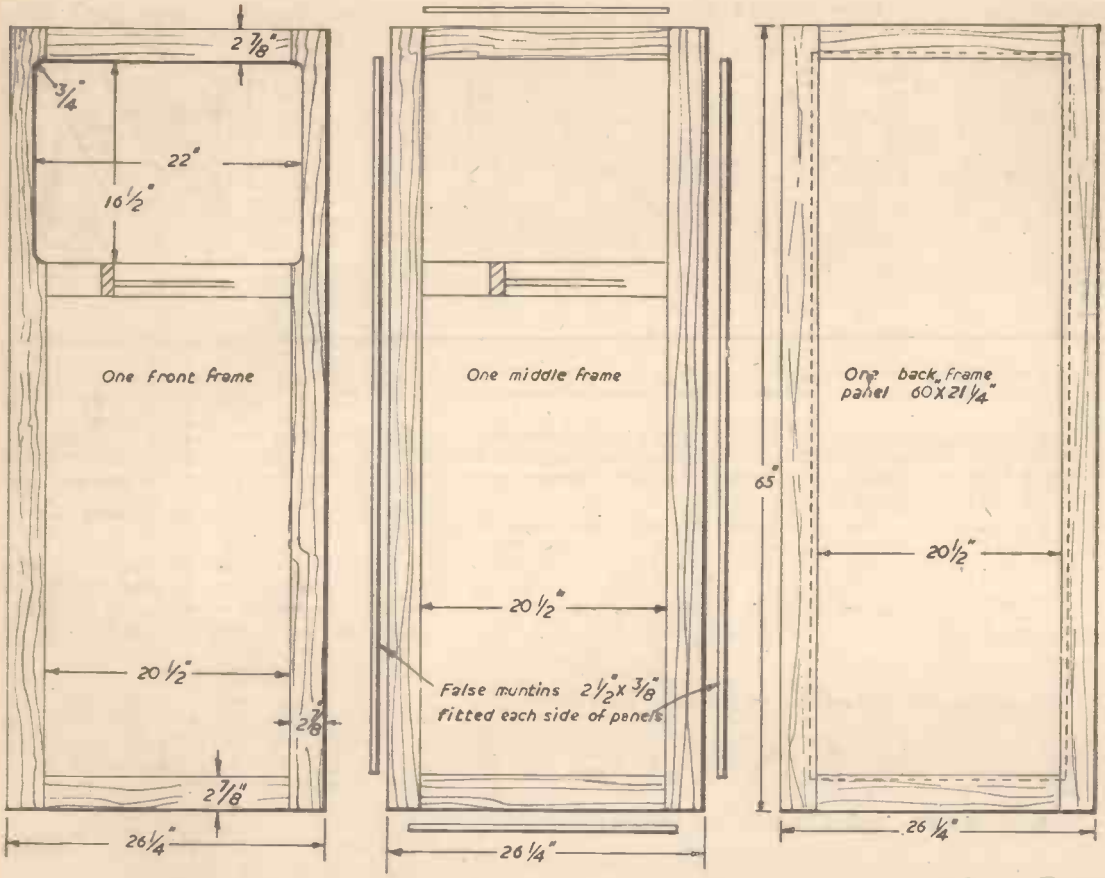


Fig. 5.—Details of the front, middle and back frames.

brackets shown in Fig. 8, each mirror pivoting on its centre swivel and being fixed by the locking bolts, shown in Fig. 9. Final adjustment is by means of these latter and the arc-shaped slots in the brackets.

It is essential that the mirrors are at 45 deg. and no amount of adjusting of one mirror will correct an error in the angle of the other mirror.

The mirror centres must be exactly in line with the centre of the screen.

The Screen

This is made of "Clearlite" translucent screen material supplied by The Perforated Front Projection Screen Co., Ltd., 43-49, Higham Street, Walthamstow London, E.17. The standard sized sheet of material, which is approximately 54in. × 18in., makes three screens.

The edges of the screen, which measures 24in. × 18in., are punched with an office punch at about 3in. centres and the screen is suspended by rubber bands on brass pins on the inside of the screen aperture.

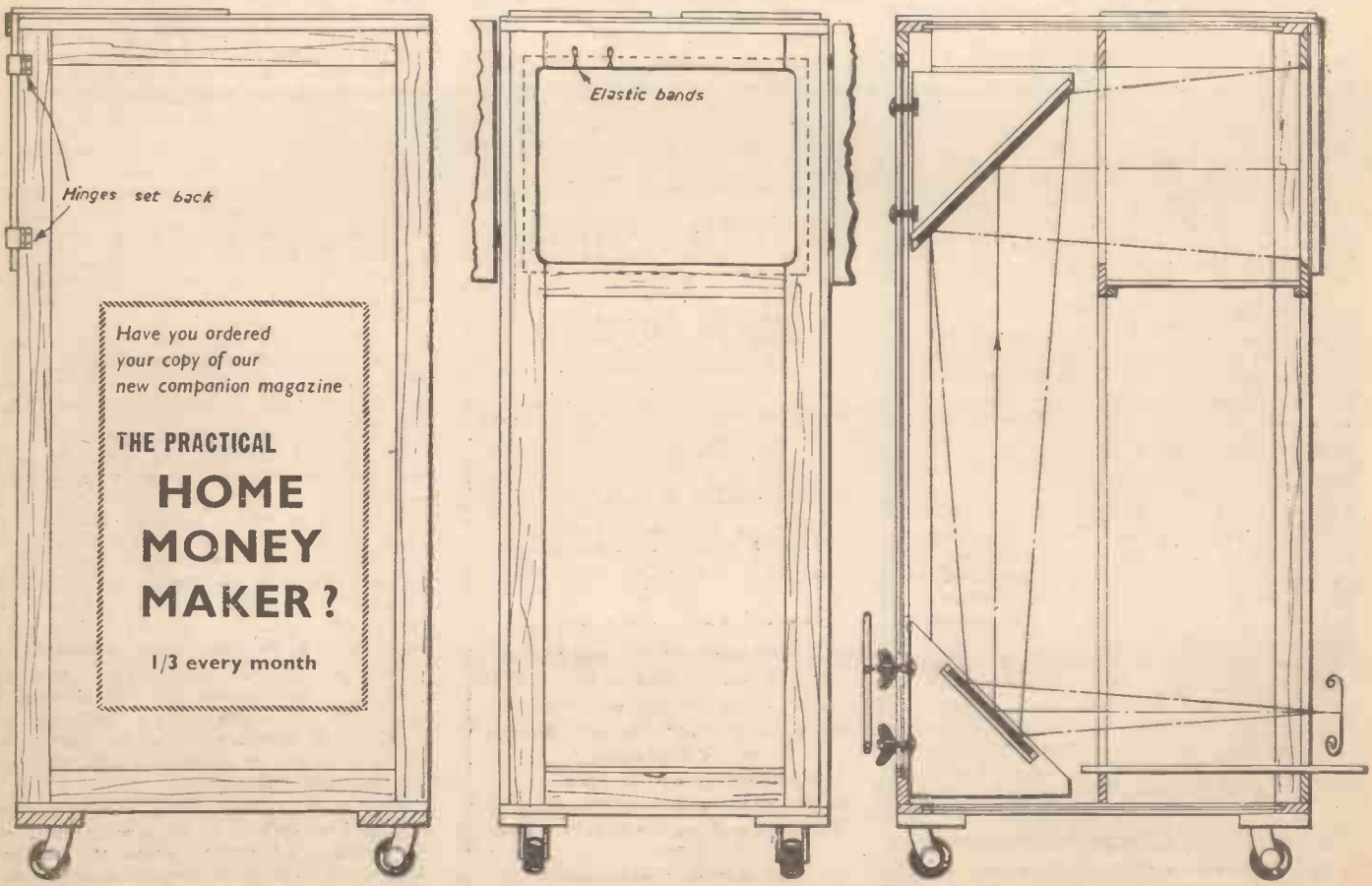


Fig. 6.—Side, front and sectional views of the daylight cinema.

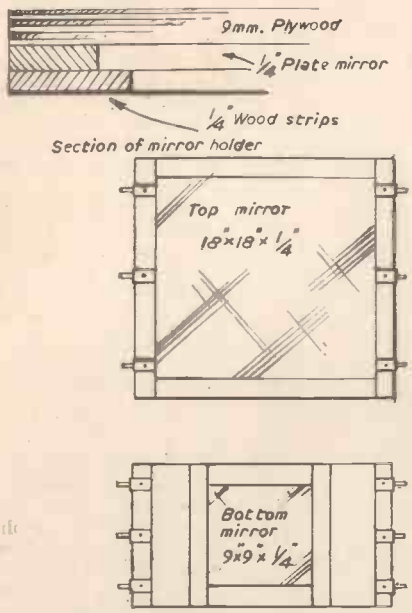


Fig. 7.—Details of mirror backing and pivots.

The slotted shelf together with the slotted holding bolts of the lower mirror provide for some adjustment in the "throw" and for differences in projector heights.

As described, the apparatus is suitable for a 4in. focal length 35 mm. strip film projector or a 2in. focal length 16mm. cine projector. For a 2in. focal length 35mm. strip film and for a 4in. 35mm. double frame projector, a higher shelf must be arranged.

A point the intending constructor should note is that mirrors intended for educational optical use only and not for domestic or office use can be purchased exempt from purchase tax.

The foregoing design was intended primarily to answer a reader's query which appeared recently in "Information Sought," but has been published here as being of interest to all those cinema projection enthusiasts with limited space at their disposal.

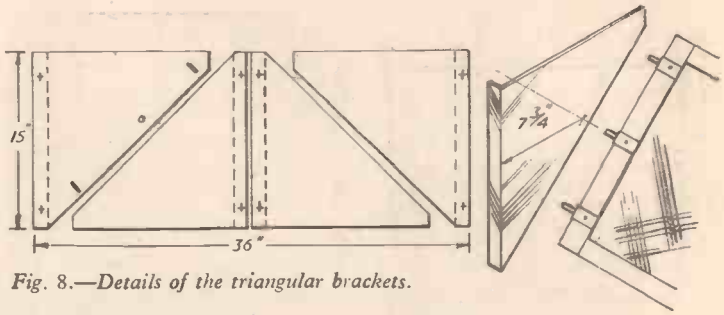


Fig. 8.—Details of the triangular brackets.

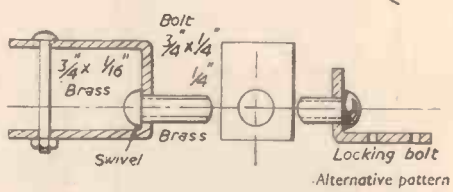


Fig. 9.—The swivels and locking bolts.

The design is intended to act as a basis for experiment as details and dimensions may vary somewhat according to the equipment used and materials available.

GLEANINGS

Tractors for the Norwegian Army

A NORWEGIAN military expert said recently that in these days, when roads could be reduced very quickly to a shambles by long-range artillery bombardment, tractors would be the best means of transport. The modern tractor, like the tank, can travel practically anywhere and can leave the road when necessary.

Power Reactors

THE opening in October of the first power producing reactors in the world at Calder Hall, in Cumberland, was performed by H. M. The Queen. This opening is estimated to be a year ahead of the first American nuclear power reactor.

Underground Bicycle

TO enable miners to travel from the pithead to the working face in German mines, a two-seater pedal-operated cycle on four wheels has been introduced. Made of aluminum alloy, the cycle weighs 66lb. and runs on rails in the mine.

Defective Rail Detection

DEFECTS in the railway track are tested for electronically in the U.S. by means of the Sperry Detector Car. Two petrol engines are used, one to drive the car and the other to power the rail current generators and an air compressor used to operate the pneumatic testing equipment.

Underneath the car, apparatus sets up an electrical field. Induction coils detect fractures, fissures and splits, which are recorded on a continuous paper tape by means of a sensitive pen. By this method defects are spotted without removing the rails and without disrupting the service.

The Electronic Computor Moves In

THE electronic computor is already taking its place in offices of the larger undertakings. The Post Office has recently placed orders worth about £250,000 with two British firms for electronic computer and printing equipment to work out the pay rolls of the 112,000 engineering, postal, telegraph, telephone and office staff in the London area. It is estimated that its use will save up to £100,000.

A Powers Samas electronic computer, went into operation recently in the Regional Accountant's Office of B. R. Western Region. Its job is to compile the paybills of 10,000 railway workers in the Swindon area. The machine is fed with details of hourly rates of pay, varying rates of overtime, details of bonuses and allowances. Then from the gross pay the machine deducts income tax, national insurance, etc., and arrives in the space of only two seconds to net pay.

A Machine to "Face" Letters Automatically

THE Post Office will shortly have a machine that will automatically examine letters presented to it in random order, and rearrange them to form a stack with all the stamps in the top right-hand corner of the letters ready for cancellation of the stamps and sorting. Scientists and engineers at the British Post Office research station have devised this machine, which is to be tested in the Southampton post office shortly.

The machine will have a number of "scanners" which will search for the stamps as the envelopes pass between them. It will then arrange the letters in separate piles according to the corner in which the stamp is found. At the same time, the scanners will differentiate between ordinary letters and those paid at the 2d. printed paper rate, and the machine will separate the two so that they can be dealt with independently. A stamp cancelling unit will be included in the machine so that letters emerge not only "faced" but with the postmark applied.

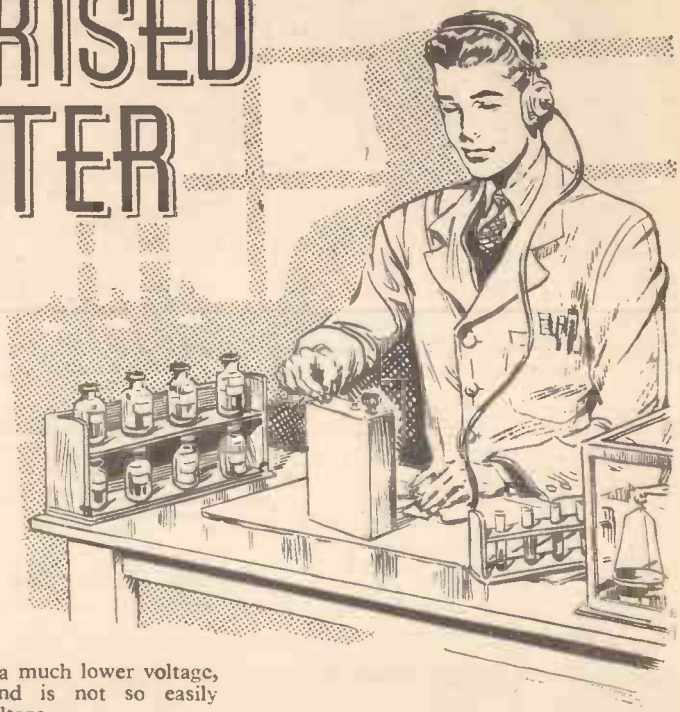
Working in collaboration with Messrs. Harrisons and Sons, the printers of postage stamps, the scientists have now evolved a new technique which involves the use of stamps in which an electrical conductor is incorporated. A high voltage electric discharge penetrates the stamp as the letter passes through the machine and, traversing the electrical conductor, causes a "recognition" signal to be given to the machine.

The electrically conducting substance applied to the stamps is "Naphthadag," which, for the purpose of the Southampton trial, will be incorporated in the stamps in one or two lines, each about 1/32in. wide on the back under the gum.

Naphthadag-treated stamps will be put on sale in Post Offices in an area centred on Southampton a few weeks before the machine is ready to operate, so that the stamps have plenty of time to come into general use before the experiment starts.

A TRANSISTORISED GEIGER COUNTER

Constructional Details of a Radiation Monitor



THE average commercial radiation monitor is primarily a measuring instrument, and is necessarily bulky and expensive. For simple purposes, such as the initial detection of the presence of uranium, a cheap and small counter can be made with one transistor.

Fig. 1.—The geiger counter in its case.

Circuit Details

The circuit is shown in Fig. 2. A Mullard OC72 transistor oscillator converts the 4.5 volts of the torch battery to A.C. in the primary of the high step up radio transformer. The output of this is multiplied and rectified by the chain of capacitors and selenium rectifiers to give 400 volts for the Geiger-Muller tube, which is a 20th Century Electronics type G5H halogen quenched tube. This tube was chosen in preference to the cheaper alcohol-quenched tube because it operates at a much lower voltage, has a longer life and is not so easily damaged by excess voltage.

In the interest of economy and simplicity no automatic voltage control is provided. Instead, a variable resistor R3 controls the current to the transistor.

The 400 volts supply is applied to the G-M tube with the anode connected to the positive side. The anode in this tube is the centre wire and the connecting pin on the base is marked "A." When a gamma ray penetrates the tube and causes ionization, a pulse of current flows which is limited by the resistor R4. Capacitor C3 is charged up and a click is heard in the headphones. The headphones should be high-impedance types and the amplitude of sound depends on the size of C3. A larger value than 100pF produces more noise but allows larger pulses of current to pass through the G-M tube, with deleterious effect.

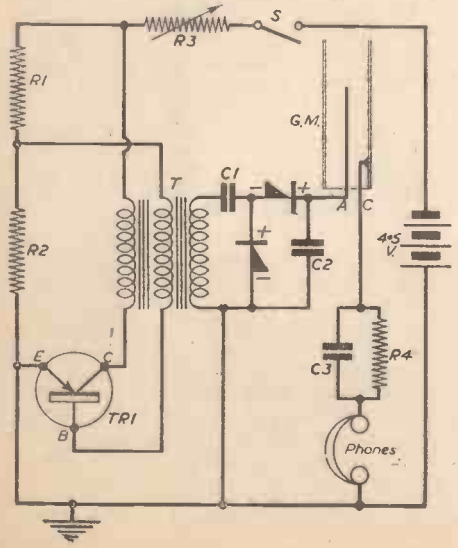


Fig. 2 (Left).—The theoretical circuit.

Constructional Details

The unit is constructed on a metal chassis that is joined to the lid of a metal box. The whole unit is made of 22 gauge tinplate. The outside dimensions of the box are 4½in. × 1⅛in. × 5¼in. and a view of this is shown in Fig. 1.

A wiring diagram is shown in Fig. 3. The components are mounted on tagstrip which can be conveniently soldered to the chassis by the feet. If no facilities are available for cutting and bending sheet metal a plywood or Perspex sheet box would be quite suitable. Attention should be paid to good insulation of the voltage multiplier. Good capacitors should be used; wax-covered types are suitable only if perfectly clean on the outside. The Geiger-Muller tube is held in position by a capacitor mounting clip with the flanges cut away, or by a Terry clip. Sponge rubber sheeting is used to surround the tube at the mounting point to reduce vibration. Clips for connection to the pins are obtained from the sockets used in

(*Concluded on page 80*)

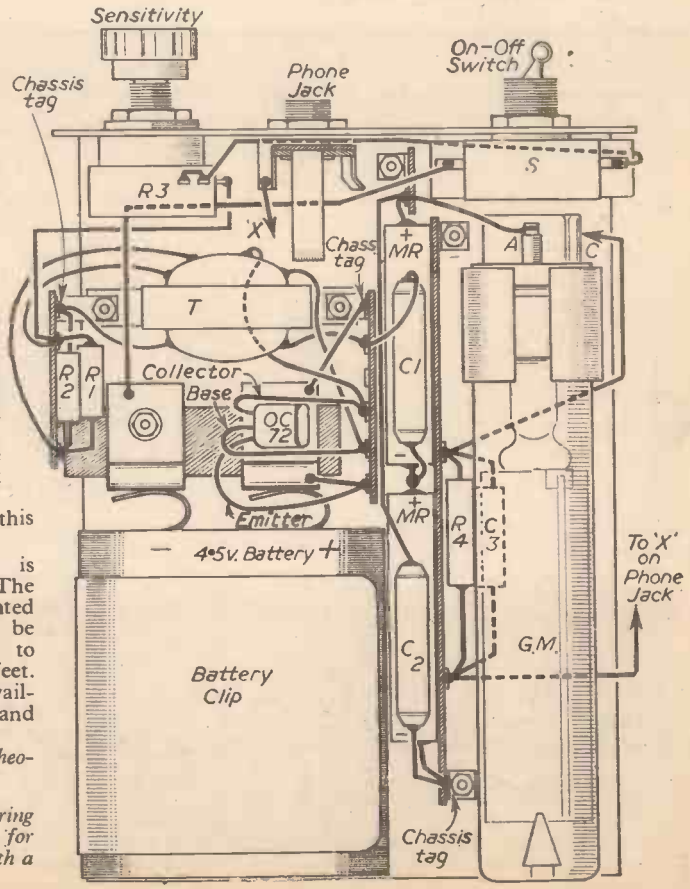


Fig. 3 (Right).—Wiring details. The collector for the OC72 is marked with a red spot.

A large Ukulele

The Tonal Qualities of this Chord Instrument Compete With Those of a Guitar

By A. POWELL

IT is the new shape which facilitates construction. There is no difficult bending of thin wood to form the sides. Straight strips of wood are used, which require only to be mitred at the corners. Although the side strips are cut from ¼in. thick wood (the side strips on conventional-shaped ukuleles are often cut from veneer 1/16in. thick), this has very little effect on the resonance of the instrument.

The model has an excellent tone—in fact, its tonal qualities compete with those of a guitar. It is a pleasure to use the large ukulele. The many delightful, harmonious chords produced by ordinary-sized ukuleles are much amplified by the larger instrument

One can, too, owing to the length of the steel strings, get a more sustained chord.

Front and Back Shapes

The elevation in Fig. 1 gives a good idea of the size and shape of the instrument. It also gives the names of the various parts. The original model was made from scrap plywood and deal. The pegs, however, require to be made from hardwood; soft deal is useless. Alternatively, it should be possible to purchase a set of four pegs, such as, for example, violin pegs.

The front and back of the instrument body should be cut from ⅛in. plywood. In the prototype a cheap "backing" plywood (alder) removed from an old cabinet was employed. It was somewhat rough and knotty in places, but after glasspapering smooth, with all crevices filled with plastic wood, it took an excellent polish, including the deal handle, head and body sides.

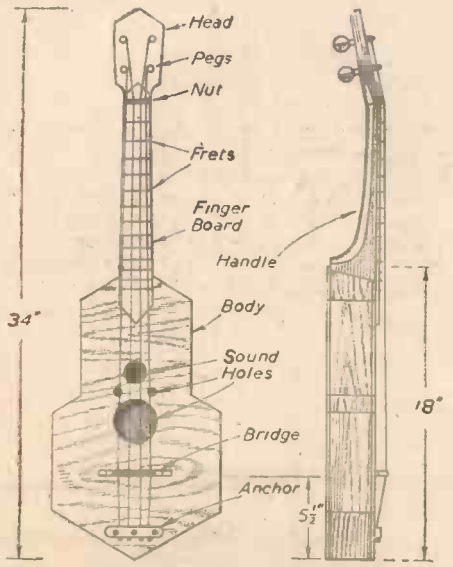


Fig. 1.—Front and side elevation showing the main parts.

Drawing the shape of the body front and back is all compass work, as shown in Fig. 2. It is largely a matter of ruling a line, ticking off the length (18in.) and then setting the compasses to scribe a 6in. radius. Without adjusting the compass, two further radii lines are scribed (see dotted lines), these lines, giving the "corners" of the shape where they pass through the 12in. circle.

The top half of the shape is found by setting the compasses to scribe an 8in. circle. Having obtained the shape of the front piece scribe the sound holes, then cut the wood

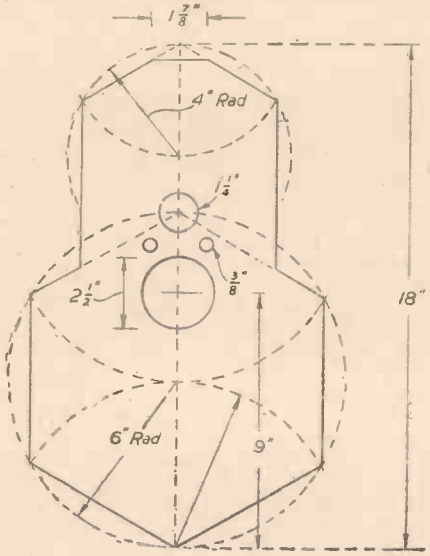


Fig. 2.—How to mark out the front and back piece.

to shape with a fretsaw. The shape can be cut with a fine panel saw, if the fretsaw is not available, the sound holes being made with suitable centre-bits which, by the way, should be used at both sides of the wood to make clean-cut holes. The back shape is identical to the front piece, except that it is pointed at the top and not made flat like the front. The back, of course, is minus sound holes. The front piece, when cut, can be used as a template for marking out the back shape.

Handle and Head Construction

The most difficult part about the construction of the ukulele is the handle and head. The latter has to be dowelled at an angle to the handle, following which the handle has to be built up to thickness.

The best way to go about the job is to prepare the handle and head shape from ⅞in. deal. The head (see Fig. 5) is not shaped up until it has been dowelled to the neck end of the handle. Have three ¼in. dowel stumps in the joint, as shown in the section. Use a hot liquid glue, such as Scotch glue.

While the joint is setting, build the handle to thickness at the shoulder end. This is done by rub-jointing on a 9in. and 5½in. length of ⅞in. wood (see dotted lines in Fig. 3). When the glue has set, the handle and its thickening pieces are roughly cut with a knife, and planed to an angle, this being seen in the shoulder section.

When bevelled, mark out the side shape in pencil, cut away the waste by paring, then bevel the underside of the work in the manner indicated, using a penknife, rasp and spokeshave. Note that the underside of the head is cut to taper about ⅜in. thick at the tip.

The Peg Holes

The four peg holes are bored with a ¼in. bit, then "reamed" via the underside with a tapering round file of suitable diameter. This is to make a "tapered" hole so that the pegs will obtain the maximum grip. After tapering, it is advisable to countersink the "rims" of the holes a trifle at each side, using a rosehead countersink bit or a "poke" of glasspaper.

Fixing the Front

Before the body front can be attached to the surface of the handle at the shoulder end, a ⅛in. deep recess must be cut here so that the front will lie flush. The recess is 3in. in length.

Both the front and back body shapes should be cut from the plywood so that the grain runs across and not along the length. In other words, the grain runs crosswise with the length. This is advised in case the plywood is flexible in the centre.

A straight central pencil line should be ruled along the surface of the handle, and the body front piece. The latter is attached to its recess with glue and panel pins. Look

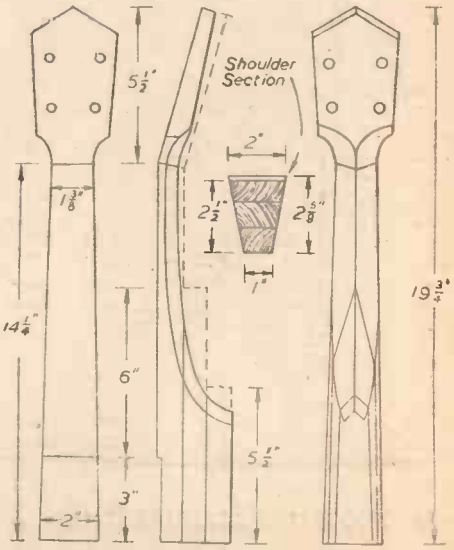


Fig. 3.—Constructional details of the handle and head.

along the length of both parts at eye level to ensure that the straight lines are in alignment, or else test with a straight-edged piece of wood, or by applying a stretched string. This test is essential; if the parts are not in true alignment, the strings will not be properly stretched over the finger board.

Adding the Side Pieces

A piece of deal 4ft. by 2½in. by ¼in. will now be required. This provides sufficient material for making the body sides. In case of difficulty, a length of 3½in. wide by ⅛in. thick tongued-and-grooved board (sheeting) could be bought, free from cracks and knots as far as possible. The wood is cut to width, gauged to ¼in. thick, then reduced by planing. It can be done easily enough with a smoothing plane, this allowing for any slight curvature in the wood.

Beginning at the bottom end, cut, mitre and attach two 6in.-long strips. A 60 deg. mitre block would be handy, but by having the strips cut squarely to size, the ends can be pared to the approximate degree of angle with a sharp wood chisel, then "trued" by trimming with a metal block plane.

The strips are glued and pinned to the interior side of the front.

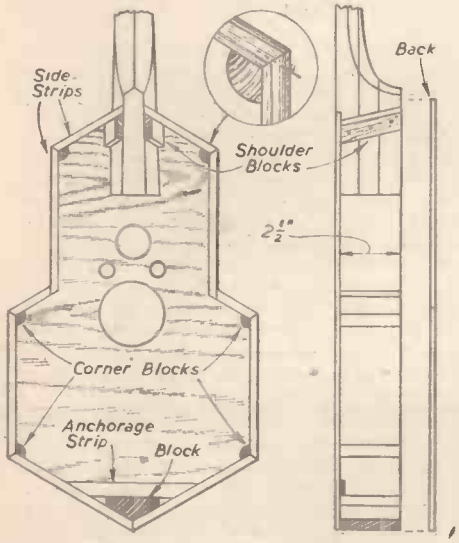


Fig. 4.—How the side strips are mitred around the front piece prior to adding the back part.

The work should lie on a flat surface. Continue to add the pieces until the shoulder end is reached. Here, owing to the bevel in the handle shape, care will be needed.

To ensure true fitting, place the back shape temporarily on the work. Rule a guide line from its top end to the end of the front. Attach corner blocks, keeping them 5/16in. inside to allow for the thickness of the side pieces (see constructional side view in Fig. 4). When all the sides have been attached, glue in the corner blocks as shown. When the glue sets, trim the wood and attach the back, but not before an anchorage strip is stuck to the inside of the front at the bottom, this strip being about ¼in. thick.

The Finger Board

The finger board is cut from 3/16in. birch plywood or plain wood, and should measure 15in. × 2in. Mark off the top "nut" piece, then the fret positions, using a small set square for the latter. It is then cut to the shape shown.

Glue the finger board on the handle so the nut end is level with the neck joint. If the wood has a tendency to rise, bind it on with tape. Nails should not be used.

While the glue is drying the body could be cleaned up. All nail heads are sunk with a punch and filled with plastic wood. Edges are trimmed, then the whole rubbed smooth with glasspaper.

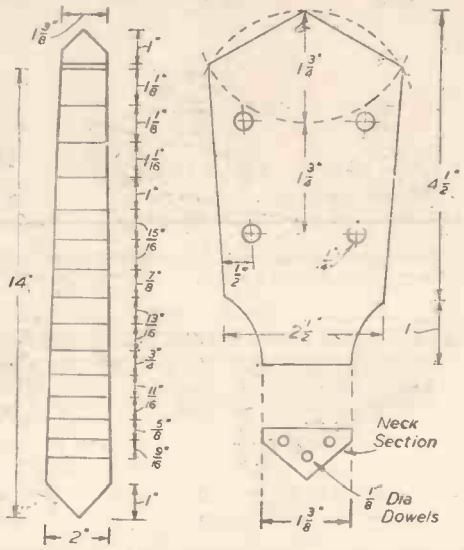


Fig. 5.—The finger board, with details of head.

Nut and Frets

The nut is a piece of bone or celluloid buckle measuring 1⅛in. × ⅛in. × ¼in. It is rounded at the top edge, then filed to make four string nicks (see Fig. 6). The prepared nut is attached behind the finger board with glue and its backing piece (see Fig. 7).

The frets are strips of black celluloid, about 1/16in. thick by 3/16in. wide. These strips are embedded in saw-cuts ⅛in. deep. The saw-cuts are best made with a small hacksaw. However, to ensure neatness, the guide lines should be scored with a penknife, then "pared" slightly at an angle to make a groove for the hacksaw blade.

When fret positions are cut, tap in the fret material. Thin sheet brass could be used for frets, of course. The frets are—or should be—a force fit. When fitted, level them off with fine glasspaper held in a flat piece of wood. The frets should stand 1/16in. proud and the strings should "clear" them by 1/16in.

Anchor, Bridge and Pegs

Instead of having the strings anchored to the bridge which results in a permanent fixture, and precludes adjustment along the "belly" of the instrument, the strings are attached to an anchor glued and screwed down.

The anchor is made from a strip of hardwood 3⅛in. × ⅜in. × ¼in., as shown in Fig. 6. It is bored for three fixing screws, and four 1/16in. holes made through the edges for the strings.

While three roundhead screws may be used it is better to use countersunk screws. The position for the anchor is shown at Fig. 1; it must be central with the body.

The pegs are cut from ⅜in. hardwood, then shaped as shown. The string holes should be ¼in. from the top.

The bridge is cut to shape from ¼in.-thick hardwood, as shown. A 2½in. piece of ⅛in. dia. brass rod fits into the top recess tightly. The rod is filed to make string nicks ⅜in. apart.

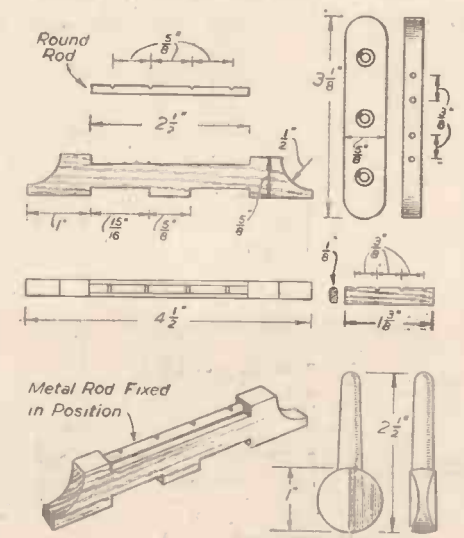


Fig. 6.—The bridge, anchor, and details of nut and pegs.

Finishing

To finish off the woodwork, apply (with a soft brush) a thin coat of light walnut french polish to all parts of the work and allow to dry. Following this the wood is rubbed down with a fine grade of glasspaper. Brush on a second coat, allow to dry, and add a third application.

This applies to all the work with the exception of the finger board. The surface of this must be several shades lighter. Following the third application, rub it down with fine glasspaper, then finish off by rubbing on a very thin polish.

The rubber is a piece of soft linen wrapped around a pad of cotton wool. Make the pad a conical shape so that it can reach all corners. You will find that polishing is much easier when the polish is thin.

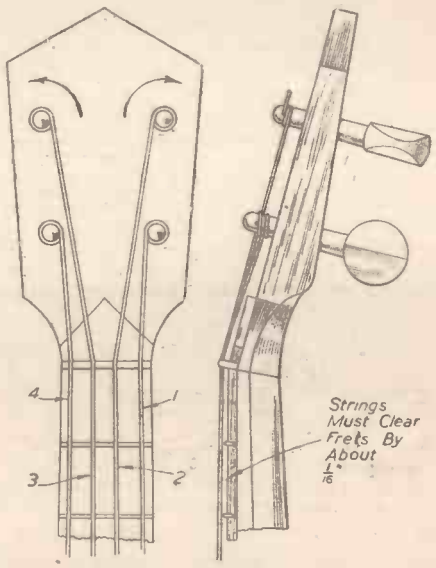


Fig. 7.—How the strings are fitted to their respective pegs.

Tuning

A half-set of guitar (steel) strings, i.e., the 1st, 2nd, 3rd and 4th string, the last two being covered, are required. The strings should be attached to their respective pegs in the manner indicated in Fig. 7.

The strings are tuned similar to the tuning of an ordinary ukulele, i.e., A, D, F-sharp and B on a piano. But the tuning is an octave lower. Further, the 4th string must be tuned an octave lower than written. It will be found that the majority of chords can be played by means of this tuning.

A Simple Episcope.....

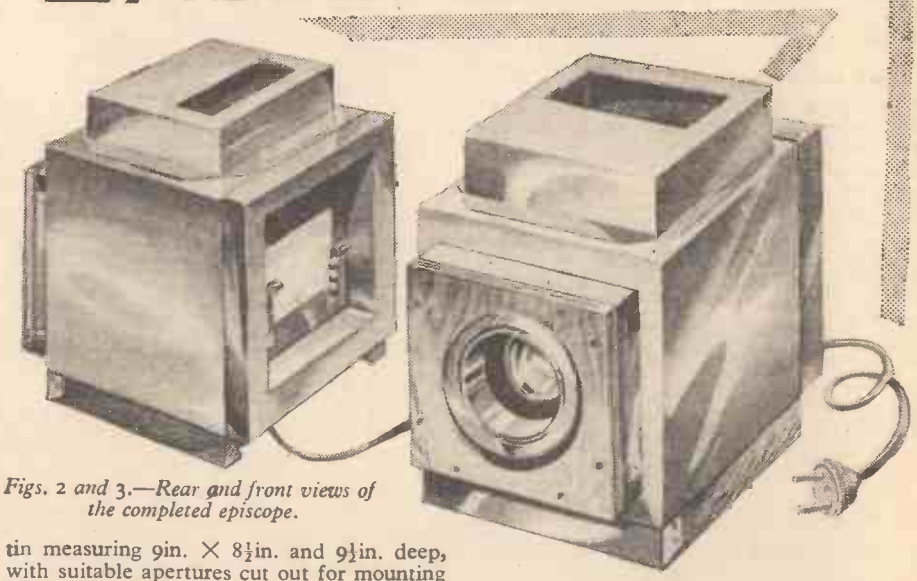
Make this Apparatus and Show Your Snaps to Their Full Advantage

ALTHOUGH this episcope cannot be expected to compare with the results obtained by the manufactured article, it has the advantage of simplicity of construction and low cost of materials.

Size of Picture

The apparatus illustrated will give a very brilliant picture of 10in. × 8in. at a distance of 3ft. from the original picture size of 2½in. × 2in., this being increased to about 15in. × 12in. at 4ft. 6in. Both these variations were obtained by suitable adjustment of the lens. The instrument will project quite a good picture at about 9ft. distance, but with the lens used, the recess in the lid would need to be 2in. to bring the picture closer to the lens.

This is one of the limitations of the instrument illustrated. If large aperture projecting lens is available, then it is possible a much larger picture space could be utilised without loss of definition. The lens used by the writer was a standard condenser lens combination of 4in. diameter, with the front lens removed. The remaining lens is approximately 5½in. focus, and the dimensions given are to suit this lens.



Figs. 2 and 3.—Rear and front views of the completed episcope.

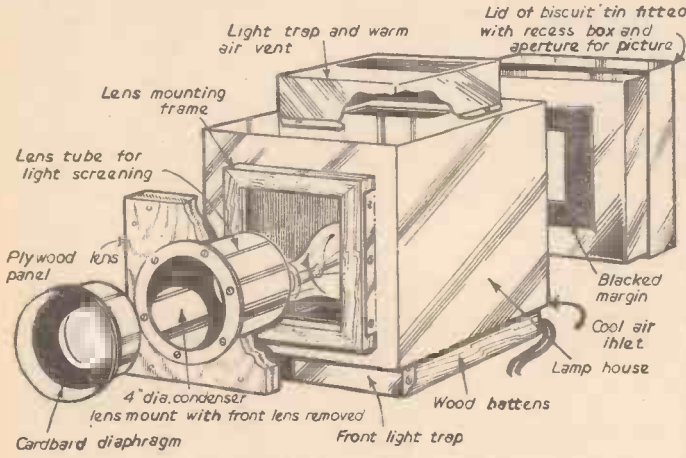


Fig. 1.—Exploded view of the instrument.

It was found necessary to fit a cardboard diaphragm, with an aperture of 2½in. diameter for good definition over the full picture space of 2½in. × 2in.

Using a standard magic lantern lens, no diaphragm was necessary. The front lens only was used, and at 3ft. 6ins. a picture 10in. × 8in. was obtained; at 6ft. a good picture of about 17½in. × 14in. was projected. Again, suitable adjustment of the lens in relation to the picture was necessary. A suggested method of adapting a magic lantern lens to the condenser mount, both lenses of the condenser combination being first removed, of course, is seen in Fig 8.

Construction

Constructional details can be clearly seen in the drawings. Fig. 1 shows an exploded view of the instrument with the parts in their order of fitting. The main body, or lamp house, is made from a standard biscuit tin measuring 9in. × 8½in. and 9½in. deep, with suitable apertures cut out for mounting the lens and for the necessary ventilating passages. The latter consist of a tin superstructure soldered or riveted on top, with holes to allow escape of warm air. Similar holes are cut out of the bottom of the tin for the cool air inlet. The original lid of the biscuit tin is used for the picture aperture, which is arranged for in a tin recess fitted to the lid. A light screening tube, in which the lens itself fits, is fitted by a flange to the plywood panel, as shown. This panel itself is screwed to the wood frame fitted to the front of the biscuit tin.

A sectional view through the lamp house is shown in Fig. 4, and in three of the four corners electric bulbs can be seen in the adjoining view. The centres for the lamp holders will be found about correct for clear-once of 100-watt bulbs. For the purposes of current economy, lower wattage lamps can, of course, be substituted and the projected size of picture kept down to the smaller size previously mentioned. One of the corner lamps can just be seen inside the lamp house in Fig. 1. The lamps are, of course, wired up in parallel and, although the flex connections are shown inside, they might with advantage be taken outside, but in doing so care should be taken that any holes drilled for the purpose are suitably protected with grommetts to avoid cutting through the insulation. Light lead-covered cable would prove advantageous if available.

Fig. 2 is a view from the back of the instrument, with a picture or print clipped in front of the aperture by means of the spring clips, which are small strips of tin or brass, turned over at their top ends and soldered at the lower ends. The pictures are inserted from the top, and adequate room should be available if the clips come half-way up the picture width, as shown. Fig. 3 is a view from the front of the instrument showing it connected to the lamp adaptor. This may be of the switch type for convenience. In Figs. 5, 6 and 7 are given constructional details of the various

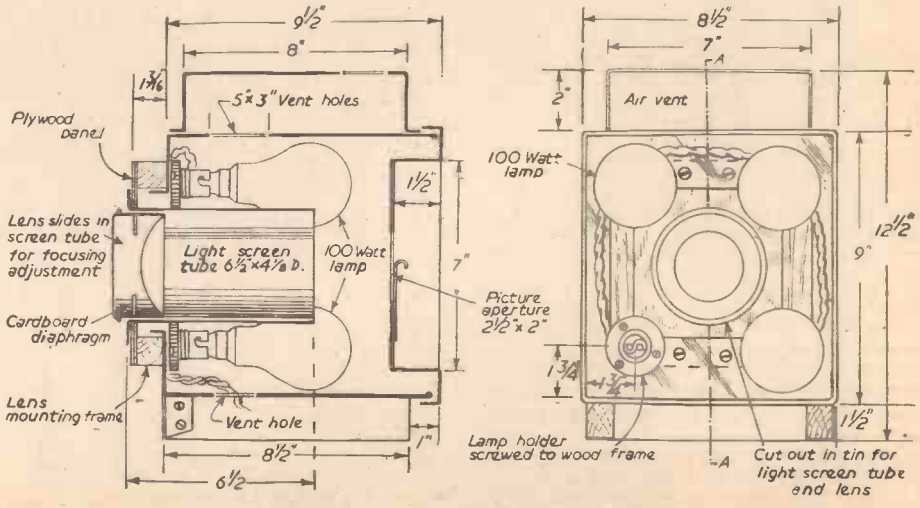
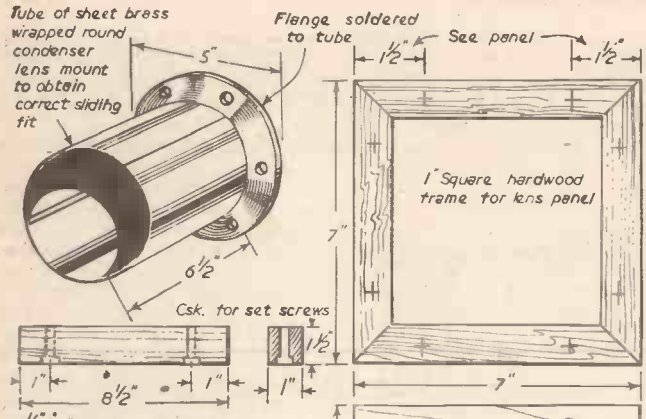


Fig. 4.—Section and end view of the lamp house.



Figs. 5 and 6.—Details of the lens tube and lens mounting frame.

parts. A smaller size of tin might be utilised for the top vent, and this can be soldered or riveted to the main lamp house. It should be given a coat of photographic black, however, before fixing in position. A hole is also cut out of the bottom of the tin to provide an air inlet, and the lamp house is raised upon two battens, as shown, with a strip of tin screwed to them at the front end to act as a light trap. As it was found difficult to screw these battens from the inside of the tin, set screws and nuts were used, the holes being countersunk, as shown. The front of the tin could, of course, be formed by a cross-batten of the same wood section of 1⅛in. × 1in. This might be an advantage.

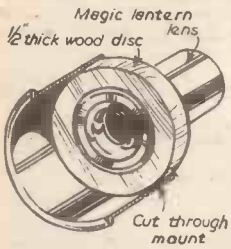


Fig. 8.—Details for mounting a magic lantern lens.

The Light Screen Tube

This is important as it prevents direct light from the lamps striking the lens, and allows only that reflected from the picture to pass through the lens. The tube is made from medium gauge brass sheets, cut to size, and soldered to an end or front flange, drilled with fixing screw holes. If using the condenser lens combination, the best plan is to wrap the cut sheet of brass round the lens mount, spot solder at the two extreme ends, remove from lens mount and solder along the seam. The inside should be given a coat of photographic black to prevent reflections.

The optical system is shown in pictorial form in Fig. 9 and it will be seen that a mirror is shown at an angle of 45 degrees to the lens. This will correct the projected image by reversing right and left, and the screen will have to be one side of the epidiascope as shown. If projected straight on to the screen, the image as well as any lettering, will be reversed. Such a mirror could be readily fixed to the lens panel at the correct angle.

The reader may, of course, vary the sizes given, and much will depend upon the projecting lens available. Some reading magnifiers may be found suitable, but some experiments should first be carried out to arrive at correct distances, and the largest aperture possible for good definition over the whole picture area.

If a biscuit tin is not available, the whole lamp house might be made up from sheet tinplate. Riveting would possibly be easier than soldering. It is suggested that some form of reflectors might be incorporated to increase light concentration on the picture area. The simple air vent and light trap arrangement could be elaborated if desired, by fitting a further section above the first, when complete light trapping would be secured. Also the bottom air inlet could be elaborated.

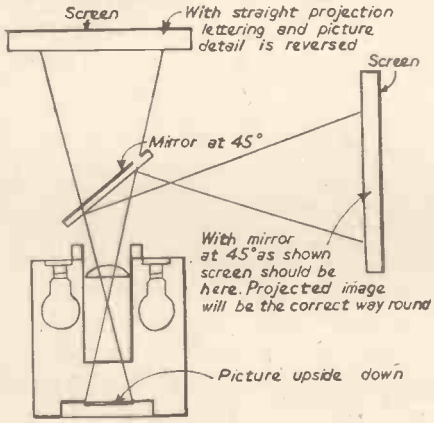


Fig. 9.—The optical system shown diagrammatically.

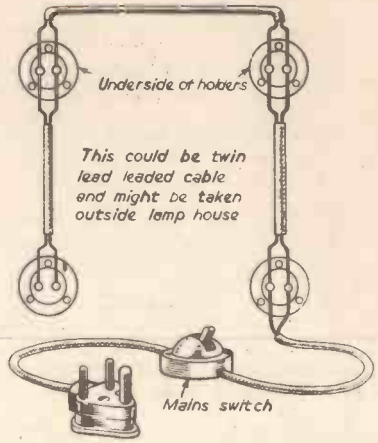


Fig. 10.—Wiring diagram.

The black margin will be found to prevent reflection near the edges of the projected image. Switch off the lights as often as possible, both to save current and allow the lamp house to keep cool.

Finally, it is quite interesting to see the palm of one's hand reflected in full colour on the screen, and serves to demonstrate that this is not just an ordinary magic-lantern.

Blueprints for making a diascope are available under our Blueprint Service.

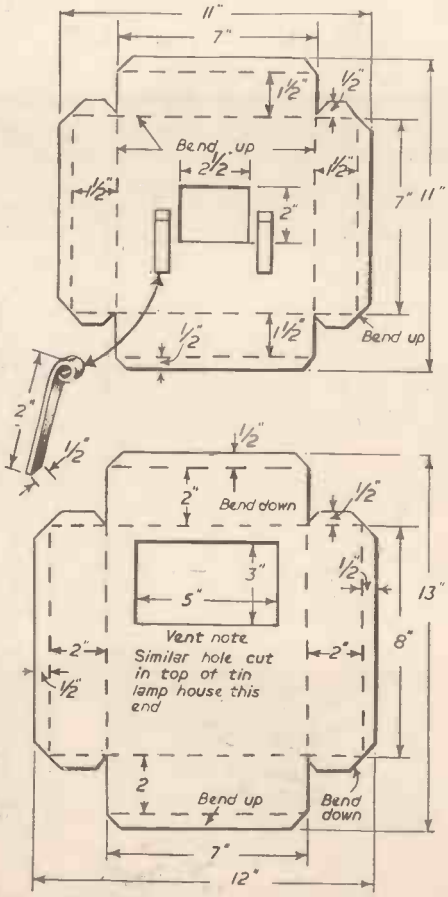


Fig. 7.—Details of the tinplate picture recess and the top vent.

A Transistorised Geiger Counter

(*Concluded from page 76*)

standard television feeder connectors. Two spring clips fitted on a piece of Perspex make contact with the battery terminals. The clips used were the ones supplied by Mullard Ltd. as cooling fins for the OC72 transistor. The one on the positive (earthed) side of the battery also serves to mount the transistor. Wire in the potentiometer using the centre and one outer terminal so that maximum resistance is in circuit when the spindle is fully anti-clockwise. The transformer requires careful construction. If wound on a bobbin with cheeks there is a danger of short circuit turns due to wires slipping down the sides. For this reason interleaving is used on the high-voltage winding.

Testing

Before connecting the 4.5 volt torch battery and switching on make sure that the collector winding of the transformer goes to the negative battery terminal. The variable resistor should be turned fully anti-clockwise so that the full resistance is in circuit. Switch on and check the battery current, it should be about 10mA. Rotate the resistor control clockwise until the circuit control begins to oscillate. At this point the battery current should be about 20mA and the generated H.T. should be enough to operate the tube. Clicks should be heard in the headphones at the background count rate, which for the G5H tube is about 40 per minute. Convenient sources of radioactivity for testing are luminous watches and meters. If desired, samples of common uranium minerals can be obtained from Messrs. Geo-Electronics, 33, Edgcumbe Street, Plymouth, Devon.

AN ATTRACTIVE CHILD'S COT

An Item of Nursery Furniture You Can Make Yourself

By J. H. HOPE

AN attractive drop-flap cot that can be dismantled in five minutes and stored in a small space when not required can easily be made by the average handyman with a limited number of tools. This cot, shown in Fig. 1, which is very practical in use, has been designed so that there are no awkward corners to collect dust. It takes a standard sized cot mattress wtih a small allowance for blankets, etc., and it can be constructed throughout with ramin or good quality softwood. Small trolley wheels can be fitted for easy movement.

Fig. 1.—The completed cot.

The Ends

First mark off positions of joints on one 42in. × 1¼in. × 1¼in. piece as shown in Fig. 2, then from this square off the three other legs. Next take the two top cross rails and mark joints as shown in Fig. 2(a), taking care to keep all measurements accurate and using a marking gauge, which should be set at ⅜in. for all the joints of the end frames. The six other rail joints can now be marked off (see Fig. 2(b)) and all joints cut with a fine tenon saw, using a 1in. chisel to clean out the waste.

The two end frames are now ready for assembly, gluing and fixing joints with ¾in. screws, after testing each corner with a set square. These are left for 24 hours to set and then the four pieces of hardboard, 36in. × 24in., can be fixed with ¾in. panel pins, nailing to both uprights and cross rails at intervals of 4in. Finish and conceal joint ends by gluing and pinning the half-round beading to edge of framework, the top corners being mitred.

Fixed Sides

The ½in. diameter dowel rods are spaced at 4in. centres and it is more satisfactory if these positions are marked, starting from the centre of each 47½in. piece and working towards the ends on the ⅞in. edge of the wood. Set the marking gauge at 7/16in. and prick a hole at each pencil mark, this method giving a true centre for the ½in. dia. holes, which should be bored ½in. deep. There are several methods of gauging the depth of the holes, but the one that the writer found satisfactory was to bore a test hole in a scrap piece of the wood being used, counting the number of turns of the brace to reach a depth of ½in. This method requires no depth gauges or other tools. The 13in. dowel rods are now glued into position and fixed with ½in. panel pins.

Drop Flaps

The 47in. lengths are marked for jointing and drilling, as in Fig. 3, the 9¼in. dowel rods also being accommodated in ½in. deep holes. The six 8¼in. × 1⅜in. × ⅞in. pieces are either dowel jointed or fixed with two corrugated joint fasteners. It is easier if the edges of the 30½in. × 11in. hardboard are chamfered before being finally fixed into position with ½in. panel pins on each side of the framework.

Assembly

The 3in. mild steel brackets are first screwed to the "fixed sides" as indicated in Fig. 3 and then to the cot ends, driving the screws well home, so that the sides are 15in. from the bottom of the legs.

The butt hinges are now fixed to the drop flaps, 12in. from the side, and then screwed to the sides of the cot.

The 2½in. cabinet bolts, used for holding

(*Concluded on page 107*)

LIST OF MATERIALS

All timber finished sizes.

Ends
- 4 pieces 42in. x 1¼in. x 1¼in.
- 8 pieces 24in. x 1¼in. x 1¼in.
- 4 pieces Hardboard 36in. x 24in.
- 4 pieces 42½in. x 1⅜in. x ½in. half-round beading.
- 2 pieces 25in. x 1⅜in. x ½in. half-round beading.
- 32 screws 1in. x 6.

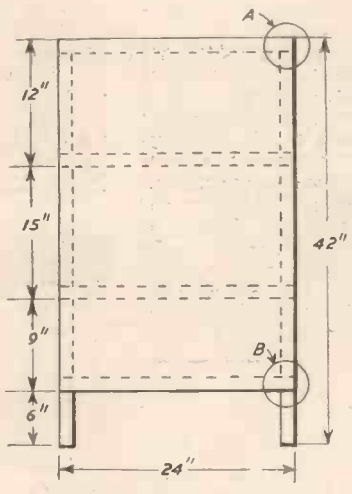
Fixed Sides
- 4 pieces 47½in. x 1⅜in. x ⅞in.
- 22 pieces dowel rod 13in. x ½in.

Drop Flaps
- 4 pieces 47in. x 1⅜in. x ⅞in.
- 6 pieces 8¼in. x 1⅜in. x ⅞in.
- 4 pieces dowel rod 9¼in. x ½in.
- 1 piece dowel rod ½in. x 12in. or 2 doz. corrugated joint fasteners.
- 4 pieces Hardboard 30½in. x 11in.

Fillets
- 2 pieces 47½in. x ¾in. x ½in.
- 2 pieces 22½in. x ¾in. x ½in.
- 2 doz. 1in. x 6 screws.

Base
- 2 pieces 47½in. x 2in. x ¾in.
- 6 pieces 22½in. x 2in. x ½in.

Fittings
- 8 Mild Steel Brackets 3in. x ⅞in. with 1in. screws.
- 2 Pair 2½in. Butt hinges.
- 4 2½in. Flat brass cabinet bolts.
- 4 2in. diameter trolley wheels (if required).
- Tube of Glue or Adhesive.
- ⅞in. and ½in. panel pins.



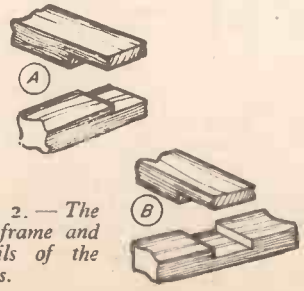


Fig. 2. — The end frame and details of the joints.

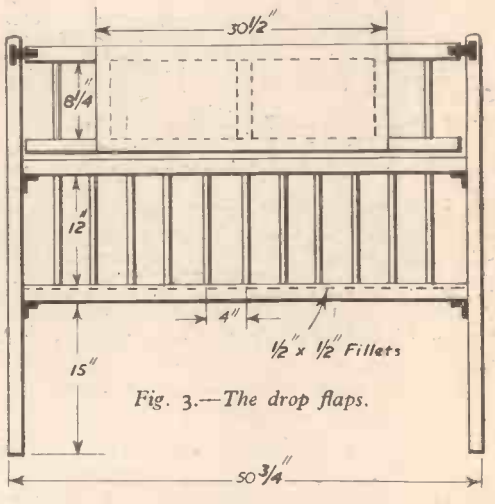


Fig. 3.—The drop flaps.

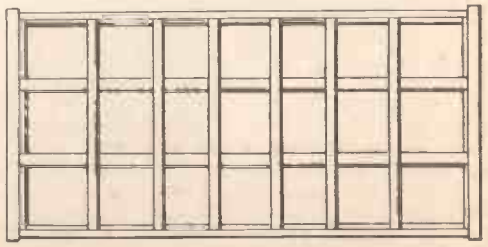
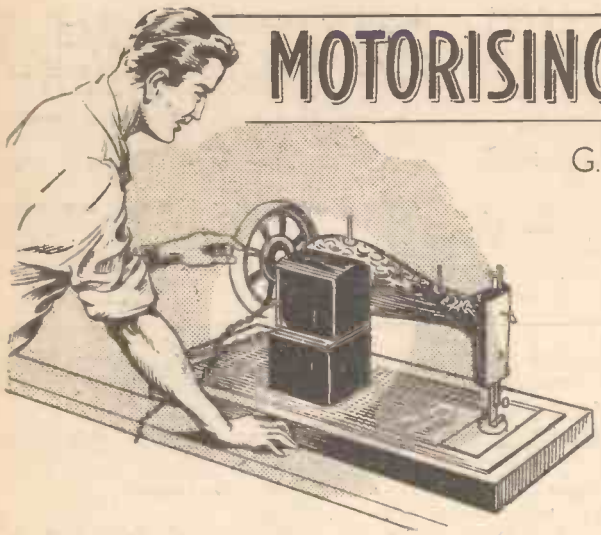


Fig. 4.—The mattress base.

MOTORISING A SEWING MACHINE

G. R. Thomson Tells You How to Take the Work Out of Your Wife's Dressmaking



THE motor used is from an old domestic vacuum cleaner rated at 230 volts. The speed was too high at this voltage so a step-down transformer was used to give 110 volts. This gives a maximum speed for the motor in excess of that required to drive the machine at its highest working speed, but leaves a little in hand should extra speed be required. Control is by a variable resistance operated by foot pedal and a smooth speed control is obtained by the method used. No sizes are given, since individual motors and sewing machines being converted will vary so much.

The Motor

This is from a cylindrical type of suction cleaner and has a circular flange round about

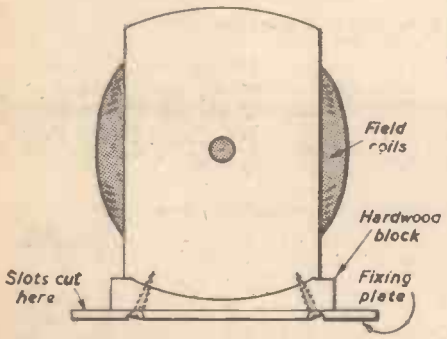


Fig. 1.—The transformer mounting.

the casing which must be cut away. Any type of motor of similar power would be equally suitable.

A hardwood block is cut and shaped, as in Fig. 1 and an aluminium plate cut to project about ⅜in. on either side of the block. The two are then screwed through into the main casing of the motor by marking through the drilled holes in the plate and block and drilling and tapping the casing. Slots should be cut in the bottom plate to facilitate adjustment of the motor when mounted on the machine. The field coils, pole pieces and armature should be removed from the motor case to prevent damage to windings while these modifications are being carried out. Two .001μF mica condensers rated at 2,000 volts, connected from each brush to earth provide effective radio and television suppression.

In the motor used the commutator, brush-gear and field coils are exposed, so a covering plate should be made which will prevent any accidental contact of the live parts.

Reassemble the motor and fix a pulley of ⅜in. dia. to the shaft. On to the pulley is forced a rubber wheel from a well-known construction toy. This wheel bears on the hand wheel of the machine and is the drive.

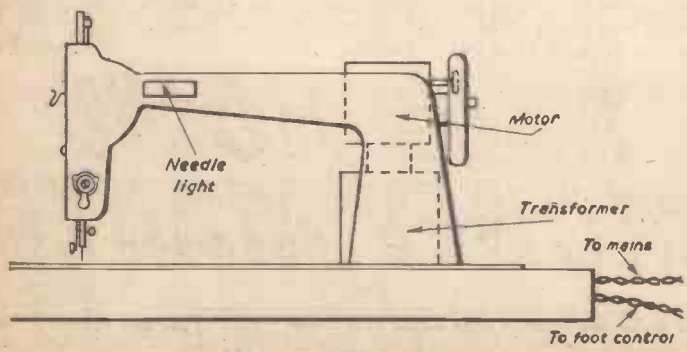


Fig. 2.—General layout.

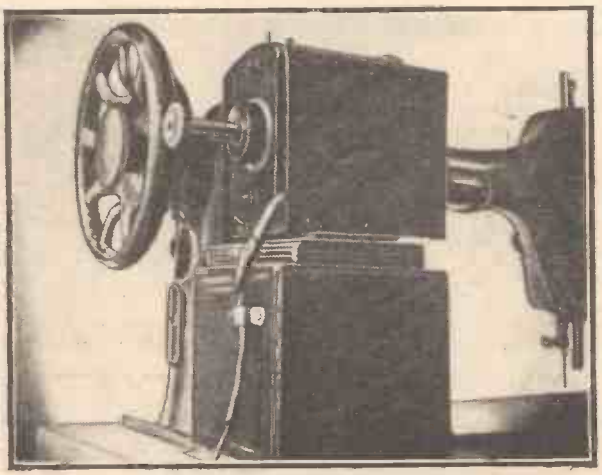


Fig. 3.—The completed modification.

The Transformer

This is wound for 230 volts A.C. input and 110 volts output. The secondary should be wound with wire having the necessary thickness to carry the total current of the motor at its maximum speed on load. Insulation is important, and if the transformer is wound at home special attention should be paid to the insulating medium between primary and secondary. Failure of the insulation here will mean the motor becoming live at mains voltage and the advantage of a transformer from a safety point of view will be lost. An earthed screen between the two windings is another precaution and also helps to keep radio interference out of the mains supply. If the transformer is to be mounted behind the machine casing then a metal case should be made to cover it entirely. All metal parts should be bonded together, including the machine, and earthed to the mains plug. A refinement is to wind on sufficient wire to give 6 volts for a needle light.

The Machine

Remove the machine and its bedplate from the old fixing and mount on a strong prepared upside down tray constructed of stout wood, i.e., ¾in. plywood. This, of course, is if it is desired to have the machine portable. The tray should be larger than the bedplate by about 2in. at the front and ends and 3in. at the back to accommodate the transformer and motor. This latter measurement may vary with the size of motor and transformer used. The depth of the tray can be 2in.

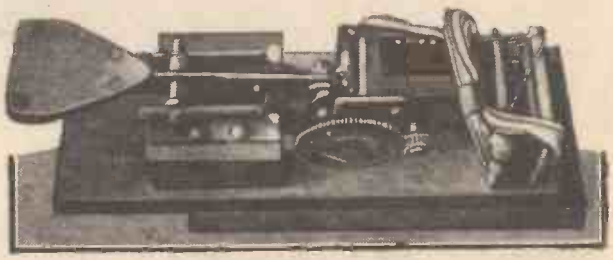


Fig. 4.—The foot control.

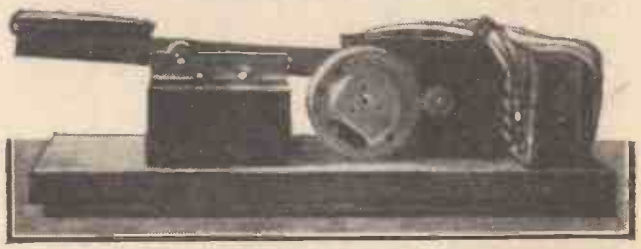
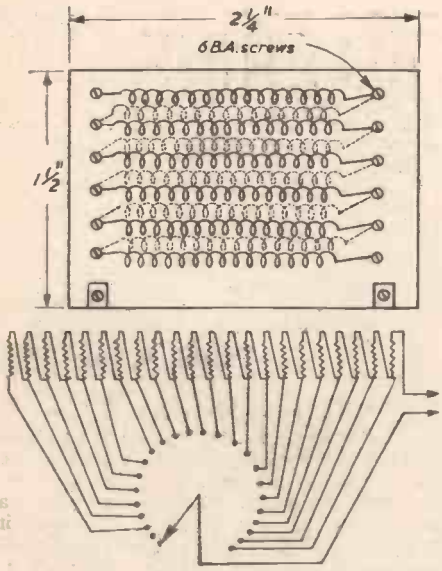


Fig. 5.—Side view of the foot control.

Having mounted the machine, the transformer should be mounted behind the pillar, as shown in Fig. 2, the four leads taken down through holes in the top of the tray and connected to small terminal blocks.

The motor is now mounted on top of the transformer box and adjusted by means of the slots in the fixing plate so that the rubber wheel is bearing on the wheel of the machine with light pressure. The motor is now screwed down tightly in this position, see Fig. 3.



Figs. 6 & 7.—Variable resistor and method of wiring to switch.

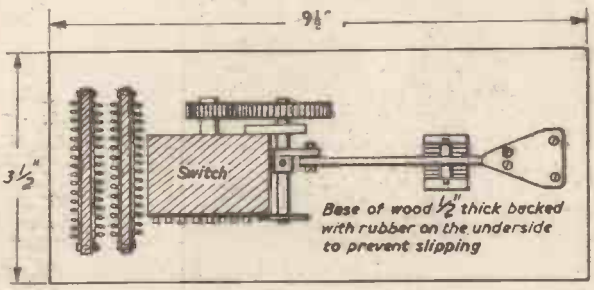


Fig. 8. (Right).—Plan of foot control.

The foot control is a variable resistance operated through simple gearing and a lever movement, as shown in Figs. 4 and 5. The resistance consists of a rotary 24-position switch connected to a bank of resistance elements. There are twenty-two of the latter and they are made from two 1,000 watt electric fire elements obtained from a well-known multiple store. These are really too heavy for the current taken by the motor, but they were used since they were convenient. Each spiral element was cut into eleven equal lengths, making 22 in all, and they were mounted on two asbestos panels, six on one side and five on the other. This is shown in Fig. 6.

The two resistance panels are mounted as shown in Fig. 8, together with the switch.

Mounted on the switch spindle is a 20-tooth gear wheel and engaging with this another wheel having 80 teeth. A quarter rotation of the larger wheel will therefore result in one complete revolution of the switch spindle. Actually the switch only moves through approximately 300 degs. and a pedal movement of ¾in. results in the full range of speed being covered. On the large wheel spindle is a fixed collar with a brass arm, as shown in Fig. 9. This is coupled by means of a link to the main arm. The pedal can be of ⅛in. brass or steel and covered with a strip of rubber. After assembly the resistances should be wired up to the switch, as shown in Fig. 7 and the connecting cable taken out at the back. A cover should now be made to cover the foot control, just leaving the pedal projecting.

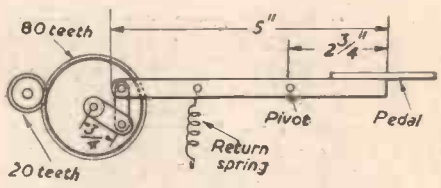


Fig. 9.—Side view of foot control mechanism.

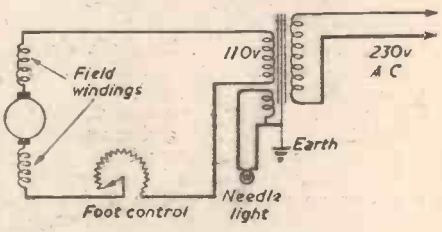


Fig. 10.—The circuit.

Wiring of the motor and transformer can now be carried out as shown in Fig. 10.

Note that the last two switch contacts are left blank, so that in the foot-up position the motor circuit is broken completely. Gentle foot pressure completes the resistance circuit and the machine will operate slowly. Speed control, thereafter, is remarkably smooth and easy.

Once the wiring has been carried out the bottom of the tray should be covered over with a piece of plywood or hardboard to keep prying fingers away from the connections.

A MODERN SINK UNIT

With a Twin-bowl Sink

By R. J. C. GOLDRING

THIS unit was designed and built to take the Fisholow Model "YY," vitreous-enamelled, twin-bowl sink. Alternatively, the more expensive stainless steel Model "XX" could be fitted. This sink requires no draining board and permits a flat working top and, if it is purchased complete with a "basket waste" in one bowl and a plastic-coated, wire draining basket for washing-up purposes, it will be found extremely satisfactory and convenient in use.

The unit as built is 5ft. long, 2ft. deep (front to back) and 2ft. 11in. high, which gives a comfortable working height for the average woman, particularly when washing up. The sink is on the left, giving over 2ft. of working space to the right; but if preferred the construction could be reversed to put the sink on the right. The design is, in fact, capable of modification to suit varying requirements. For a restricted space, it could be reduced to 3ft. long to accommodate the sink only, or increased to 7ft. to give an equal working space both sides of the sink, with a consequent increase in cupboard and drawer space. If desired, the area under the working space (with the drawer omitted) is sufficient to accommodate an electric water heater of the Sadia "UBD" type.

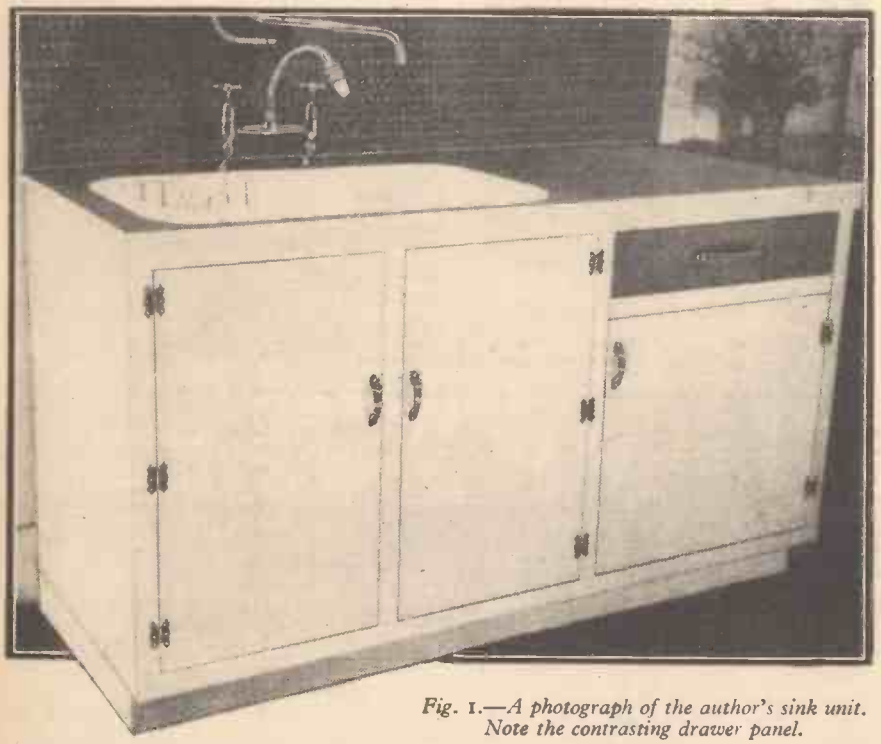


Fig. 1.—A photograph of the author's sink unit. Note the contrasting drawer panel.

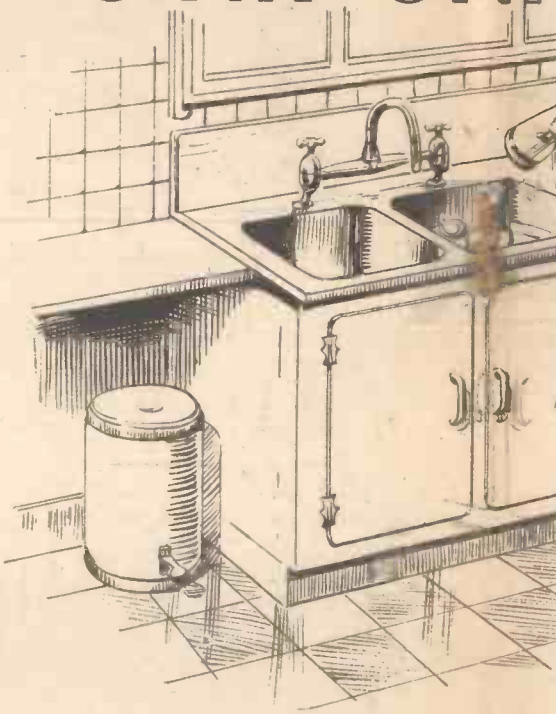
Consideration should be given to the water supply and the type of tap or taps to be fitted. If only cold water is laid on, then a separate tap can be fitted for each sink bowl, but if a hot supply is available as well, a mixer tap with a swinging arm will be required. Actually, the unit as built was fitted with a mixer tap, although no hot water is connected to it, as the swinging arm is a desirable feature, and it is also an incentive to install a hot water system eventually! In such a case, of course, the "hot" side of the tap must be plugged to prevent the cold water going straight through!

To prevent too much dislocation in the kitchen, a certain amount of planning is desirable, especially if the unit is to replace an existing sink. First of all, the Fisholow sink itself should be ordered, as there may be some delay in delivery, and then the services of a plumber should be arranged to be on call when the time comes for the plumbing to be installed. If an existing sink is to be replaced, then any cupboards or shelves underneath it should be removed in advance and preparations made to take the old sink out quickly at the right time.

General Construction

The plinth and framework of the unit as built were constructed from ramin, which has proved very satisfactory. The plinth is of 4in. × 1in. nominal (3⅞in. × ⅞in. planed) and the framework of 1½in. × ½in. nominal (1⅜in. × ⅞in. planed). Panelling is ⅛in hardboard and the construction is such that most of the edges of the hardboard are protected. The drawer, being a hard-worked portion of the unit, is of hardwood, the front of beech and the sides and back of mahogany. The drawer runners are also of hardwood. The top of the unit is ¾in. Weyroc, covered in "Redimix" plastic flooring compound. No floor is fitted, as the kitchen floor serves equally well on which to stand buckets and bowls. Besides keeping the cost down, the absence of a floor ensures that the unit is well ventilated, as there is a gap between the front of the plinth and the front bottom rail of the unit.

A floor of tongued and grooved boards is something the reader may like to add for himself.



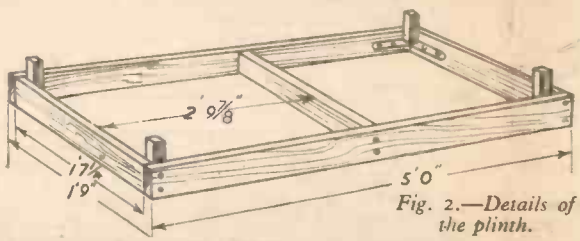


Fig. 2.—Details of the plinth.

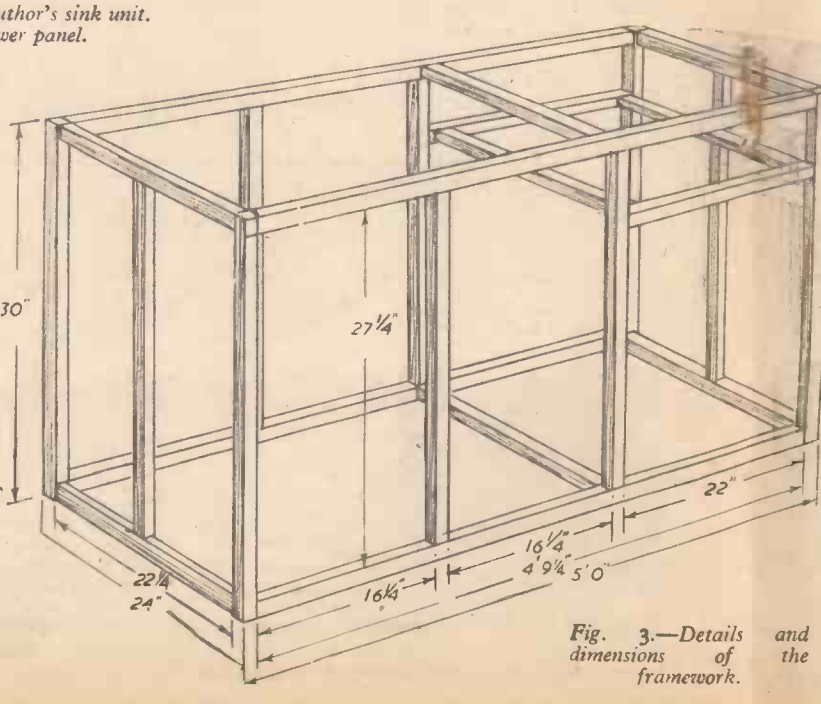


Fig. 3.—Details and dimensions of the framework.

Plinth Construction

Details and measurements are shown in Fig. 2. Butt joints, glued and screwed or dowelled, are used and the corners may be strengthened with angle brackets or wooden blocks glued and screwed to the framework. If angle brackets are used, wooden pegs should also be screwed in the corners to protrude about 1in. above the top, while if glue blocks are used they should also stand proud by 1in. or so. These form locating pins which hold the framework of the unit in position when it is lowered on to the plinth. When complete, the plinth should be treated with a suitable preservative and painted before the unit is assembled to it.

It should be noted that the front of the plinth is set back 3in. from the front of the unit to provide a toe space and also ventilation as mentioned above.

Framework

The timber should be carefully selected, as it must be straight and free from twist.

The main frame consists of two identical end frames and front and rear frames, which are also identical and which are joined by top and bottom cross members and the drawer runners. Drawer guides and shelf supports are added after assembly.

The assembly of the framework is shown in Fig. 3, in which the measurements are for timber finished to 1¼in. × ¾in. All joints are dowelled and glued with waterproof glue, such as "Cascamite," and, although this involves cutting 80 dowels and boring 160 holes, it is considered that this is simpler and quicker than cutting half-laps or mortise and tenon joints. This form of construction has proved satisfactory in over a year's use.

Two ¾in. × 1½in. dowels are used per joint, and are inserted 1in. into the ends of members and ½in. into the sides of mating members. This ensures a good grip in the end grain and also that, where three members meet, the dowels do not "clash" inside the joint. Exploded views of the joints used are shown in Fig. 5.

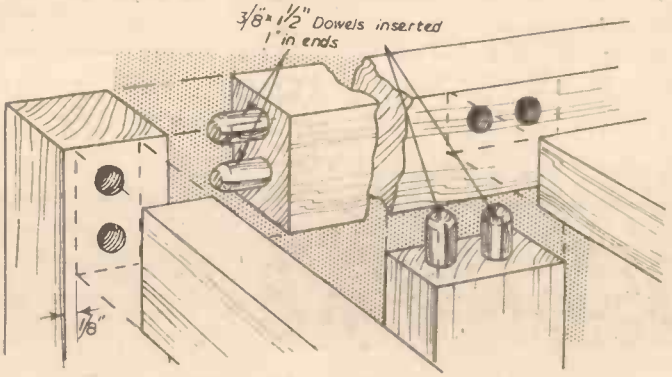


Fig. 5.—Details of the dowel joints.

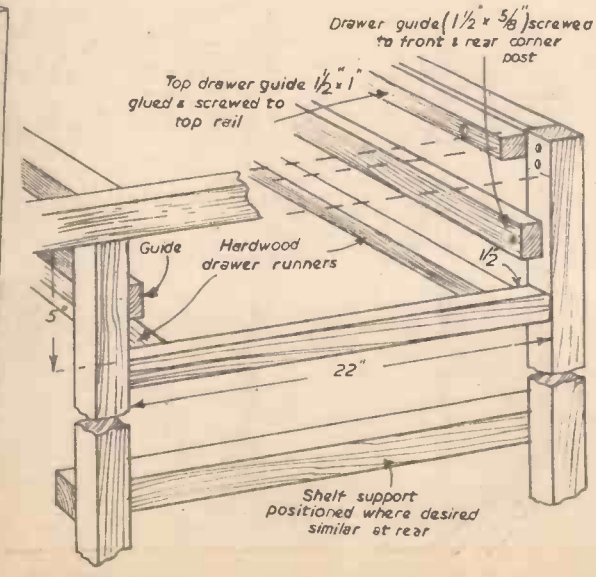


Fig. 4.—The drawer runners and shelf support.

The first job, therefore, is to cut the 80 dowels, 1½in. in length. Make a saw cut along each and slightly round the ends with sandpaper.

The timber should now be cut to length (except the corner posts, which should be left oversize until after the dowel holes have been bored), and precise trimming is essential to ensure the framework goes together accurately. The joints are then marked and, to ensure accurate positioning of the dowel holes, a jig or template of the type described in most carpentry books should be used. Note when marking the joints on the corner posts for the side frames that these are set in ⅛in. to allow for the side panels. The dowel holes are then bored, using a bit gauge to ensure correct depth, and the dowels are inserted and glued into the holes in the ends of members and allowed to set.

Glue up and assemble the front and rear frames and knock the joints tight with a mallet. Ensure the frames are true and leave to set. They may be cramped by tying lengths of cord around them from end to end and top to bottom and inserting wooden wedges under the cords to tighten them.

The framework is then checked by assembling the end frames to the front and rear *dry*. If no adjustments are required, dismantle and complete the assembly of the end frames by gluing the uprights to the top and bottom members.

The complete framework is then glued and assembled together and this can best be done by laying the rear frame flat on the floor; insert the ends, the top and bottom cross members and the drawer runners and then place the front frame on top and drive all the joints home. Stand the framework upright, check again for squareness, cramp up (with cords and wedges again) and leave to set thoroughly.

The drawer guides, details of which are given in Fig. 4, are then screwed to the framework. Note that the side guides are set back by half the thickness of the front uprights to allow for the front of the drawer and also to act as stops for the drawer. The top guide is screwed and glued to the top member of the end frame.

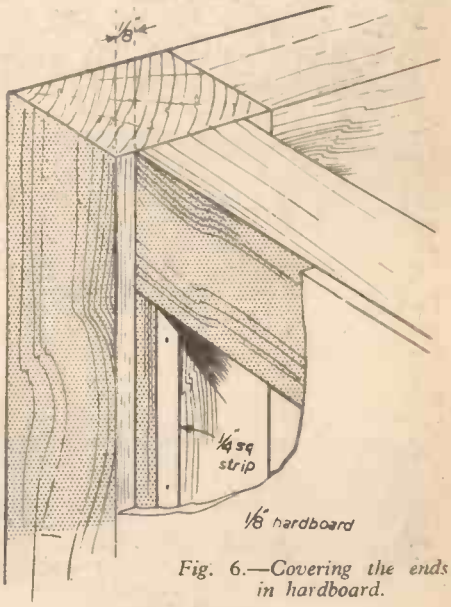


Fig. 6.—Covering the ends in hardboard.

Supports for a shelf or shelves are then fixed across the front and rear frames, being screwed to the insides of the upright members, as shown also in Fig. 4. Their position is a matter for personal preference.

The Drawer

As it is considered that a drawer which is used frequently might as well be a good-looking piece of furniture, it was constructed in hardwood. The front is of ⅞in. thick (finish) beech and the sides, back and partition are of ⅝in. African mahogany type. The bottom is ¼in. ply, lined with green baize. The construction is shown in Fig. 8. A rebate is cut and chiselled at each end of the front as shown, and the sides are pinned and glued to it. The back is glued into grooves sawn and chiselled into the sides and the partition similarly glued into grooves in the back and front. The bottom (in two pieces) is supported on ¼in. square or quarter-round strip pinned and glued around the inside of the sides, back and partition, the ply being glued to this strip.

The Top and Fitting the Sink

Before cutting the ¾in. Weyroc to size, decide whether any overhang would be

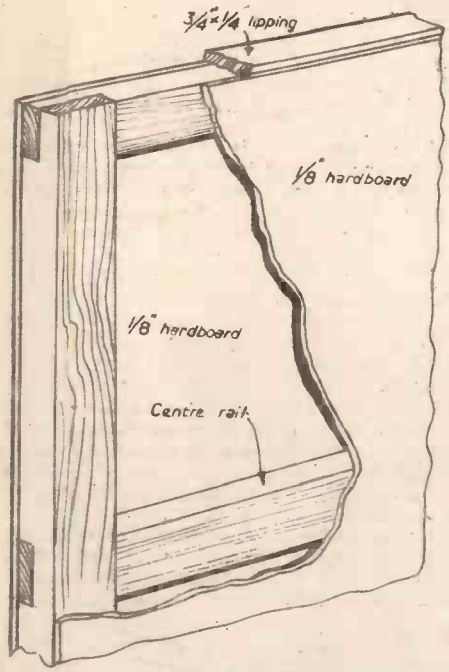


Fig. 7.—Details of door construction.

desirable (e.g., at the back to bring it flush to the wall); if not, it should measure 5ft. × 2ft. finished size. The edges are planed smooth and square and finished with a ¾in. half-round moulding pinned and glued all round. The moulding stands above the surface of the Weyroc by 1/16in.-⅛in. to contain the "Redimix."

Fitting the sink into the top is slightly tricky, as, if the holes are cut too large, the holding-down bolts on the sink will have nothing to bear against. Square a pencil line across the Weyroc coincident with the left-hand edge of the top cross member of the frame, thus indicating the area into which the sink must fit. Then place the sink upside down on this area, 2in. in from the front edge and centralised from left to right. Sufficient space will then be left at the rear to fit the taps. Mark a pencil line all round the periphery of the sink. By measuring in from the outer edge of the sink to the sink bowls, it is then possible to mark in the position of the holes, but it is advisable first to experiment with a sheet of stout cardboard and thus produce a template. When the holes have been successfully cut out and a trial fit made, bore the holes for the taps.

Remove the sink and then cover the top surface of the Weyroc with the "Redimix" compound, carefully following the maker's instructions. This compound can be obtained in plain colours and marbled effects and, if properly applied, will provide an attractive, hard-wearing and waterproof surface.

When the "Redimix" is thoroughly hard, the top can be placed in position on the framework and small angle brackets screwed to the undersurface and to the framework to hold it in position.

The taps and sink are then fitted and the plumber called in to connect up. His work is simplified by the fact that the panelling and doors have not yet been fitted.

When the plumber has finished and the sink is tightened down, any gaps between its edges and the top may be filled with "Redimix" to prevent ingress of water. The sink unit can then be put into use, if desired, in advance of fitting the doors and panelling.

Panelling

The unit was panelled in ⅛in. Celotex hardboard, which was applied only to the ends. If desired, of course, the back could also be panelled, but this seems unnecessary unless the wall against which the unit stands is in bad condition.

The end panels extend from the top to the bottom of the unit framework, so that the top edge is protected by the moulding applied to the edge of the Weyroc top. As the end frames are let in ¼in., the panels are flush with the corner posts and are supported there by ¼in. or ½in. square or quarter-round strip pinned and glued to the corner posts, as shown in Fig. 6.

After cutting the panels to size, they should be wetted on the backs and allowed to stand for 24-48 hours before fitting. They are then glued to the end frames and to the strips fixed to the corner posts with impact adhesive such as "Evostik."

Doors

The construction of the doors is shown in Fig. 7. They consist of a framework of 1in. × ½in. battens with a centre rail, the joints being simple half-laps, panelled each side with ⅛in. hardboard. A ¾in. × ½in. moulding is applied to the top, bottom and closing edges. This results in a slim, lightweight door which, if properly constructed, is perfectly rigid.

The stiles are cut ½in. less than the height of the door opening and the rails ½in. less than the width. Mark and cut the joints and assemble the framework dry to check for squareness. Cut the hardboard panels to size, wet the backs and leave to dry out. The joints are then glued, the framework assembled and the panels glued to each side. The doors are clamped until the glue has thoroughly set, after which any protruding edges of the hardboard may be planed flush. The moulding is then glued and pinned to the edges, as mentioned above, the panel pins being punched well below the surface.

The resulting doors are thus the exact size of the openings, and it is only necessary to plane the moulding down slightly to obtain a perfect fit. The simplest method of hanging is with surface hinges, and these can be obtained in various designs and finishes which look very attractive. A great variety of catches is also available, from which suitable ones may be selected.

After initial fitting, the doors should be removed to enable both them and the framework to be painted.

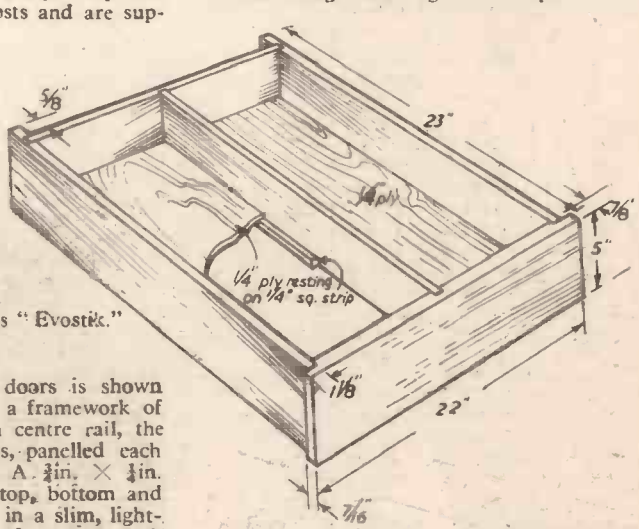


Fig. 8.—Construction of the drawer.

LIST OF MATERIALS

Plinth

Timber 4in. × 1in. nominal.		
Front and back	—	2 off 5ft.
Ends	—	3 off 19in.
Cross member	—	

Framework

Timber 1⅝in. × ½in. *finished* size.		
Corner posts	—	4 off 30in.
Uprights	—	6 off 27½in.
Cross members	—	6 off 22½in.
Drawer supports	—	2 off 22in.
Drawer runners	—	2 off 22½in. (hardwood).
Drawer guides	—	2 off 23½in.
Drawer guide (top)	—	1 off 22½in.

End Panels

Hardboard ⅛in. thick	—	2 off 22½in. × 30in.

Doors

(2 left-hand same size)

Framework—1in. × ½in.	—Stiles 4 off 26¾in —Rails 6 off 16in.
Edge moulding—¾in. × ¼in.	—4 off 16½in. —2 off 26¾in.
Panels—⅛in. hardboard	—4 off 16in. × 26¾in.

Door

(Right-hand)

Framework—1in. × ½in.	—Stiles 2 off 20¾in. —Rails 3 off 21⅝in.
Edge moulding—¾in. × ½in.	—2 off 22in. —1 off 20¾in.

Drawer

Front (Beech) ¾in.	—	1 off 22in. × 5in.
Sides (mahogany) ⅜in.	—	2 off 23in. × 5in.
Partition (mahogany) ⅜in.	—	1 off 22½in. × 5in.
Back (mahogany) ⅜in.	—	1 off 21½in. × 5in.
Bottom (ply) ¼in.	—	2 off 10½in. × 21½in.

Top

Weyroc ¼in.	—	1 off 5ft. × 2ft.

Dowels

80 off 1½in. × ⅜in.

Mouldings

¾in. half-round for top.
½in. square or quarter-round for drawer bottom and end panels.

Sundries

"Redimix" for top.
"Cascamite" and "Evostik" adhesives.
8 off surface type hinges.
3 off door catches.
3 off door handles.
1 off drawer handle.

Finishing

The framework and doors should be primed and undercoated and finished with one or two coats of hard-gloss or lacquer. The drawer, however, is given a coat of clear varnish, the natural finish of the beech front making a pleasant contrast with the remaining painted surfaces.

Finally, the doors are refitted and handles to choice fixed to the doors and drawer front.

Possible Modification

The construction could probably be improved upon, but it is simple and inexpensive to make and satisfactory and convenient in use. The design can be modified to suit varying requirements and the interior also can be modified by fitting extra shelves or drawers or by panelling in the portion which encloses the drawer and shelf.

As an alternative to the "Redimix" surface, plastic-coated Weyroc or Weyroc or plywood veneered with one of the laminated plastics such as "Formica" could be used. The "Redimix" was used by the writer because it was also being used to cover the kitchen floor.

The drawer can be subdivided further to suit individual requirements, and this can be easily done by means of a removable "egg-crate" type of assembly.

Finally, the two pieces of Weyroc cut out to permit fitting the sink can be padded or veneered with plastic, then, with screw-on wood or metal legs fitted, they make excellent stools or small tables.

A 6" Personal TV for £10

How to Convert the ex-Government Indicator Unit 62

THIS television receiver is not of the most up-to-date type, but is very cheap to construct and is being used successfully in spite of the small picture. For the constructor's "den" for the bedroom, and similar cases, it will offer a very good alternative set, and may also prove very useful as a basis round which to carry out experiments on vision or sound receivers, or even on timebases.

The Indicator Unit 62 or 62A is built on a two-deck chassis and provides most of the components for a vision receiver and timebase. The power unit is built on a separate chassis, as it thereby relieves the main unit of a great deal of weight and thus makes it easier to handle.

Fig. 1 shows the position of the main items, with the tube removed. The sound receiver is in the foreground; on the opposite side of the chassis is the timebase, while the vision receiver occupies the upper deck in the background. The EHT supply is contained in the unit at the back of the vision receiver, being fed from a mains plug fitted on the back of the unit.

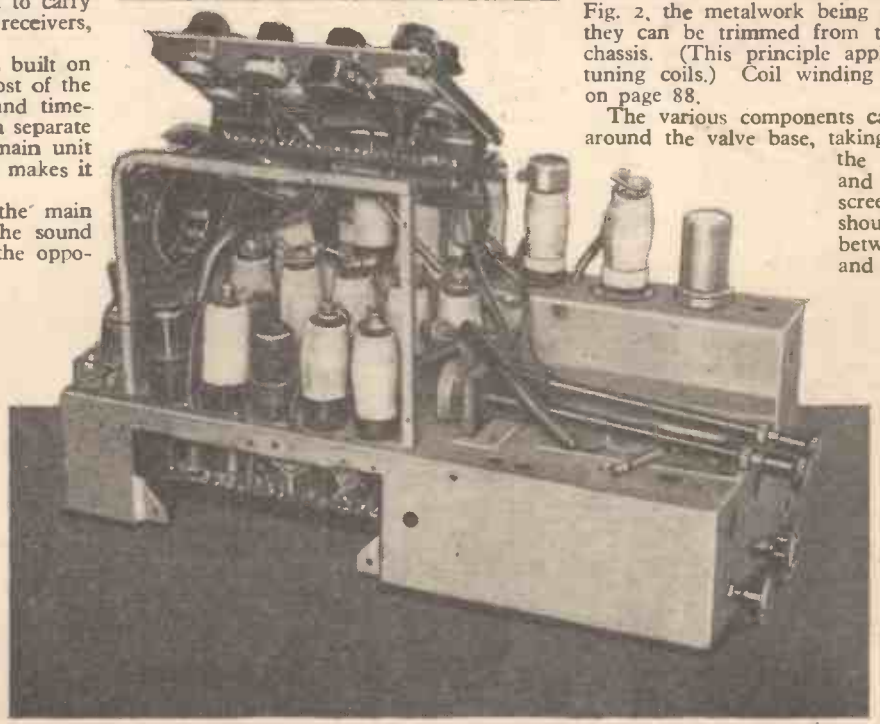


Fig. 1.—A view of the set with tube removed, showing the positions of the main parts.

Stripping the Unit

When the unit is received it is advisable to check the tube, if possible, under normal working conditions on a friend's televisor. If this is not possible, the filament should be tested and the base of the tube examined for looseness. Some of the dealers who sell this unit will change the tube if it is faulty.

The tube can be removed by undoing the screw fitted at the bottom of the bracket which supports the tube holder; the bracket can then be drawn back. The potentiometer panel on the top of the chassis can then be swung back on its hinges by undoing its retaining screws, and the tube can be withdrawn from the chassis.

After removing the valves, the whole of the unit should be completely stripped with the exception of the valve holders, the tube holder, the 0.03μF 2.5kV, condenser (which becomes C75), the D.C. restoring diode and the associated resister on the top of the chassis (these become V19 and R73), the focus and the brilliance controls (which become VR9 and VR8), and the bleeder network (this becomes R76, 77, 78 and 79). Do not remove leads from C.R.T. holder.

Remove everything else from the chassis including the double-sided paxolin strip underneath the unit and the VR92 valveholder by its side.

The valveholder (see Fig. 2) in V20 position is removed and is replaced with a ceramic-based type for the EHT rectifier valve. The valveholder occupying the next position is removed for C78. The valveholder in V1 position is removed and replaced with one of the EF50 type. Change the valveholder at V10 position with that of V9. Change the valveholder at V13 position with that at V11. Remove all the potentiometers from the top panel. Remove the front metal (double) panel.

Finally, test all the condensers for leakage. This is important, as a leaky condenser can cause some very puzzling faults.

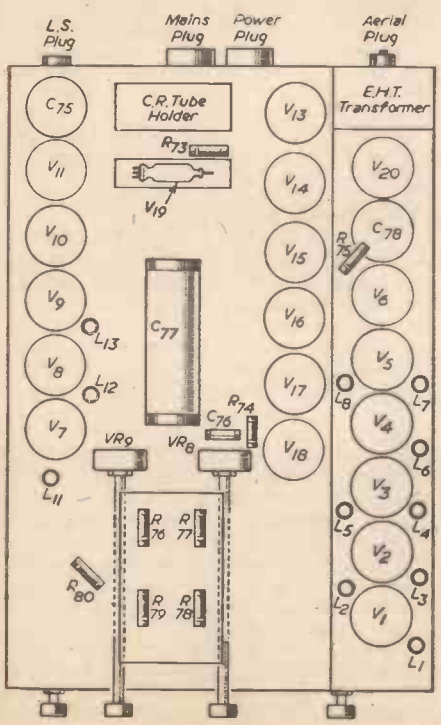


Fig. 2.—Layout of the chassis top.

The First R.F. Stage

The circuit diagram is given in Fig. 3. It uses an EF50 valve (V1) and provides a good signal for feeding into the sound and vision receiver. L1 and L2 are mounted under the chassis in the position shown in Fig. 2, the metalwork being drilled so that they can be trimmed from the top of the chassis. (This principle applies to all the tuning coils.) Coil winding data is given on page 88.

The various components can be grouped around the valve base, taking care to keep the leads short, and the metal screen, 2in. × 2in., should be erected between this stage and the first vision R.F. stage. It will be found convenient to erect this screen after the components have been wired. The aerial connection is made on a Pye socket fitted at the back of the unit and a piece of co-axial cable is run from this socket to L1. The sheath of the cable should be earthed at both ends.

The Vision Receiver

Shown in Fig. 4, this consists of four R.F. stages using VR65 valves, which feed into the VR92 diode detector, whose out-

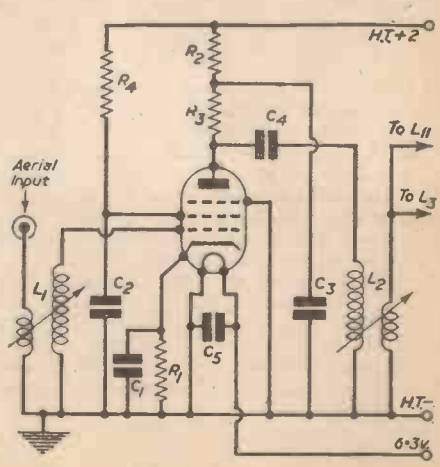


Fig. 3.—Circuit of the first R.F. stage.

put is injected into the VR65 video valve. Sound rejection is provided by L5 and L8. All coils are mounted underneath the chassis in a similar manner to L1 and L2. Screened leads to the valve grids (top caps) should not be used, but V3 and V5 valve caps should be screened.

Metal screens, 2in. × 2in., should be mounted between each stage after the components in each stage have been wired. Keep all leads as short as possible and do not mount anode components near grid components.

Anode decoupling components can be mounted on a paxolin strip fitted on the side of the chassis underneath the valveholder. These components are : R5, C8, R8, C10, R13, C18, R17, C22, R18, C25, R23, C31.

VR1 forms the contrast control and is fixed on the front panel.

V5a and its associated components, L9, R22, C30 and L10 are wired directly on the tag strip, no valveholder being used.

The Timebase

The circuit is shown in Fig. 5. All valves are VR65s, with the exception of the D.C. restorer diode (V12), which is a VR92. (Note there are two D.C. restorers in this unit, one in the timebase and one in the CRT circuit.) V13 is the phase splitter, the signal for the CRT grid being taken from the cathode resistor, R43. V14, the sync separator, follows and feeds the sync pulses to frame and line timebases.

The line timebase receives its sync pulse from the condenser C58, which is made variable so as to obtain the best amplitude of sync pulse, for triggering the line oscillator.

Both line and frame timebases use the Miller integrator combined with Transistron oscillator as sawtooth generators. V15 is the line oscillator, its frequency being varied by VR3, which forms the "line-hold" control. Output of sufficient amplitude is obtained by paraphase amplification which employs V16. The output to the deflector plates is taken from the anodes of these two valves via C60 and C61, which are 450-volt working.

The frame oscillator (V17) is similar in nature to V15, the only difference being in the component values. VR5 is the "frame-hold" control and V18 forms the other half of the paraphase amplifier. The frame deflector plates are fed from C68 and C74, which are both 450-volts working.

Components marked with an asterisk in Fig. 5 are mounted on the double-sided tag strip taken from underneath the chassis. It will be found convenient to wire up this strip before fixing it back in the chassis, leaving about 6in. long leads where interconnection between strip components and chassis components are to be connected together.

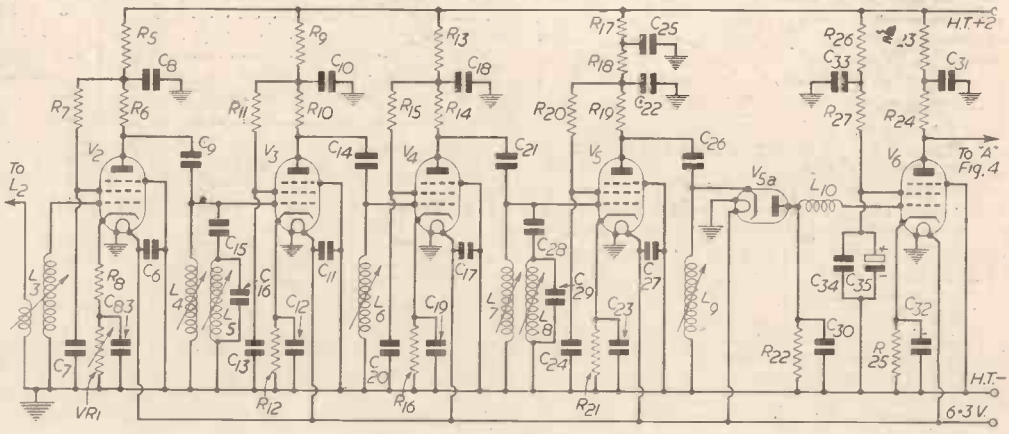


Fig. 4.—The vision section.

On the other side of the strip should be mounted the components for the sound receiver which are indicated in Fig. 6.

Great care should be taken not to get the leads mixed, and each 6in. length should

Resistors		Condensers	
No. Value	No. Value	No. Value	No. Value
1—100Ω	25—47 Ω	1—500 pF	25—0.01 μF
2—2.2 KΩ	26—30 KΩ	2—500 pF	26—100 pF
3—4.7 KΩ	27—1 KΩ	3—500 pF	27—230 pF
4—5 KΩ	28—4.7 KΩ	4—500 pF	28—5 pF
5—1 KΩ	29—10 KΩ	5—500 pF	29—5 pF
6—4.7 KΩ	30—100 Ω	6—230 pF	30—15 pF
7—10 KΩ	31—4.7 KΩ	7—230 pF	31—0.01 μF
8—100 KΩ	32—10 KΩ	8—230 pF	32—0.1 μF
9—1 KΩ	33—100 Ω	9—100 pF	33—0.1 μF
10—4.7 KΩ	34—2 MΩ	10—230 pF	34—230 pF
11—10 KΩ	35—4.7 KΩ	11—230 pF	35—8 μF
12—100 KΩ	36—2.2 KΩ	12—230 pF	36—500 pF
13—1 KΩ	37—10 KΩ	13—230 pF	37—500 pF
14—4.7 KΩ	38—20 KΩ	14—230 pF	38—500 pF
15—10 KΩ	39—150 Ω	15—5 pF	39—500 pF
16—100 Ω	40—1 MΩ	16—5 pF	40—500 pF
17—1 KΩ	41—47 KΩ	17—230 pF	41—500 pF
18—1 KΩ	42—470Ω	18—230 pF	42—500 pF
19—4.7 KΩ	42a—10 KΩ (2, 20 KΩ 1 watt in parallel)	19—230 pF	43—500 pF
20—15 KΩ		20—230 pF	44—500 pF
21—100 Ω		21—100 pF	45—35 pF
22—4.7 KΩ	43—3 KΩ	22—230 pF	46—0.001 μF
23—1 KΩ	44—1 MΩ	23—230 pF	47—0.01 μF
24—4.7 KΩ	45—47 KΩ	24—230 pF	48—0.01 μF

Resistors		Condensers	
No. Value	No. Value	No. Value	No. Value
46—10 KΩ	66—2.2 MΩ	49—0.01 μF	66—8 μF
47—100 KΩ	67—2.2 MΩ	50—0.01 μF	67—0.003 μF
48—10 KΩ	68—2.2 MΩ	51—0.002 μF	68—0.01 μF
49—56 KΩ	69—2.2 MΩ	52—50 μF 25 v.w.	69—0.01 μF
50—120 KΩ	70—100 KΩ	53—0.05 μF	70—0.001 μF
51—47 KΩ	71—100 KΩ	54—0.01 μF	71—0.001 μF
52—4.7 KΩ	72—100 KΩ	55—0.1 μF	72—0.01 μF
53—1 MΩ	73—1 MΩ	56—0.005 μF	73—0.5 μF
54—2.2 MΩ	74—2.2 MΩ	57—0.25 μF	74—0.01 μF
55—56 KΩ	75—510 KΩ	58—0·75 μF	75—0.03 μF 2.5 kV
56—120 KΩ	76—180 KΩ	59—100 μF	76—0.1 μF 500 v
57—100 KΩ	77—470 KΩ	60—0.01 μF	77—0.1 μF 2.5 kV
58—100 KΩ	78—470 KΩ	61—0.01 μF	78—0.1 μF 2.5 kV
59—50 KΩ	79—470 KΩ	62—50 μF	79—81 16+8 μF 450 V
60—33 KΩ	80—390 KΩ	63—60 pF	80—82 16+8 μF 450 V
61—150 KΩ	81—1.5 KΩ	64—100 pF	83—500 pF
62—5.6 MΩ	82—1.5 KΩ	65—0.5 pF	
63—47 KΩ	83—25KΩ	T1, T2, T3 0-30 pF postage stamp type trimmers.	
64—2.2 MΩ			
65—150 KΩ			

All resistors ½ watt unless otherwise stated above or in the text Component tolerances + or −15 per cent. Components should be combined or in series or parallel to make the utmost use of those in the 62 unit.

Potentiometers

VR1—5 KΩ Contrast
VR2—¼ MΩ Volume
VR3—½ MΩ Linehold
VR4—25 KΩ Height
VR5—2 MΩ Framehold
VR6—100 KΩ Shift
VR7—100 KΩ Shift
VR8—100 KΩ Brilliance
VR9—500 KΩ Focus

Valves : Civilian Equivalents.

VR65—Mazda SP61
VR92—Mullard EA50
VR54—Osram D63

Transformers

EHT, 200-230 volt input ; Output, 2,500 volts 3 mA., 4 volts 1 amp. C.T., 4 volts 1 amp. C.T. : H.T. — 200-230 volts input ; Outputs, 350-0-350 volts 160 mA., 5 volts 3 amps., 6.3 volts 3 amps., 6.3 volts 6 amps.

Coil Winding Data

L1, L2 Primary 1 turn, Secondary 4½ turns
L3—Primary 4 turns, Secondary 4 turns
L6—4 turns
L4, L7 4½ turns
L9—5 turns
L11, L12, L13 Primary 2 turns, Secondary 4 turns

All above coil forms are ⅜in. diameter
Secondary spacings approximately 2 mm. between turns
Wire gauge, 18 s.w.g.
L5, L8 9 turns 22 s.w.g. ¼in. forms

Note.—The above data refers to Sutton Coldfield (Channel 4). For Channels 3, 2 and 1 add 1½ to 2 turns in each case, except on primaries. Add half-turns on the primaries. For Channel 5 remove 1 turn ; leave primaries.

L10, 50 turns 40 s.w.g. enamelled wire wound between cheeks ¼in. diameter spaced 1/64in. apart mounted on a 1 MΩ resistor.

be suitably labelled to avoid any errors.

Before remounting the strip, the valve-holder for V12 (originally removed from underneath the chassis) should be re-mounted towards the back end of the chassis (underneath). The strip can now be replaced and the wiring of the timebase completed.

C54 and R44 are mounted on a small paxolin strip fitted underneath the EHT transformer on the back end of the chassis. The strip should be fixed right at the bottom and well clear of the EHT leads.

The connection between C54 and "A" (Fig. 5) should be made in coaxial cable, the outer sheath being earthed at each end.

The height of the picture is controlled by varying the HT applied to the anodes of the frame timebase valves. VR4 forms the control and is one of the 25 KΩ potentiometers previously removed from the top panel. It is shunted by a 1 watt resistor, R.83.

The connection to the deflector plates and to the grid of the CRT can be made by utilising existing wiring.

The Sound Receiver

Two R.F. stages using VR65s (V7 and V8) are transformer coupled, V9 is a VR54 and one-half forms the detector, while the second half is used for noise-limiting.

The output from V9 is fed into the first A.F. valve, a VR65 (V10), which is R.C. coupled to the 6V6 output valve, V11. VR2 is the volume-control. Screened leads and valve caps can be used, though they should not be found necessary.

Trimmers T1, T2 and T3 should be firmly wired and fixed so that they are easily accessible from the side. The coils are mounted in a similar manner to those in the vision receiver. When mounting these coils it will be found that the best method is to wind on the secondary, bolt the form to the chassis, and then wind on the primary.

Connection between L11 and L3 (Fig. 3) is made in coaxial cable, the outer sheath being earthed at both ends.

If the anode circuit of V11 is disconnected while the valve is working, heavy current will flow via the screen, and the valve may be severely damaged. It is, therefore, wise to permanently wire the loudspeaker transformer in the circuit, detaching it from the loudspeaker if necessary and making connection between the transformer secondary and the speech coil via a plug and socket.

EHT Supply

The EHT transformer is mounted at the end of the deck containing the vision receiver (see Fig. 2). It will be noted that the positive EHT is earthed. The reason for this is to keep the peak inverse voltage from the transformer windings. When the negative is earthed, we have on the second half of the A.C. cycle (when V20 is not conducting) the potential across C78 (2.5kV) added to the inverse voltage (2.4kV) which appears across the windings of the transformer. This is the reason for many early breakdowns in EHT transformers.

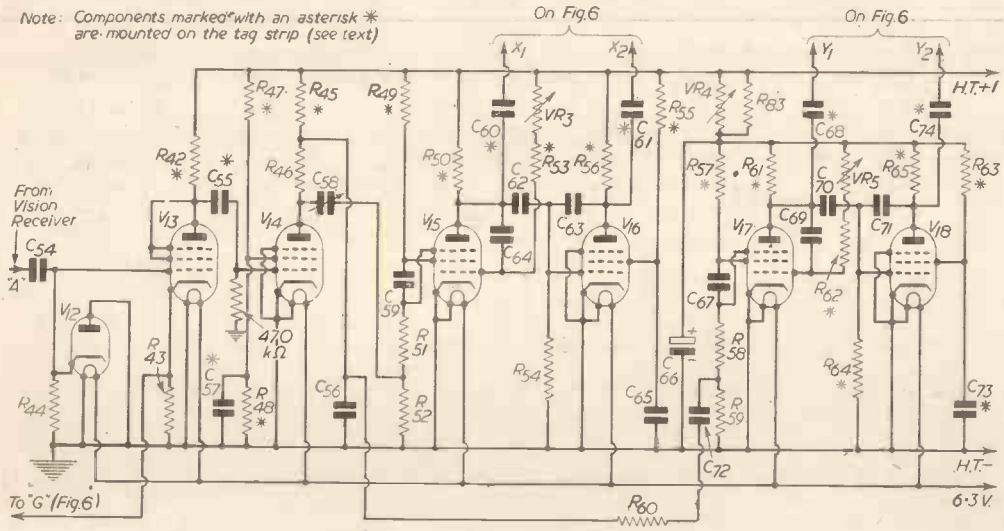


Fig. 5.—The timebase section.

Another benefit derived from earthing the positive is that the working voltage of the coupling condensers to the deflecting plates of the CRT need only be that of the timebase HT 450-volt working condensers provide a good safety margin.

One snag with this system is that the cathode and heater of the CRT are at EHT potential and must be carefully insulated from the earth. This feature is catered for in the layout of the 62 unit, but it is important to bear the fact in mind when handling the televisor when it is working.

All EHT wiring must be thoroughly insulated.

In the prototype the wires were first covered with plastic sleeving of sufficient diameter to contain the wire, and then covered again with another length of larger diameter.

Soldered terminations must be made with care, no stray ends being left to set up brush discharges.

C78 is mounted in the position shown in Fig. 1 and R75 wired directly to the top terminal of the condenser, its remote end being supported by the insulated strip mounted on the supports of the potentiometer panel.

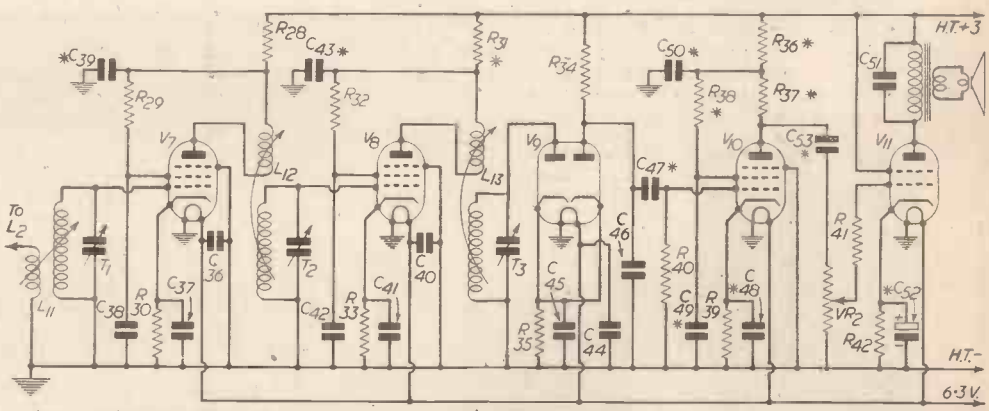
VR8 is already *in situ* and R75 is connected directly to it. R76, VR9, R77, R78, R79 will be found *in situ* and wired. R79 is earthed at one end and this connection is broken so that R80 can be inserted. C76 and R74 are wired across VR8, both components being supported by their own wiring. Care should be taken when fixing these two items so that they do not make contact with the chassis, or with the mu-metal screen of the CRT when it is in place.

The D.C. restorer V19 and associated resistor R73 are already *in situ* adjacent to the CRT base. The wiring can remain as it is except that the connections to the cathode and anode of the valve must be reversed, and any wiring between the cathode and heater must be removed.

C.R.T. Network

Bias for the deflector plates is obtained from the timebase HT supply. The coupling resistors R66, 67, 68 and 69 can be wired directly to the tube holder, R72 (2 watts) and R70 and R71 are mounted on the potentiometer panel. VR6 and VR7 form the shift controls for centralising the raster.

It should be possible to obtain even focusing over the whole of the raster, but if this should not be the case (some tubes are temperamental), the deflector plates 11 and 12 can be taken to separate shift controls. To do this disconnect R66 and 67 at their junction and from each other; connect two more 100 kΩ controls across the biasing network in a similar manner to VR6 and VR7. Connect the centre of one potentiometer to R66 and the centre of the other to R67. (This modification was made to the prototype as a refinement.)



Note: Components marked with an asterisk * are mounted on the tag strip (see text)

Fig. 6.—The sound receiver section.

Power Pack

This is made on a separate chassis. It relieves the unit of a great deal of weight, though it is possible to fit it on the existing chassis, provided a transformer of suitable size can be obtained. If this is done it should be mounted underneath the chassis at the front end, below the bleeder network. Metal rectifiers will have to be used and the whole carefully screened from the rest of the equipment. A separate chassis is recommended for the reasons given

(To be continued)

Painting Woodwork

With Particular Emphasis on Preparation

By "DECORATOR"

MANY of the troubles which arise in painting on new work or the redecoration of old seem to spring from insufficient care in the preparation of the surface to be painted. The home decorator is perhaps more likely to err in this direction than his professional counterpart, and for this reason it is proposed to go through some of the "tricks of the trade" to help the amateur avoid the pitfalls.

Fig. 1.—Use of blowlamp and shave hook.

Painting Over Existing Paint

Here one's job is perhaps a little easier, but nevertheless the same care should be shown and the same attention to detail that would be exhibited if the work were new. In cases such as this, it must first be decided whether or not the existing paint film is good enough to act as a foundation for the new covering. Is the film blistered or cracked? Has it run in wrinkles around the arrises of vertical members due perhaps to being too thickly applied in the first place? Does it look as though it will provide a firm, trouble-free base after the usual rubbing-down? Needless to say, if a change of *colour* in the new coat is contemplated, even if the new coat is a darker shade, then the old coat must be removed first of all.

If there is any doubt at all as to whether or not the old coat is a good enough foundation for the new, then it should be removed. The extra time and trouble in the early stages will pay for itself over and over again in the years to come.

Let us assume first of all that the original paintwork is sound and that the surface will "take" the new paint. The old surface must first be well washed down with warm water, in which has been dissolved some sugar soap. A brush with short, fairly sharp bristles is best for this job, since in addition to getting into all the crevices, it will tend to scratch the old paint film, thereby providing a key for the new. Care must be taken to ensure that the solution is not too strong, as otherwise the original paintwork will be softened, with unhappy results. Having given it a thorough washing to remove dirt and air-borne grease, the surface is rinsed off and rubbed down with one of the proprietary brands of waterproof abrasive papers which are obtainable from any good ironmonger's or handyman shops. A convenient block should be made from a scrap of 1½in. × 2in. timber for small areas and a larger one for the bigger areas of paintwork, so that the sandpaper can be wrapped around it. This method is much quicker than if the paper is held between the fingers.

Having washed and rubbed down thoroughly, the whole surface should be well rinsed with clean, tepid water, and dried off with a chamois leather or a really absorbent sponge. Now the work must be thoroughly dried out before painting begins. The importance of a thoroughly dry surface cannot be over-emphasised; it is as important as a properly prepared surface, new or old. Quite apart from the water lodging in cracks and applied moulding in woodwork, where the rubbing down has exposed the bare woodwork below, moisture will be trapped and cause no end of trouble unless it is allowed to dry out well.

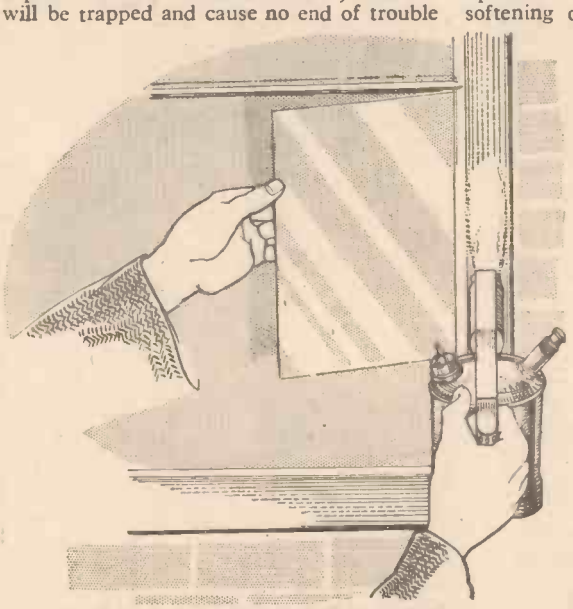


Fig. 2.—Use of blowlamp and metal shield.

Before starting the painting proper, the bare patches already referred to must be touched up with paint similar to the existing shade. If you have the original paint and it is still in good condition, it will be suitable after being thinned down with some turpentine.

Paint Removal

If the original paint surface is not a good enough foundation for the subsequent coats of paint it must be removed and the woodwork prepared and painted virtually from scratch.

There are two courses open to the man who wishes to strip off existing paint from woodwork: first, the old and well-tried blowlamp, or, secondly, the caustic and non-caustic strippers.

The Blowlamp

Operation is simple enough not to need any description here, but it is well to remember to keep the flame on the move. A great many otherwise sound jobs of burning off are caused by the operator encountering a difficult patch of paint, scraping away at it with the scraper in his right hand whilst, in his left, the lamp is playing on one area for several seconds at a time with disastrous results.

A few tips to bear in mind are:

1. To work at the speed at which the paint can be scraped off rather than to soften a large area with the lamp and then have a much harder surface to deal with later on with the knife.

2. To work from the bottom of the job upwards. The heat rising all helps in softening off without making it too soft.

3. Always to burn off the mouldings and similar work first, leaving the adjacent flat surfaces until afterwards. This avoids scorching the latter where difficulty is encountered in shifting hardened paint in narrow crevices.

4. To scrape with and not against the grain of the woodwork.

5. To hold the knife at as flat an angle as possible and never to have it too sharp.

Figs. 1 and 2 show two further points to watch.

Once burned off, the woodwork should be inspected carefully and any holes or crevices filled. This done, the flat surfaces may be rubbed down with a medium grade sandpaper, a fine grade one being used on the mouldings. If it is desired to rub down wet, water should not be used. It is far better to use a mixture of linseed oil and white spirit (one to three or four) as a rubbing down

Fig. 3.—Straining paint through a filter.

agent and rinsing off with neat spirit. This has the merit of avoiding any likelihood of moisture in the woodwork affecting the subsequent paintwork.

Solvent Strippers

These, in many cases, are preferable to the blowlamp, particularly where casement windows are concerned or where an aspirant handyman-painter is not too sure about the blowlamp treatment!

The caustic stripper is an alkaline-based product consisting of, say, caustic soda solution mixed with a powder-vehicle to render it to a paste-form. This is then brushed or spread on to the surface to be stripped and by attacking the oils latent in the paint film the surface is softened and may be scraped off as before. When using a caustic stripper of this kind one cannot be too careful to ensure that the skin and easily damaged surfaces, furniture, clothing, curtains, etc., are adequately protected.

After scraping off, the surface of the woodwork is well washed down with water and it may be of interest to observe the "suds" which accompany this process. The reason for this frothing is that the action of the solvent upon the latent oils in the paintwork is to turn them into what amounts to soap. After thoroughly washing down, the woodwork should be "pickled" with a weak vinegar solution to neutralise any remaining alkalinity, as all must be removed before the paint is applied. As before, the surface must be allowed to dry out well and, the grain tending to rise, the woodwork will need sandpapering down well before further work is done.

Spirit-based, these solvents work on the basis of a volatile liquid, again in a vehicle, usually wax, which tends to "hold" the stripper so that the softening effects of the volatile contents can attack and soften the paint film. The non-caustic strippers are usually highly inflammable and care should be exercised as to smoking, etc., whilst applying them. After the paint has been removed, the whole surface is washed down with white spirit and rubbed over with a pumice stone.

Generally the strippers are not quite as good as the blowlamp for giving a first-class job and more than one application may have to be made if the paint is old and particularly hard. At the same time they are of great assistance where the nature of the work or the lack of skill on the part of the operator rules out the use of a blowlamp.

Painting New or Stripped Woodwork

In these days the period of "seasoning" or drying out of the moisture latent in the growing tree is often shortened, with the result that quite a lot of unseasoned and semi-seasoned wood is perforce used in domestic work. For this reason care must be exercised so as to ensure that the timber is allowed to dry out as much as possible initially before any paint whatever is applied.

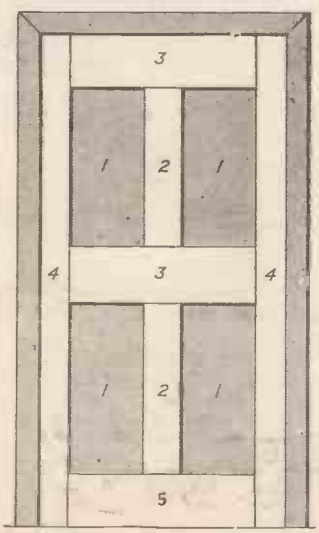


Fig. 4.—Painting sequence for panelled doors.

Knotting

Knotting is the term used to illustrate the painter's method of covering and sealing knot-holes in "raw" woodwork prior to painting. Knots are, of course, caused by the growth of branches in the original tree and are, as a result, centres of resin. This substance will exude through the applied paintwork, thereby spoiling the face, the action being strongest where there is exposure to the sun. Thus, all minor knots should be sealed off with two or three coats of the best shellac knotting, applied thinly and extending for an inch or so all round the knot. Alternatively, if the knots are bad misshapen ones, they should be cut out and filled with a proprietary filler, sandpapered afterwards to a flush surface with the surrounding woodwork. Aluminium, either in powder form on the tacky knotting or as thin foil to a badly affected area of knotty timber can also be used.

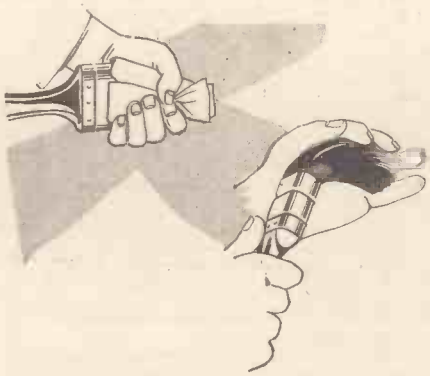


Fig. 5.—Drying off brushes after cleaning.

Priming

The familiar pink primer is made from a combination of red and white lead in a vehicle of raw linseed oil Red lead dries out somewhat harder than does white lead, and although it is obviously desirable to have these hard-setting qualities in the priming coat, the proportion of red lead is usually between 10 per cent. and 20 per cent. to avoid shade difficulties in the finished (painted) woodwork. The paint should be applied with vigour, using a fairly stiff brush, care being taken to brush well into the crevices. Use enough paint to cover and penetrate the woodwork, but do not try to fill minute holes with primer. They should have been filled with a proprietary filler before painting was commenced. If the work being primed has an end grain section, i.e., the top of door stiles, window frames, etc., two coats of priming should be applied. External work should be double-primed also, preferably with one of the aluminium-based primers now on the market. With all these priming applications, enough of the best primer obtainable should be used, but care taken to remove all the surplus by "laying off" at edges and inside angles where it can otherwise collect and spoil the finished job.

Where priming over knots, as dealt with above, it may be necessary to apply a thin coat of, say, oilbound water paint over the shellac to give a key for the subsequent priming. On the question of cost, best pink priming paint costs about 77s. per gallon, whilst aluminium priming for woodwork is 57s. 6d. This latter is definitely a good buy where external woodwork is concerned, but care must be taken to ensure that the timber is well seasoned beforehand, as otherwise the "sealing in" effect of the aluminium paint might well give rise to trouble later on.

The actual number of undercoats is one which always comes in for a certain amount of argument whenever painters get together. With woodwork generally, the whole question revolves around the type of finish wanted and, of course, to the actual condition of the surface to be painted itself.

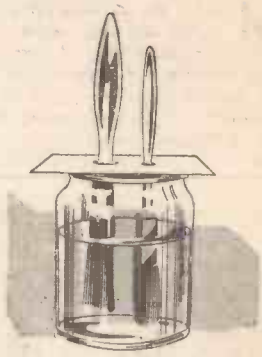


Fig. 6.—Method of suspending brushes in water when not in use.

Finishing Coats

On the question of application, the aim should be to spread as little paint as possible rather than apply thick and badly brushed-out coats which may appear dry but remain semi-liquid beneath. With woodwork, particularly, the whole painting must proceed on systematic principles with as little delay as possible if best results are to be obtained. The priming and undercoats will be applied so as to give the maximum amount of foundation for the finishing coat without ever being "thick," the application of the finishing coat will be perhaps more generous, but nevertheless not so much as to give rise to drips, runs, etc.

Method of Application

Cultivate a free action springing from the wrist. Nobody should need instruction in the holding of the brush, but a similar grip to the thumb-and-forefinger fountain pen grip will normally be used. The system of painting is, in the case of large areas, to apply about two to three square feet at a time, "laying off" each area into the next, so that adjoining areas are as one instead of painting larger areas wherein one portion of newly-applied paint is partially dry whilst the remainder is still in process of application.

Painting Indoors

When dealing with internal paintwork it will be found that the fireplace and the door are the most noticeable features in the average room. For this reason it is usual to paint the windows or picture rail first, then the door and mantelpiece, as the paint will then be working freely and uniformly. The skirting is the last portion to be dealt with. Naturally, one should endeavour to remove all finger plates, escutcheons and similar impedimenta from doors and windows before painting begins.

In the case of doors and french windows, or normal small casements for that matter, the edges are normally painted first. Painting is normally from the top downwards, in the case of flush doors, but where panelled doors are to be painted, the mouldings to the panels are dealt with first, then the panels proper. After this the muntins (the vertical portions between the panels) are painted, followed by the top and middle rails, then the two stiles, and finally the bottom rail (see Fig. 4). Some painters leave the stiles until the last. Figs. 5 and 6 show some useful hints for looking after paint brushes.

A RADIO CONTROLLED MODEL OF THE ROYAL YACHT

Part Three of a Series Describing the Construction of a 6ft. Long Boat, Electrically Driven

By G. W. PATTISON

THE method used for supporting the gearwheels is clearly shown in Fig. 9, which appeared last month, and consists of a steel bar ½in. wide and ⅛in. thick, drilled at each end to drop over the rudder and motor shafts. It also carries the idle wheels which are secured by bolts through their inner ball races. A right-angled bracket is riveted to the arm and fixed by a screw to the deck beam. Thus to centre the rudder relative to the same position on the motor shaft, one has only to remove this screw, lift the arm and remesh the gears.

Superstructure

Only a brief outline of how the main work is carried out will be given. Small details can be left to the individual builder, but it must be emphasised that everything above deck must be as light as possible and to scale. The more details put in, however, the better the final result.

All decks and cabin sides are of 3/64in. plywood, stiffened with stringers and braced together by cross beams of ½in. thick wood where necessary. The "Britannia" has an upper deck with a covered promenade, then the shelter deck, followed by the bridge and signal decks. The upper deck is first cut out and this rests on the deck already fixed to the hull. On this is built the whole of the superstructure which extends from just forward of station 16 to as far aft as No. 1 and the whole lot can be lifted off in one piece to provide access to the machinery and radio gear. It fits neatly between the bulwarks, being guided into position by the lower portion of the davits and the supports which hold the upper and shelter decks together along their otherwise unsupported edges. Details of how these decks are held together and how the superstructure fits into the hull can be obtained by reference to Fig. 10 which shows a typical section.

Where no davits are present the metal

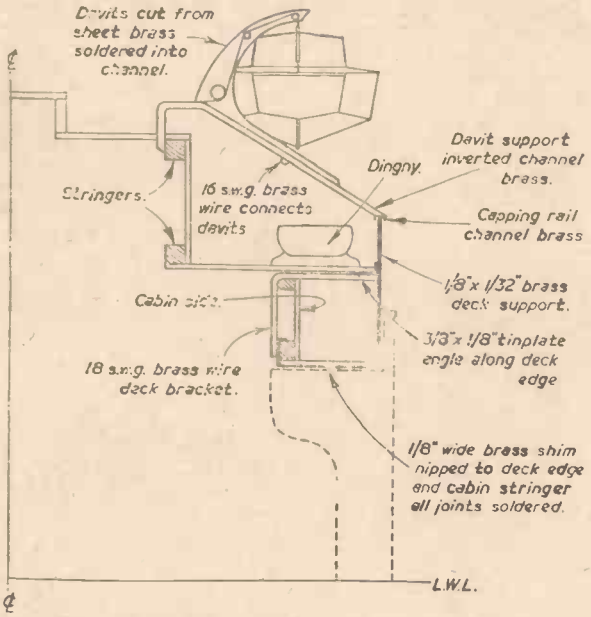


Fig. 10.—A typical section through the boat's superstructure.

deck supports are only carried up as far as the shelter deck. The edge of this is stiffened by a tinplate angle running its full length and as well as being soldered to the various brackets, this angle is drilled for the wire railing stanchions. These are soldered underneath the angle and filed off flush, their top ends being soldered to the capping rail.

The walls of the various cabins and staterooms are planted on the upper deck, not forgetting the numerous alleyways which lead to some of the doors. These add greatly to the appearance and look much better than just marking out the doors on the cabin side. The walls of these alleyways can, in some cases, be used as cross beams, all unwanted wood being fretted out to reduce weight. To stiffen the cabin walls and secure them to the decks ¼in. square stringers run their full lengths. One of the main difficulties is to preserve the camber when building up the various decks. All decks and other such woodwork not seen from the outside should be completely cut away leaving only a hollow shell, as can be seen in Fig. 11. Note that the after end of the shelter deck is raised and reached by three steps from the main part. This after end will therefore have to be fixed as a separate piece.

The shelter deck carries the Royal apartments, the top of the engine room and the bridge work. The cabin aft is of a peculiar shape and has a stairway on either side. The easiest way to build this is to cut out the the floor and roof from ¼in. plywood, then remove the centre of each leaving only a rim ⅜in. wide. Glue one to the shelter deck and support the other on beams, then add the walls, alleyways and stairways and finally cover with another deck. A row of stanchions can now be driven in all around the edge of this deck to take the railings and capping rail. Seats are arranged round the edge of this deck and if made from thin brass and soldered to the capping rail will add support to the latter.

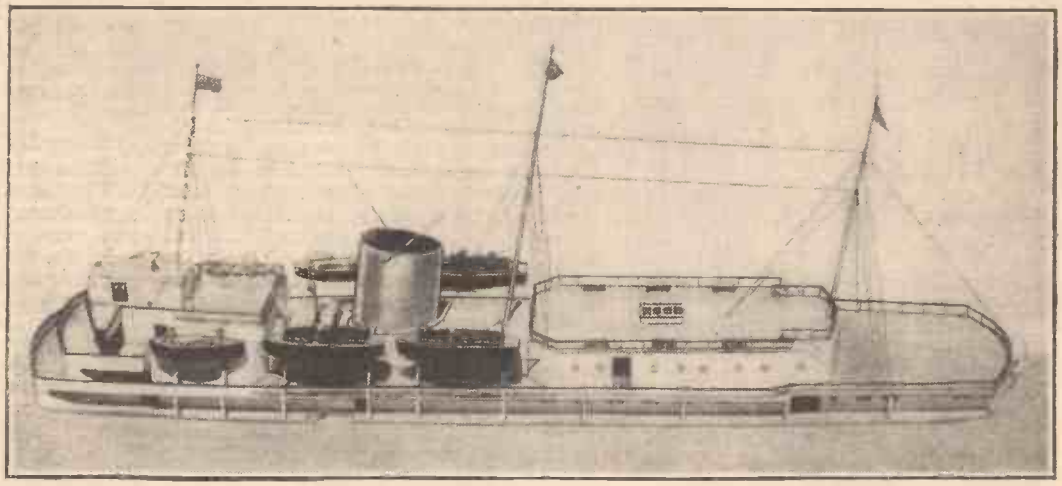


Fig. 12.—A close-up view of the superstructure removed from the hull.

Fig. 11.—An underside view of the superstructure.

(Continued on page 95)

Mounted wheels and points made by CARBORUNDUM

CARBORUNDUM offer a complete range of mounted wheels and points in standard shapes and sizes. From large-scale sculpture in metal to model engineering. these tools find a thousand and one uses for small grinding and finishing operations, in a wide variety of metals and other materials, ranging from hard steel to plastics. If you have a powered tool suitable for them, you will find these mounted wheels and points invaluable in your workshop.

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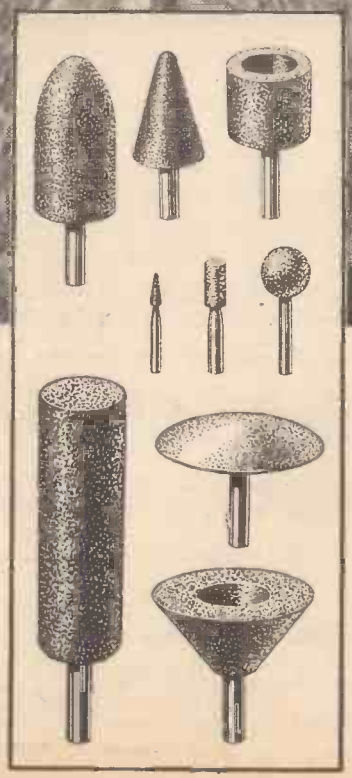

A mounted point made by CARBORUNDUM *in use for weld-dressing on a screen by Mrs. Mitzi Cunliffe, the well known sculptor. The screen, designed for the new restaurant of the Liverpool store of Lewis's, was cast in aluminium bronze, in sections which were later welded into place.*

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The engine room is made next and this also has an alleyway on the starboard side, then just ahead of this there is a large louvred panel for ventilation. Next comes the bridge work and signal deck with their curved fore ends and railed all round, the after part having open rail's with the fore end screened and capped with a rail, this latter being achieved by extending the cabin walls to rail height. Fig. 12 gives some idea of the finished appearance.

Superstructure Detail

Doors leading into cabins or staterooms are of mahogany or teak, all cabin sides painted white with decks painted buff, lined and varnished. The cabin doors cannot be reached after the decks are fitted so they should be completed and varnished before fixing, similarly the walls of the alleyways should pe painted right out. It is also far neater to impress the windows on the wood than to cut them out and glaze with celluloid. Such details must, therefore, be carried out as the work proceeds. To impress the windows a short length of steel rod is filed so that in section it corresponds to the shape of the windows. The end is ground off square and the rod used as a punch. When struck with a hammer it will leave a definite impression cut in the wood and after painting the cabin white these windows are filled in with pale blue and the top, say, left-hand corner, shaded with deeper blue.

Port holes are made in the same way except that the punch is made from round rod of the appropriate size. When a round window has to be impressed on a mahogany door the procedure is the same, except that a piece of blue-backed celluloid is inserted between punch and door before the blow is struck. When struck with a hammer a disc of celluloid is punched out and left embedded in the wood, where it remains. This, of course, is carried out after the door is completed and just before fixing.

Stanchions may be bought or turned with a form tool in a lathe, those shown, however, were simply made by driving panel pins into the wood at correct intervals and all left standing at an even height by using a gauge alongside. The nail heads were then rubbed over with a smooth file, fluxed and tinned leaving a small dome of solder on each. The channel brass capping was also tinned, placed over the rails and heat applied. Below this rail the tubular ones were made by stretching linen carpet thread very tightly right round the outside of the stanchions, then touched where they crossed the stanchions with a spot of resin glue. Finally they were painted white and rail teak coloured.

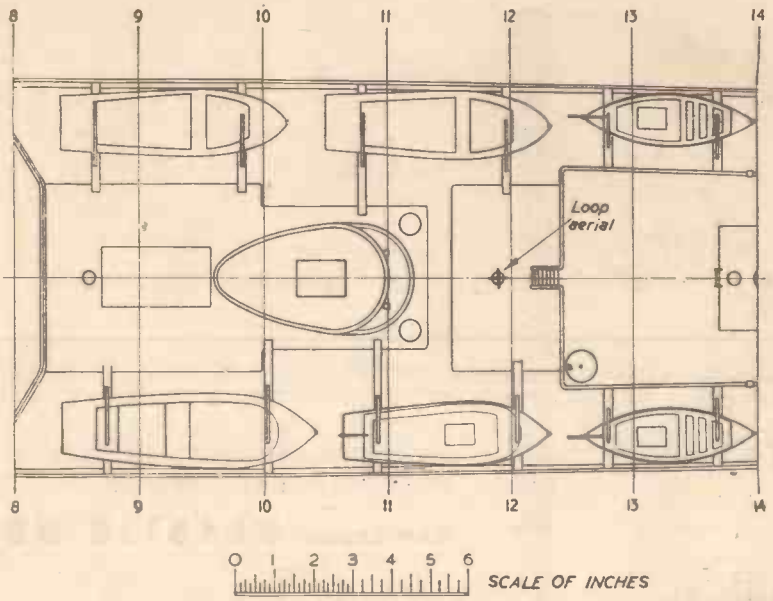


Fig. 13.—Midships plan showing positions of davits, boats, etc.

The Boats

Each boat was shaped from a solid piece of wood, sanded smooth and covered with a layer of wet tissue paper completely enveloping it. It was further covered with three thicknesses of paper, torn from a magazine, each layer coated with resin glue. When hard the deck was filed around the edges, the hull slid off the mould, forming a feather-light hull. With glue applied to the edges of the gunwale, the hull was inverted on to a sheet of Bristol board and when dry trimmed to form the deck upon which was mounted the various cabins, etc. Pins were pressed into the bottom of the hull and each carried a miniature propeller. Quite a tricky little job, but very effective and adding to the appearance when the boat was slung from the davits. To make these small propellers three 1/16in. dia. discs were punched out from brass foil, which had previously been tinned. The pin was dropped through a fine hole in a block of wood so that only the head protruded, this was turned and the three discs arranged round it. Heat was applied and the solder melted and united the lot. Once or twice the discs moved but eventually the required number of propellers were assembled. Painted royal blue with mahogany cabins and varnished decks, these small model boats looked first rate.

The boats carried in the davits consist of the Royal Barge, a motor cutter and a double-ended jolly boat on the starboard side, together with two power boats and another jolly boat on the port side. Underneath these, mounted on chocks on the shelter deck, are two motor dinghies and two sailing dinghies. Details of the boats and their positions can be seen from Figs. 12 and 13.

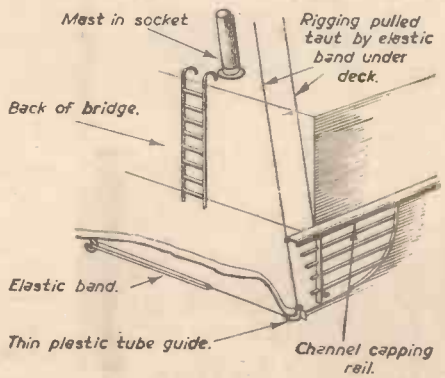


Fig. 15.—Method of securing the standing rigging.

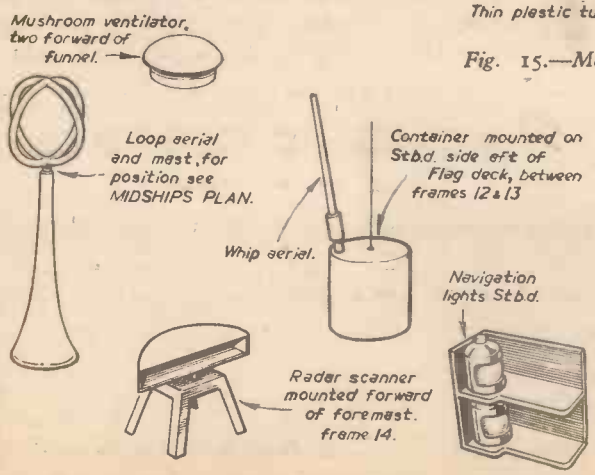


Fig 14.—Some of the details on the superstructure.

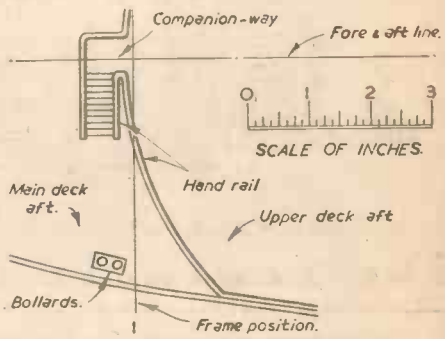


Fig. 16.—Details of the after companion way.

Davits are made from channel brass similar to that of the bulwark rail. Details are given in Fig. 10.

The Funnel

This is of tinplate conveniently cut from a large tin similar to that used for packing dried milk. First carefully remove the bottom, filing flush with the sides and leaving the folded rim on the outside. Then cut up the seam and bend the tin round a block of wood, shaped to the funnel dimensions, the rim now becoming the top of the funnel. Solder the joint up the after side and cut round the base until it stands at the correct angle. Stand it on a flat sheet of tinplate and sweat all around the outside of the base. Trim away all superfluous metal until only an $\frac{1}{8}$in. rim is left around the base which will form a flange for fixing to the top of the engine room. A further rim is soldered inside the funnel about $\frac{1}{2}$in. down from the top and on this rests a balsa block carved to the shape of the dome and having a rectangular hole cut in its centre. If loosely fitted, it will float and act as a marker buoy should the boat meet with an accident and sink. A length of strong thread is attached to the dome with the other end anchored to an eye inside the funnel. Incidentally, the funnel makes an ideal handle for lifting the superstructure.

The various whip aerials (Fig. 14) are best made from steel wire, such as thin knitting needles, as this material does not bend. They can be arranged to fold horizontal when not in use and in this position were not so liable to damage. Masts are made from aluminium alloy knitting needles, carefully tapered to

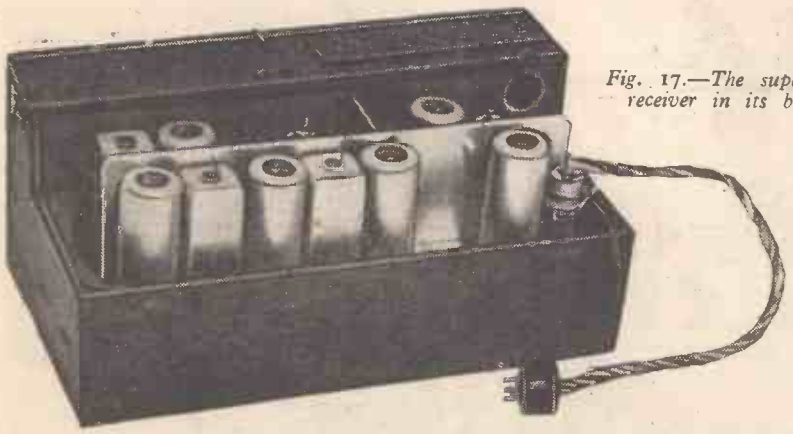


Fig. 17.—The superhet receiver in its box.

shape and fitted into deck sockets for easy dismantling.

The standing rigging is of strong linen carpet thread drawn taut below decks by springs or elastic bands. Details of this are shown in Fig. 15. Short lengths of plastic tube stripped from fine bell wire act as guides where the thread passes through the deck. For the aerial and other rigging which cannot be dealt with in this manner, thin elastic thread is used, when purchased it is usually white but can easily be dyed or stained a more natural colour.

Other details, too numerous to mention can be picked out from the drawings and photographs. Such fittings as the radar scanner, engine room ventilators, hatches, capstans, etc., can easily be executed in wood or metal whichever is most convenient for the builder to use. Some hints are given in Fig. 14, and Fig. 15 shows in full the after companion which was not fully detailed in the half plan.

The Motor

The main propulsion motor is a Lucas type dynamotor with the high tension brushes removed and in the prototype the high tension windings were also removed, but this latter is optional. The motor is coupled to twin propeller shafts by a gear box containing four gearwheels all on ball bearings. The propellers are three-bladed, 2in. dia., and have a pitch of 3in. They are geared down with a reduction of 1½ to 1. Although the motor is rated at 12v. it has ample power running on 10v. The main battery is of the lead-acid type with a capacity of over 10 amps. The reason for using a large capacity battery is that besides giving a long run to the driving motor it also supplies current for all the radio intergear and this is accomplished with a voltage drop, Otherwise separate batteries would be necessary.

The original receiver fitted to the boat was of the super-regenerative type with a single valve, but this was later replaced by a two-valve "Hill" receiver named after the designer. This latter is certainly an excellent receiver and can be recommended. It gave absolutely no trouble whatever during the time it was in use and only required a 30-volt H.T. battery to run it. Later, however, it was replaced by a superheterodyne receiver. This, of course, has numerous advantages, the most important being that should several boats be equipped with superhets, they can all operate on the pond at the same time. The receiver is shown in Fig. 17. The construction of a superheterodyne receiver for model control was described in our May, 1956, issue.

(To be continued)

Science Notes

Satellite Observation Test

A SIMULATED earth satellite comprising a plumber's plunger equipped with a subdued flashlight was towed behind a plane at over 100 m.p.h. to test the ground observing teams. Two teams spotted the imitation satellite.

The English Electric "Thunderbird" at Farnborough. This is a surface-to-air guided weapon system now in production, having an internal sustainer motor and four wrap-around boosts.

Pole to Pole Conversation

SCIENTISTS at the South Pole and the North Pole have talked to each other by radio across some 11,200 miles. This is only the second conversation of its kind known.

Ultrasonic Echoes Detect Cancer

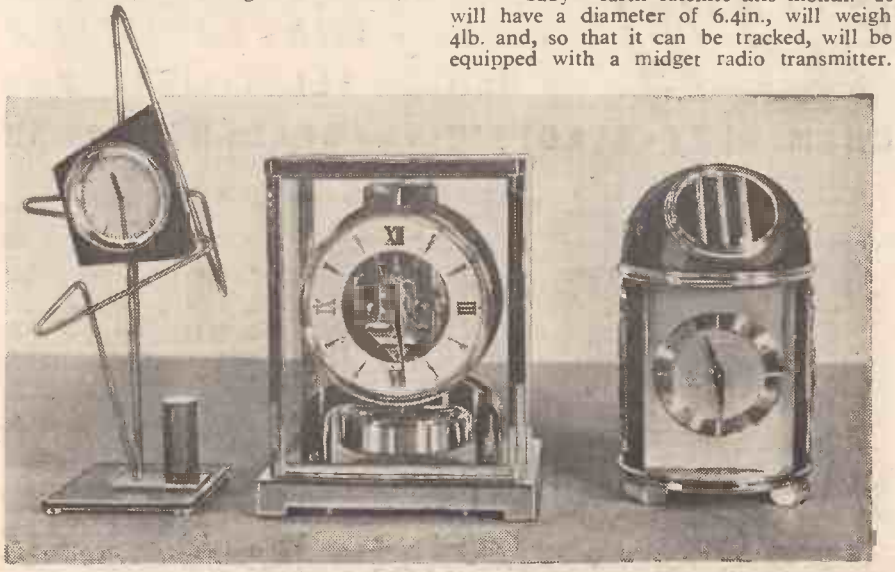
FROM Japan comes a report of a technique similar to radar detection for detecting cancer in the human body by means of pulsating ultrasonic waves. These are beamed into the body and bounced back from various internal structures. Echoes are recorded as wavy lines on a cathode ray ocilloscope, the strength of the echoes indicating the state of the tissues. They are able to indicate brain tumours, gall stones, abdominal and breast tumours and trace the contractions of the large intestine. An inside picture can be produced which is impossible by any other means, including X-rays.

Slotted Wings for Aircraft

FROM America comes news of a method of reducing drag in aircraft by means of slots in the wings. These will be situated in positions where the smooth airflow is interrupted and will conduct the airflow through the wing. The reduced drag will mean an increase in the aircraft's range.

Small Earth Satellite

IT is planned in America to launch a "baby" earth satellite this month. It will have a diameter of 6.4in., will weigh 4lb. and, so that it can be tracked, will be equipped with a midget radio transmitter.



The Swiss have perfected timepieces that run on every conceivable source of energy. Here are three examples displayed at the Basle Watch Fair. The table clock on left works on the same principle as a transistor radio, using two microscopic transistors and four condensers; daily variations in temperature power the movement of the centre timepiece; the one on the right converts light into energy by means of a photo-electric cell located in its top.

MAKING A DESIGNOGRAPH

With Which You Can Make these Weird Contemporary Designs

By H. A. WYNE

OUR SPECIAL SECTION for the JUNIOR MECHANIC

THE appliance shown in Fig. 1 is capable of drawing an infinite number of designs, and can be constructed with odd scraps of material which may be found in the scrapbox. The materials include part of a packing-case, three motor cycle spokes, a piece of broken hinge, a few screws and terminals from old electrical apparatus.

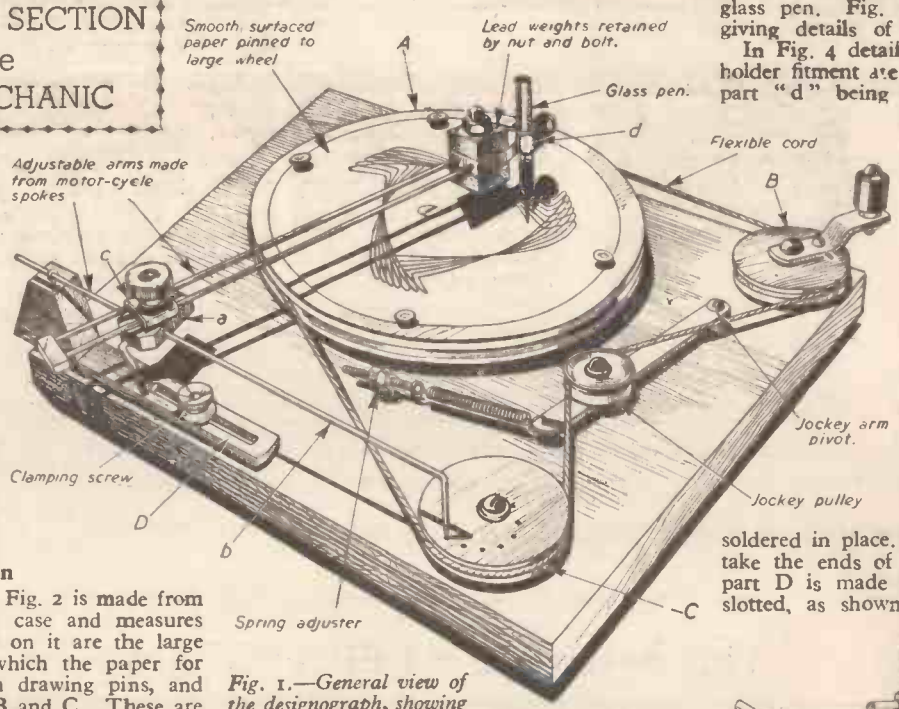


Fig. 1.—General view of the designograph, showing how the pattern is traced on the paper.

Details of Construction

The base as shown in Fig. 2 is made from the end of the packing case and measures 11in. × 9in. Mounted on it are the large grooved wheel, A, to which the paper for the design is fixed with drawing pins, and the two smaller wheels B and C. These are made of a double thickness of the thin sides of the packing case glued together with the grain at right angles. A handle, shaped from a strip of sheet brass ⅜in. wide and 1¾in. long, is attached to wheel B, a small knob being fitted as shown in Fig. 1. It should be noted that wheel A is mounted ½in. off centre as indicated in Fig. 2. Wheel C has a number of small diameter holes drilled partly through at varying distances from the centre of the wheel. The pointed end of the rod "b" engages in one of these holes when the appliance is operated. Each of the three wheels should be provided with a thin metal or wooden washer to raise them slightly above the surface of the baseboard in order to eliminate unnecessary friction.

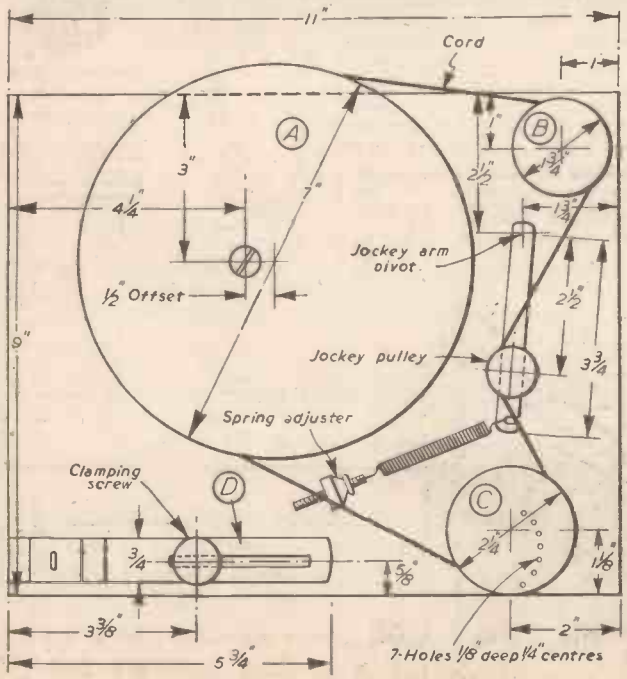


Fig. 2.—Plan of the designograph showing the layout of the various parts.

Adjustable Arms

The adjustable arms (see Fig. 1) are made from cycle spokes, the brass block "a" being drilled and fitted with a clamping screw for the rod "b" which is bent at right angles at one end, and pointed, as shown, to drop into one of the holes in wheel C, as already mentioned. The block "a" is also drilled to take a clamping screw for the bridge piece and double arm which carries the pencil or glass pen. Fig. 3 is an exploded view giving details of this fitment.

In Fig. 4 details of the weighted penholder fitment are given, the centre brass part "d" being drilled to take a bolt for clamping the two lead blocks in position. These blocks are provided to ensure a suitable pressure being maintained on the pen or pencil point on the paper. The penholder is shaped from a small piece of brass and drilled to take the glass pen or pencil, which is clamped into position by means of a brass milled-head screw. One end of the penholder is filed to fit into a slot in the block "d" and is soldered in place. This is also drilled to take the ends of the double arm. The part D is made from hardwood and is slotted, as shown in Fig. 3, to take a

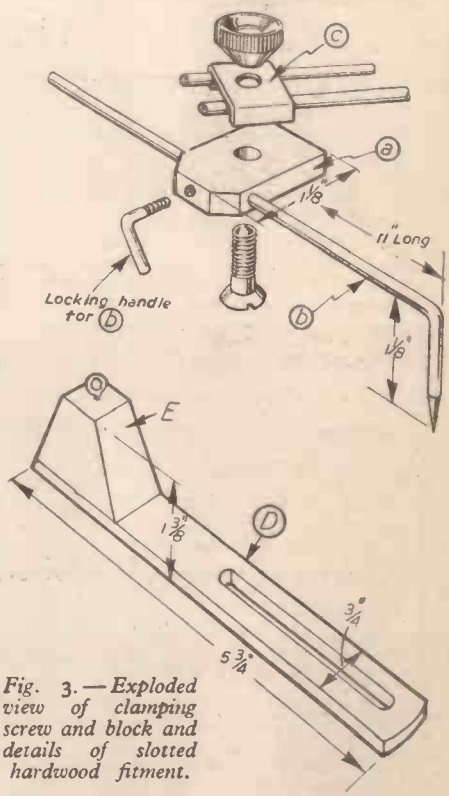


Fig. 3.—Exploded view of clamping screw and block and details of slotted hardwood fitment.

clamping screw. A shaped block E is glued and screwed to one end, and is provided with a small screw-eye in which the end of the rod "b" slides freely.

(Continued at foot of next page)

an easy to make Waterline Ship model

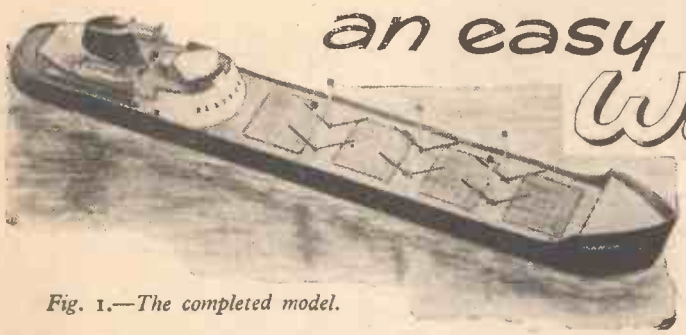


Fig. 1.—The completed model.

Turn Odd Scraps of Wood and Card and a Few Pins into this Modern and Distinctive Craft

MAKING waterline model ships is not difficult, but it does require a certain amount of care and patience. The usual methods have been somewhat simplified here, but by following these instructions a very creditable model may be produced.

Materials

The materials required include various sizes of strip wood, wooden dowels, thick cartridge paper, pins of assorted sizes, poster colours, clear varnish and brushes, glue, a sharp knife or razor blades, and a pair of small pliers.

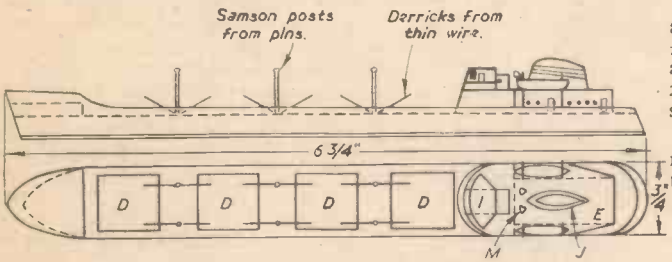


Fig. 2.—Side elevation and plan of the model.

Construction

Fig. 1 shows the model which it is proposed to construct and the first step is to make the hull. For this a piece of strip wood 6 11/16in. × ⅜in. × ¼in. is required, and this is shaped as shown on the plan in Fig. 2 and marked A in Fig. 3. The forecastle deck is cut from a piece of ⅛in.-thick wood and measures ¾in. × ¾in. and is shaped as shown at B in Fig. 3.

The saloon is made from two pieces, one piece measuring 1 1/16in. × ¾in. × ¼in. and the other ⅝in. × ¾in. The two pieces are glued together after being shaped to form part C in Fig. 3.

The hatches (D) which are shown plainly in both Figs. 2 and 3 can either be made from thin card or from 1/16in. strip. The boat deck, E, is made of thick cartridge paper to the T-shape of the saloon and the front rail F is made of the same material glued in position.

The chart house, G, is made of wood and measures ⅛in. long × ¼in. wide × ¼in. high and the wireless cabin behind it should be made slightly smaller. The bridge roof, I, is cut to the shape shown in the plan, Fig. 2.

The funnel is cut from a piece of wood, ¾in. × ¼in. × ¼in. and shaped as shown in Figs. 1 and 2 with a penknife and sandpaper.

The boat davits are made from thin wire to the shape shown at K in Fig. 3 and the lifeboats (L) are cut from pieces of scrap wood ⅝in. long and shaped as shown. The ventilators are made from pins, with the heads bent over to form the shape shown at M. Some larger pins with the heads broken off can be used for the samson posts or fine nails, perhaps, if they look well. The derricks may be made from fine wire.

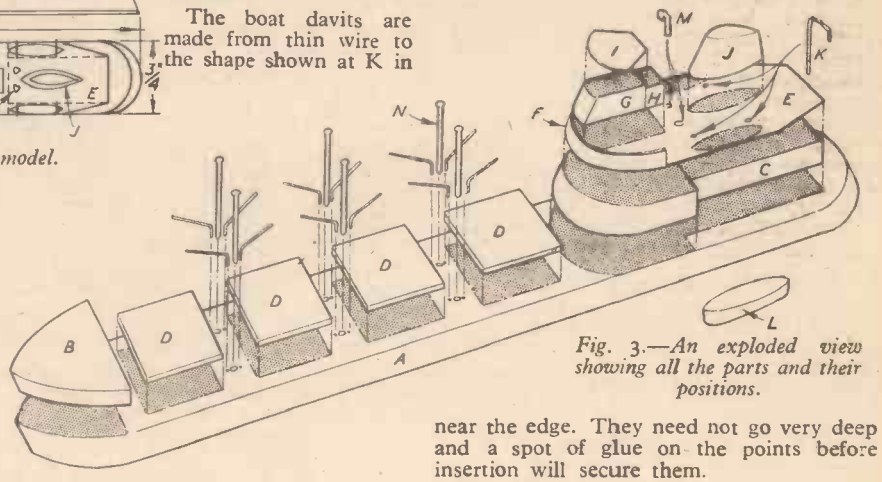


Fig. 3.—An exploded view showing all the parts and their positions.

Assembly

Cut out the two sides of the vessel from thick cartridge paper to the shape shown in Fig. 4 and when all the parts are made they can be glued together; the positions of all the parts will be seen from reference to Figs. 2 and 3.

Press the davits through the holes marked in the boatdeck into the hull, being very careful not to split this, as they are very near the edge. They need not go very deep and a spot of glue on the points before insertion will secure them.

Painting the Boat

It will be found easier to paint the superstructure and deck fittings before the sides are fitted. When this has been done the sides are glued in place and the boat is complete, except for finishing off.

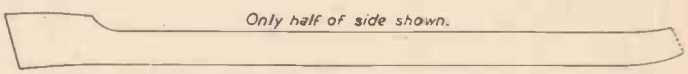


Fig. 4.—The side of the vessel which should be cut from stout cartridge paper.

The most convenient paint to use has been found to be poster colours. These are quite permanent if varnished over with clear varnish.

The finish of the boat and the amount of fine detail included is a matter for the constructor's individual preference and it will, of course, be possible to improve on the details given here.

MAKING A DESIGNOGRAPH

(Concluded from the previous page)

Jockey Pulley

A brass jockey pulley is fitted as shown to take up the slack in the driving belt. This may consist of blind cord or similar material. An adjustable coiled spring is provided to maintain the necessary pressure for keeping the belt taut.

Four small rubber feet, screwed to the underside of the baseboard, complete the appliance which will produce an unlimited number of varying designs by simply altering one or more of the four adjustments provided.

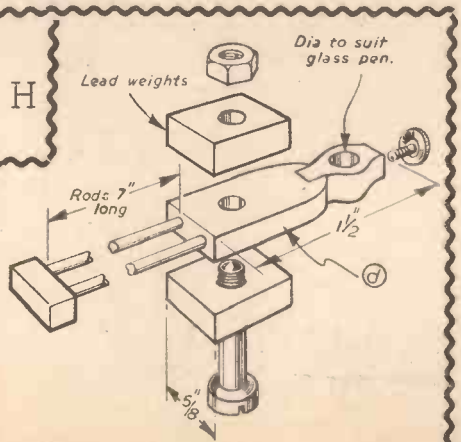


Fig. 4.—Details of the weighted penholder.

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A NOVEL MARBLE ALLEY

An Indoor Game to Make and Play this Winter

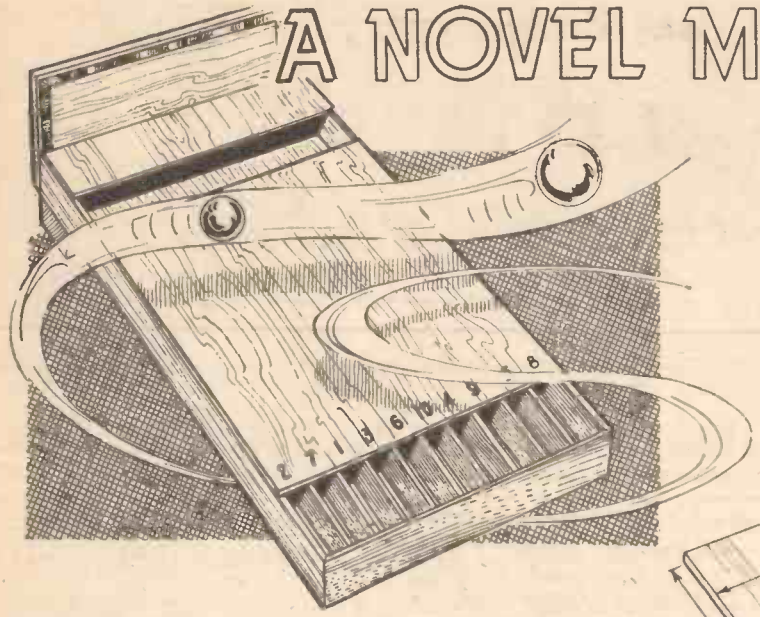
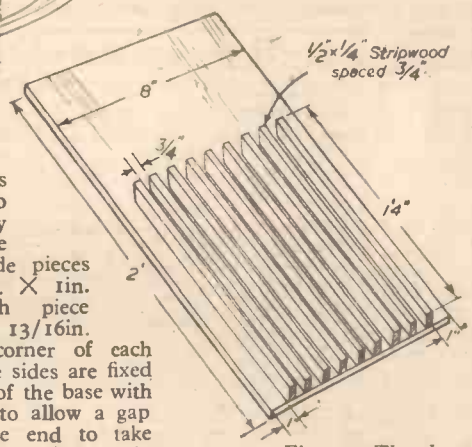


Fig. 1 (Left).—The completed marble alley.

THE marble alley shown in Fig. 1 is quite different from the usual kind of game, where the marble is rolled on a board into holes at the back with a series of spikes in front as hazards. A glance at the illustration will convince the reader that a good deal of fun is to be obtained from the game, since the marble is rolled up the board and disappears in the slot at the back. The score is decided by the marble rolling into one of the divisions and reappearing in the front. You may decide to try for a ten only to be greatly surprised if the marble turns up in division one or two. There is a similar game commonly seen in amusement arcades. The alley is quite straightforward to make.

The Base Board

Commence by making the bottom piece indicated in Fig. 2. Cut a piece of ¼in. wood 2ft. long × 8in. wide and take care to get the sides square. On one end of the wood mark a distance of 1in. from either side and then make marks ¾in. apart between this distance. On the marks thus made, neatly glue nine strips of ¼in. × ½in. stripwood 1ft. 4in. long parallel with the sides and with the ¼in. width facing upwards, this being clearly shown in Fig. 2. All glue must be removed from the face of the channels thus formed in order to provide a clear way for a small marble to roll. Two side pieces are cut from ¼in. × 1in. stripwood, each piece being cut 1ft. 11 13/16in. long with one corner of each rounded off. The sides are fixed on the top edges of the base with glue, taking care to allow a gap of 3/16in. at the end to take the back piece. The front strip required is a piece of ¼in. × ½in. stripwood 8in. long. Fix this neatly to the front with a couple of small nails driven through into the front of the side pieces.



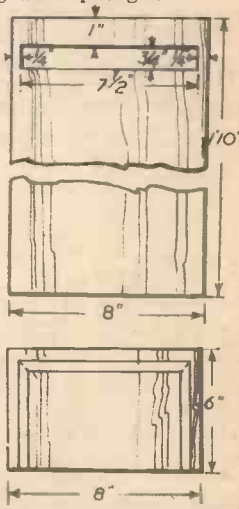


Fig. 2.—The base and stripwood divisions. Fig. 3 (Right).—Top and head board details and dimensions.

The Back

Due attention should be paid to the back, which can be decorated with a piece of moulding as shown in Fig. 1. First cut a piece of 3/16in. wood 8in. × 6in. The moulding ornament is fixed in position with glue, and then the completed back is secured with a few small tacks driven through into the back ends of the side pieces. The top of the alley is illustrated in Fig. 3 and this is cut 1ft. 10in. × 8in., taking care to get the sides square. A distance of 1in. from one end cut an opening 7½in. long × ¾in. wide.

Sloping the Board

Smooth the face of the top with sandpaper and fix it in position with the opening at the back by means of a few tacks on each edge of the sides. The alley can be completed by gluing a length of 3/16in. half-round beading along the top edges.

In order to give a slope to allow the marble to roll down with ease, a foot, 8in. long by 1in. thick by ½in. wide is glued on the bottom at the back. The top edge is cut with a slight taper to allow the foot to bed nicely on the bottom. A coat of stain should be applied which will add to the appearance of the finished alley. When playing the game the small marble used should be able to roll down between the stripwood easily.

If the marble alley is made in time for Christmas, it will make a useful present for a friend or alternatively could be employed as a party game.

A Diving Model Submarine

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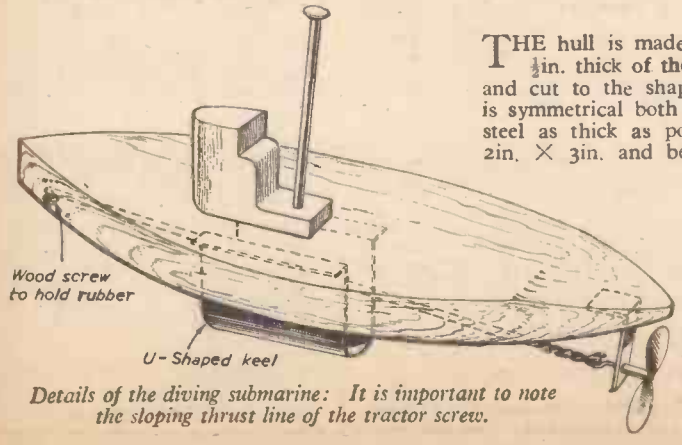


Details of the diving submarine: It is important to note the sloping thrust line of the tractor screw.

THE hull is made from any wood about ½in. thick of the dimensions 8in. × 2in. and cut to the shape shown, noting that it is symmetrical both ways. A piece of sheet steel as thick as possible is obtained about 2in. × 3in. and bent into a U-shape, this being fastened about halfway down the centre line to form the keel. A bracket is now made for the propeller shaft from sheet brass or iron, and a screw provided at the nose for the rubber motor. The propeller is made from tinplate and soldered to its shaft. A small bush is made from tinplate to take the thrust. A conning tower can be made from wood or cork to the shape shown and a large nail will serve as a periscope. The rubber used for the motor may be cut from an old cycle tube. The model will have to be weighted until it just floats, and this can be done by putting washers over the periscope. When wound up in the usual way and placed on the water the model will first run on the surface for a second or two and then dive realistically until the power has run out. The diving action is due to the slope of the propeller lifting the stern.

Letters to the Editor

Address letters to The Editor, "Practical Mechanics," Tower House, Southampton Street, London, W.C.2.

The Editor Does not Necessarily Agree with the Views of his Correspondents

The Mantell Incident

SIR,—In recent correspondence on the "Mantell Incident," Major Ruppelt's book "The report on the U.F.O's" is referred to for reference. The findings of Project Bluebook on the above case are stated therein. It appears that when the staff in the control tower were questioned later about Captain Mantell's last message they could not agree about the "It looks metallic and of tremendous size" part; in fact, no one was certain he ever said that.

They agreed about him saying, "I am going to attempt to reach its altitude, if I can't I will give up the chase."

The whole case hinged around the statement, "It looks metallic and of tremendous size." If he had said that then he must have got a reasonably close look at the object he was sent up to investigate.

The findings of Project Bluebook after much research were that there could have been a "Skyhook" balloon in that area, one was released a distance away and, due to upper atmosphere winds, could have been in that vicinity at that time. He was asked to investigate an object reported by hundreds

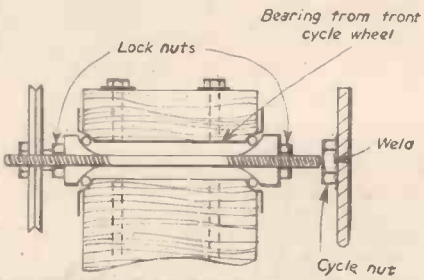
(*Continued on page 107*)

A SIMPLE LATHE BEARING

Details of a Useful Alternative

SIR,—It seems to me that the ideal bearing for your lathe (May issue of PRACTICAL MECHANICS) would be the bearing from an old bicycle front wheel.

The bearing could be clamped betwen two blocks of wood and fixed to the lathe bed, as shown in the sketch. The faceplate, etc., could easily be made by welding a cycle hub nut to each item.—K. H. FLINT (Leics).



(Right).—Suggested cycle hub lathe bearing.

Puzzle Corner

SIR,—With reference to "Puzzle Corner" in the September issue, I should like to comment on the solution given. First, the statement that "the rope is pulling upwards with a force of 12lb. on the monkey" is incorrect. The upwards force on the monkey by the tension in the rope is 10lb. balancing the monkey's weight, it is the tension at the point where the rope passes over the pulley which is 12lb.

Furthermore no allowance is made for the fact that once moving, the weight will retain its momentum.

May I suggest that the same answer can be obtained, that the weight reaches the pulley before the monkey, by ignoring the weight of the rope?

To lift himself up the rope the monkey must exert a downwards force on the rope which will therefore cause the weight to accelerate upwards. During the exertion of the monkey (assuming constant pull), the weight will have uniform acceleration upwards, and the monkey, as it is of the same weight and is experiencing the same force, will have the same acceleration with respect to the rope, and therefore stay in the same place with the rope moving past it. When the monkey ceases pulling, the accelerations cease and the whole system carries on with the uniform speed gained up to then, i.e., the weight upwards and the monkey downwards.

Consideration of the weight of the rope, gives a small ever-increasing acceleration in the same direction and will make the weight reach the pulley even sooner. If the rope is in the form of an endless ring the result is the same in that the weight will reach the pulley while the monkey will not rise above his original height in fact will almost certainly finish up lower down.—A. J. ROSKELL (Cheshire).

OUR ELECTRIC FENCER

How to Make it Even Cheaper

SIR,—I read with interest the description of an Electric Fencer in the August issue. It was a lucid and easily applicable article for the average farmer. To paddock graze on the recommended system, which is supposed to give 50 per cent. better utilisation of grass, requires a large number of fence posts and here I must disagree with your contributor in his last sentence where he says, "Metal posts, insulators and fencing wire may be purchased at a 'moderate' price."

According to their elaboration fence posts cost from 3s. 4d. to 4s. 3d. each and even on our small 40-acre dairy farm we use about 300. If you collect them every time you move the herd to another patch, a great deal of labour is involved. Moreover fence wire costs about 29s. for a 300 yd. coil.

Now, having made your own fencer, why not make your own fence posts? They are even more simple.

Dunlop and Rankin of Leeds provide ⅜in. dia. straight black steel rod in lengths of about 18ft. to 20ft. according to what they have in stock. Price at the moment is about 55s. per cwt. and since it weighs about 0.37lb. per ft. we get 300ft. per cwt. A fence post must be about 30in. to 32in. out of the ground so with the pigtail and the underground portion it is best to cut the lengths at 45in.-46in. If the rod comes in 18ft. lengths you have a bit of waste, but the local blacksmith will weld two together for a few pence each. Anyway assuming you throw the short ends into the concrete when you are making some gate posts, instead of buying them, you still get four posts per length. Sixteen lengths per cwt. gives 64 posts for 55s. or, say, 10¼d. per post.

Now you want insulation and this comes from B. I. & Callenders Cables. 0.40 i.d. by 0.040 wall thickness at 85s. per 100 yards. Chopped into 10in. length this adds about 3d. per post. This makes 1s. 2¼d. per post plus the painting with bright yellow synthetic paint at about 1d. per post. You can see posts this colour if the cows trample them down when the fencer is earthed by a piece of grass growing just too tall or the wind blowing a bit of hedgerow against it.

For the pigtail I use an old Austin seven wheel hub, but any flat disc with a piece of 1¼in. to 1½in. o.d. pipe, 1½in. long welded on to the centre with a piece of ⅜in. bar 1in. long welded about ½in. away from it, will do the job. Slip the insulating material over the ⅜in. rod, lay it between the 1½in. centre stub and the ⅜in. stop, slip a length of ¾in. i.d. water pipe over it till it reaches within 1in. of the centre stub and just walk round the vice which is holding the jig in place. As you approach the stop after the first time round, just raise the water pipe handle a little to go over the top of the ⅜in. stop and carry on for 30 deg. I can do fifty an hour.

There is available at the moment, "shorts" as they call them of galvanised "half-hard" wire at half price, i.e., about 42s. per cwt. from most scrap merchants. It is a bit more trouble to handle since it is springy, but, run out neatly, it cuts costs a lot.—K. MCGRATH (Stockton-on-Tees).

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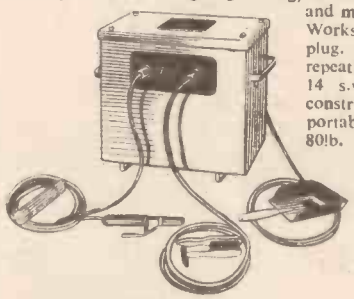

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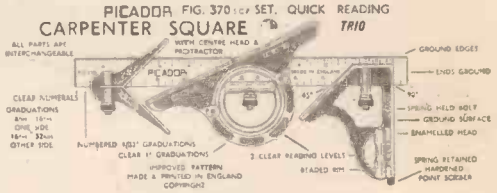

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(*Continued from page* 104)

of people over a large area and as they concluded, Captain Mantell had never heard of, or seen, a "Skyhook" balloon, and died trying to reach its altitude which was far above his ceiling.

Also as regards Venus and the above case, Venus was in the sky but low at the time and was six times as bright as the surrounding sky. It is practically impossible to see a pinpoint of light at that brightness in daylight with the naked eye.

The whole findings on U.F.O.s by the project, was that 26 per cent. of the reliable reports they evaluated were "unknowns" and being classified as unknowns means they could not be accounted for by anything we know—which is different to a recent R.A.F. statement on Flying Saucers which said *All* objects seen can be identified as natural phenomena, hoaxes, clouds, miss-identification of aircraft, etc.—D. HARVEY (Essex).

Dexion in Small Quantities

SIR,—We were very interested to read of the home-made work bench described by Mr. E. Rosenstiel (S.W.15) in the September issue of your journal. May we be permitted to correct the statement he makes regarding possible difficulties in obtaining Dexion slotted angle in small quantities of less than 100ft. Our slotted angle products are now readily available in any quantity from distributors situated all over the country.—DEXION LIMITED (N.W.6).

Treating H.S. Steel

SIR,—Re your reply to J. Houfe (Leeds, 11) in the September issue, the following is a method which is foolproof.

To soften high speed steel for cutting or shaping, have at hand plenty of hot fine sand, sufficient to cover well the tool or tools to be softened. Heat the high speed steel slowly to "blood" red, then quicken the heating till the steel is white hot. Immediately bury the white hot steel in the sand and wait until the sand is quite cold.

To reharden the steel, repeat the same heating process exactly and then plunge the steel into a tank of thick oil, preferably whale oil. Care should be taken as the oil may blaze.

Never dip warm or hot high speed steel into water; this practice makes the steel brittle.

If Mr. J. Houfe wishes to cut soft work with high speed steel, the steel can be hardened by holding it in a draught of air.—O. M. ETCHELLS (Sheffield).

SIR,—I should like to comment on the reader's query "Softening H.S. Steel" in the September issue of PRACTICAL MECHANICS.

This can be done by heating to as high a temperature as can be obtained with ordinary workshop equipment (rather more than a bright red), and quickly burying in plenty of lime, oak or boxwood sawdust. Some old toolroom men prefer the latter.

Very slow cooling is absolutely necessary, and naturally the time taken will vary with the size of the steel concerned. It may be too hot to handle after two days in lime!

Heating to a high temperature, and cooling in air will result in it being almost as hard as quenching in oil, or in an air blast.

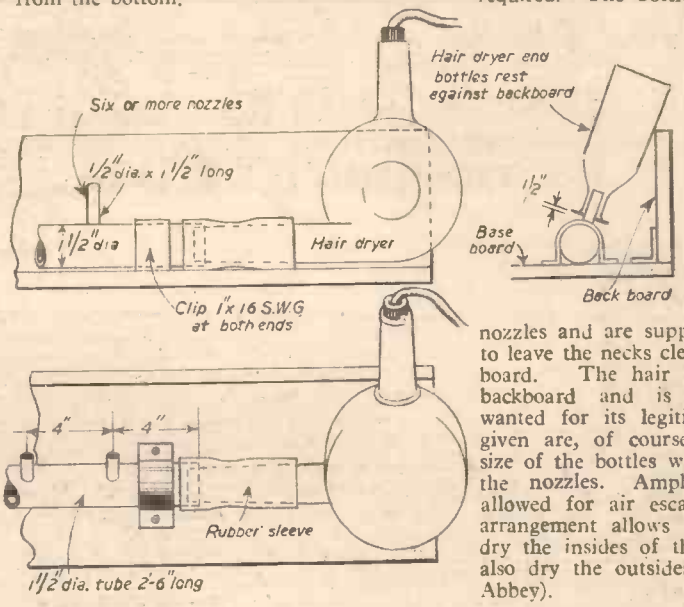
High speed steel should never in any circumstances be quenched in water, if it does not fly to pieces it will be a mass of small cracks. Even the cooling of an H.S. lathe tool in water when grinding is frowned on by the makers of high speed steel.—"TOOL ROOM" (Bath).

A Home-made Bottle Dryer

Simply-made from Odds and Ends

SIR,—In reply to N. O. Thwaites (September, "Information Sought"), I submit my suggestions for a bottle dryer.

The device (shown below) consists of a metal tube about 1½in. dia. × 2ft. 6in. long, into which are soldered six ½in. dia. pipes 1½in. long. The ½in. pipes are provided with a brass pin 1in. long × ⅛in. dia, ½in. from the bottom.



Mr. N. Dean's bottle drying apparatus.

The whole is fastened to a wooden baseboard by two clips and the nozzle of an electric hair dryer pushed into the 1½in. tube and made airtight by means of a rubber sleeve; a piece of an old cycle inner tube will do. The diameter of the hair dryer nozzle will determine the diameter of the large tube—a reducing piece may be required. The bottles stand over the small nozzles and are supported by the brass pins to leave the necks clear and rest on the backboard. The hair dryer also rests on the backboard and is easily removed when wanted for its legitimate use. The sizes given are, of course, only nominal as the size of the bottles will determine the size of the nozzles. Ample clearance must be allowed for air escape at the neck. This arrangement allows the blast of hot air to dry the insides of the bottles, the heat will also dry the outsides.—N. DEAN (Waltham Abbey).

I.G.Y. DATA CENTRES

How Some of the Fields of Investigation Have Been Assigned

IN Russia two International Geophysical Year data centres are being set up one in Moscow and the other in Novosibirsk. At Moscow all the information gathered during the 18 months of the Geophysical Year on aurora and airglow, ionosphere physics, solar activity and cosmic rays will be housed.

The fields of meteorology, geomagnetism, longitude and latitude, glaciology, oceanography, seismology and gravity will be dealt with by the Novosibirsk centre.

A third centre is operated by a number of nations in Western Europe and the Pacific and is divided into a number of subcentres. Geomagnetism is handled by Denmark and Japan, aurora by Sweden and Great Britain, airglow by France and Japan, the ionosphere by Great Britain and Japan, solar activity by Switzerland, Italy, Great Britain, France, Germany and Australia, cosmic rays by Sweden and Japan, glaciology by Great Britain. The World Meteorological Organisation will deal with meteorology. Seismology is covered by the International Central Seismological Bureau, Strasburg.

The three centres will all exchange data collected.

Measurements and observations will be taken at more than 2,000 stations all over the world by thousands of scientists belonging to 70 nations.

The first step after this vast amount of data has been collected will be its compilation, filing and indexing, so that it is easily accessible.

All the various fields of research will also be investigated in America and universities and scientific organisations all over the country are taking part. In addition the U.S. is launching the earth satellites, which have captured public imagination, and this particular branch of vast fields of research being covered by the I.G.Y. is the project of The National Academy of Sciences.

An Attractive Child's Cot

(*Concluded from page* 81)

the flap in the upright position, are best fixed after the cot has been painted.

It is well worth the extra small cost to fit 2in. dia. trolley wheels, boring ⅜in. holes 2in. deep into the base of the legs. These wheels can be purchased at any chain store for about 1s. 6d. each.

Mattress Base

The ½in. × ½in. fillets are screwed into position flush with the bottom edge of the cot sides and the base made as shown in Fig. 4 using the 2in. × ½in. softwood, forming halflap joints which can be glued and pinned.

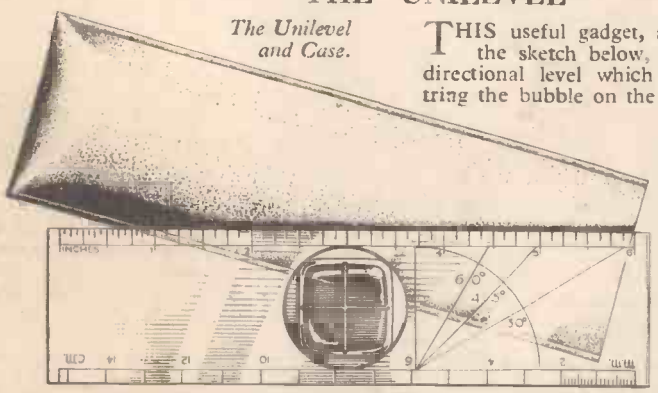
Finishing

All square corners are chamfered and the whole of the finished article glass papered thoroughly. The cot is given two coats of lacquer using whichever pastel colour is preferred. This will make a good background for the animal transfers which can be fixed quite easily in a few minutes.

TRADE NOTES

A Review of New Tools, Equipment, etc.

THE UNILEVEL



The Unilevel and Case.

THIS useful gadget, as can be seen from the sketch below, consists of a multi-directional level which is worked by centring the bubble on the crossed wires. The level is set in a transparent plastic rule, graduated in both inches and centimetres. A carrying case is also supplied. The makers are Dorset Light Industries, Ltd., East Street, Bridport, Dorset. The price is 7/6 including postage.

Tubular Fixing Collets

MADE by Simplex Products, Lambert's Yard, Hale Road Bridge, Altrincham, Cheshire, the Simplex tubular fixing collets are designed for fixing or straightening any kind of tubular post, e.g., clothes posts, bus stop signs, "halt" and other road signs, safety barriers, etc.

The device consists of two halves forming a "split" metal collet which locks together round the post to be fixed by means of locating pins, and completely encircles the post after it has been instated in the usual manner. It is then hammered down to produce the extra rigidity afforded by the "outer" conical shape of the collet wedging itself in the ground. For a leaning post, only one half of the collett need be used.

The tubular fixing collets.

Special provision is made in each collet so that it may be raised for purposes of reinstating or reclaiming.

The collets are cast in malleable grey steel and treated against corrosion. They are available from stock in standard sizes—2in. at 5s. each (complete) collet and 1s. extra per half inch extra for larger sizes. Any odd sizes will be made to order.

World Oil Map

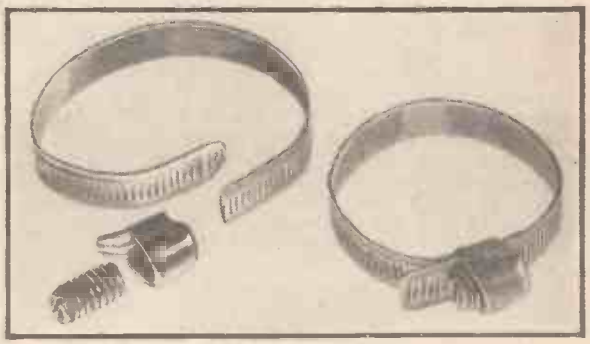
THE 1957 edition of the Petroleum Information Bureau's Wall Map is now available, price 2s. post free, from the above Bureau at 29, New Bond Street, London, W.1. The world's oil-producing and refining countries, with relevant statistics for 1956, are shown.

"Polybond"

NEWLY introduced by Corrosion Ltd., 16, Gloucester Place, London, W.1, "Polybond," a plastic adhesive and bonding agent, is described as a universal binder for cement, concrete, bricks, plaster, asbestos, glass, metals, wood, most plastics, slates, tiles, building blocks and boards, fabrics, linoleum, etc. It is an emulsion, and is thinned only with cold water. The makers claim that it is waterproof, resistant to oil, grease, petrol, moulds and fungi, etc., is clean, safe to handle, non-toxic, non-inflammable and does not become brittle with age. Polybond can be used as an integral part of cement and plaster mixes and is supplied in ready-to-use form straight out of the can. The price is 55s. per gallon.

Lightning Hose Clip

THE multi-size, non-strip hose clip shown below is produced by Elms Garage, Birmingham. 31. It is tightened by means of the screw, the thread of which meshes with the rack on the body of the clip. Two sizes only are needed, No. 1 covering from 2in. down and No. 2 covering from 1½in. to 3¼in. Trade prices are: for No. 1, 27s. for three dozen, and for No. 2 36s. for three dozen.



Lightning hose clips

NEW WOLF HIGH SPEED POWER UNIT

WOLF ELECTRIC TOOLS LTD. have announced the introduction of their new Quartermaster Home Power Equipment range.

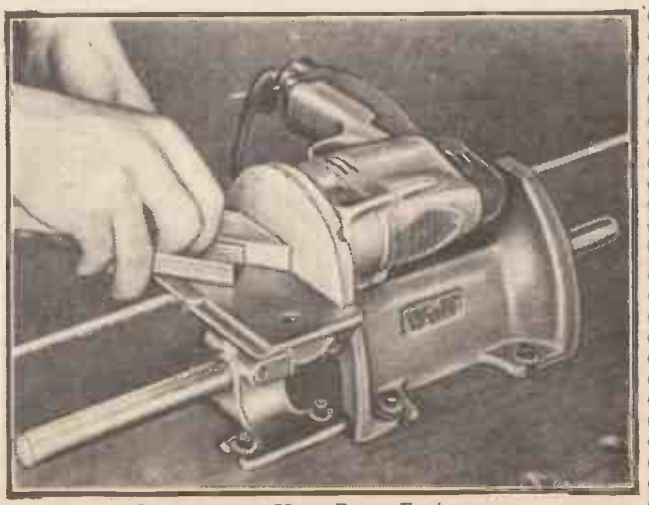
The specially designed "Quartermaster" high speed power unit has been designed to give both a power "reserve" and a high running speed which is essential for efficient sawing, sanding, buffing, grinding, planing, wire brushing, etc.

The powerful continuously rated motor is of new design and the armature is precision balanced by electronic methods. The double-pole switch has a trigger of insulating material and is fitted with a retaining button for locking in the "on" position.

The chuck spindle is mounted on a ball-bearing and a grease-packed, high-speed precision needle roller bearing is fitted at the commutator end of the armature shaft. The unit is supplied complete with built-in radio and television suppressors, three-jaw key chuck, chuck key and 5ft. of 3-core T.R.S. cable for £9 9s.

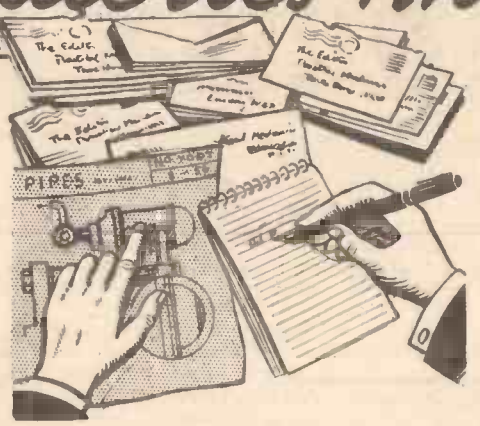
An extensive range of attachments and accessories is available and most of the Wolf Cub equipment can be used with the "Quartermaster" power unit—for bench use with the new QCS Bench Clamp Stand (39s. 6d.).

Literature covering the complete "Quartermaster" range is available from Wolf Electric Tools Ltd., Pioneer Works, Hanger Lane, London, W.5, or from tool merchants and electrical dealers.



Quartermaster Home Power Equipment.

Your Queries Answered



Transparency Projector

I HAVE a large number of colour transparencies and to show them I want a small, compact back projector, with a screen approximately 12in. square. I have been told the method of getting such a large screen size is by using two mirrors. Is this possible? The transparencies are 35 mm.—W. C. Smith (E.11).

TO obtain a picture 12in. × 12in. you will require approximately 18in.-24in. between lens and screen, according to actual size of 35mm. frame, and focal-length of lens. A shorter distance would be possible if the lens had a shorter focal length than about 1¾in. to 1½in., but such a lens might not cover the corners of the frame. The required lens-to-screen distance could, of course, be made up by using mirrors so as to reflect the light-rays back and forward, and a smaller containing case would then be possible. The lens should be near the slide. A lens intended for projection is recommended, with a short focal length and large aperture, for maximum brilliance. Some loss of light may be anticipated from the mirrors, which would require to be of high quality, to avoid distortion. A projector lamp would be best, with condenser and reflector. These may be purchased from photographic dealers. The more mirrors used, the smaller may the equipment become, but construction is likely to be difficult. The position and angle of the mirrors can be found by trial. The simplest method would be to use one mirror only, at the back of the box, reflecting the light forwards to a ground-glass screen on the front.

White Glass-marking Ink

I HAVE a constant use for small quantities of a white glass-marking ink and use at present a commercial preparation. Unfortunately the solvent in the preparation dries out rapidly and the solid content of the ink becomes unusable in a week or so, depending on how long the cap is off during use. There is no local stockist, and to get a single bottle entails a delay of two weeks or more.

Could you suggest a formula which could be made up as required? I do not wish to etch the glass. An ink which dries fairly rapidly when applied to the glass with a pen would be ideal.—E. R. Skinner (Oxford).

FORMULA for white glass-marking ink is as follows: shellac, bleached, 0.080 gms., alcohol, denatured, 0.820 gms., lithopone, dispersed, 0.100 gms.

Filter Unit

I REQUIRE a filter unit of about one foot square to extract dust. Also, what are the possible merits, practicability and level of expense of incorporating a small ultra-violet source in a small air duct for bacteriolytic purposes, that is to say, with a view to more or less sterilising the air current? In each case a small booth is being served by a duct of some 8in. square in section and the air is propelled in this by a fan comparable with the larger type "Ventaxia" window fan.—A. V. Light (S.W.10).

IF complete freedom from airborne bacteria is desired we suggest that you resort to the bactericide known as "Aeryl 1," obtainable from Aerosols Ltd., 65, Old Brompton Road, London, S.W.7.

QUERY SERVICE
RULES

A stamped, addressed envelope, a sixpenny, crossed postal order, and the query coupon from the current issue, which appears on the inside of back cover, must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

As bacteria present will depend upon the efficiency, or more correctly, lack of efficiency of the air filtering device employed, it will be found, for most practical purposes, that freedom from bacteria can be secured by air filtering devices of high dust arresting capacity.

Dry fabric filters, such as are made by Vokes Ltd., Henley Park, Guildford, Surrey, should comply with the requirements outlined. However, this firm, as specialists in this field of engineering, are in a position to advise on any problem that is presented for their consideration. The efficiency claimed for the Vokes Dry Filter is 99.98 per cent., which means but little dust passing the filter and, in consequence, small danger of bacterial contamination of the air within the booths.

Concrete Posts

I WISH to make two concrete posts, each to carry a gate 6ft. high, with 5ft. span, made of 3in. × 2in. wood.

What size posts do you suggest and what strength of mixture?—S. H. Boorer (Kenton).

YOUR concrete posts should have a cross section of not less than 12in., and it would be as well to increase this to 18in. below ground (18in. × 18in.) and to a depth of 2ft. 6in., so as to give weight and stability. Height above ground can be to your own liking. Reinforce with four vertically placed steel or iron rods as normally used in this practice for each post. Pour a 3:1 mixture of ballast and cement. The shuttering can be done in sections if desired and thus build up to the desired height. There would be no need to soak them if the original slurry is moist enough. Do not have this too sloppy but nicely mobile.

Modernising Old Gilt Picture Frames

CAN you give me instructions on how to modernise gilt picture frames, i.e., light paint with gilt showing through?—T. Rose (Airdrie).

THERE are two ways in which the frames can be treated. If they are old frames which have already been gilded you have only to paint them with a broken white flat oil colour and, with dry soft rags, wipe off the paint from any projecting ornament which you wish to show as gilt. If the original gilding has lost its brilliancy the projecting ornament must first be regilded and then painted over and the paint wiped off. That is one way and the usual way.

The other method is to paint all over with white, or if it is a very quick drying paint, a portion at a time and having obtained a quantity of gold bronze powder lightly touch the relief work with a dry rag which has been dipped in the bronze powder. This must be done whilst the white paint is still tacky so that it will retain the powder. A variation of this method is to make a paint of the bronze by mixing it with cellulose lacquer and applying it by brushing with a soft brush lightly over the ornamental relief work.

Jewellery Mounts

COULD you please give me a short list of metals suitable for mounts for brooches and necklaces and powder compacts? Also the best material for dies for their respective material metal. Could you also tell me what metal is used for untarnishable jewellery?—L. Nuttall (Bolton, Lancs).

THE metal most used in the jewellery trade is brass, with various electro-plated finishes. Powder compacts are almost invariably stamped from brass sheet. Small

parts of intricate contour are, however, sometimes centrifugally cast in an alloy of lead and tin, using vulcanised rubber dies. Some high-grade jewellery items, produced in fairly large quantity, are cast in plaster moulds by the "lost-wax" process. Much of the so-called untarnishable jewellery items now on sale in the big stores—scarf rings, bangles, chain necklaces and the like—is made from aluminium wire which has been given a patented chemical dip treatment to produce the characteristic "rose-gold" colour. A proportion of cheap imported jewellery consists of moulded plastic material which has been electro-plated. Much "hand-crafted" jewellery is made from semi-worked-up material obtainable from craft shops, and we suggest that you get in touch with Fred Aldous, Ltd., Shude Hill, Manchester, if you are desirous of obtaining the same.

Rubber Masks and Animal Heads

PLEASE give me some information on the making and moulding of rubber masks and animals heads.—Eugéne B. Chape (Cowes, I. o W.).

UNLESS you are specially equipped for the purpose, you will not be well advised to attempt rubber moulding, which cannot be performed without heavy presses, steel moulds, and a steam-raising installation.

It seems to us very probable that flexible masks well suited to your purpose might be moulded from one of the newer plastic materials, which are more adaptable to small-scale operations. We suggest, therefore, that you contact suppliers of such materials, stating exactly what you propose to produce, for there is a very wide range of possible materials, and without exact knowledge of the product even the manufacturers will not be able to give you their best service. The two following firms may be able to help you:

I.C.I. Ltd., Plastics Division, Black Fan Road, Welwyn, Herts.

Scott Bader & Co. Ltd., 109, Kingsway, London, W.C.2.

Copper Plating

IN copper deposition, can the plating bath be switched off at night without spoiling the object? Can the plating time be speeded up in any way?—E. G. Swann (Tunbridge Wells).

IT is not essential to complete the plating in one continuous operation. Maximum plating rate, and minimum plating time, are obtained by using maximum current. However, the current should be kept at a very low value until the copper "flush" spreads over the work and, in any case, we suggest that it be limited to about 1.5 amps per square decimetre. Excess current may cause brownish, rough patches, particularly on edges and projections.

Installing Power Socket

HAVING built an additional room to my house I intend installing a plug in it for a kettle and iron. Could the supply for the room plug be taken from the one in the kitchen by connecting them in series? Where could I get pole finding paper or a neon tester?—L. Doyle (Danesfort, Eire).

WE are not familiar with the regulations of your local electric supply authority, but would make the following suggestions. If the original socket outlet was rated at not more than 15 amps it should not be connected to another socket outlet unless the current rating of the cables supplying the original socket outlet is equal to the current rating of both socket outlets. In this respect it should be noted that a cable having conductors of 7 strands of copper wire of 0.029 in. diameter is rated at 15 amps only. However, cables rated at 10 amps, say, can supply two 5 amp socket outlets connected together in parallel.

The best system is to use three leads from the new socket outlet back to the supply point, supplying the two leads through separate fuses; or supplying the "live" side through a fuse only if the neutral point of the supply system is permanently and effectively connected to earth.

Neon test lamps are obtainable from:

Runbaken Ltd., Deansgate, Manchester, 1.

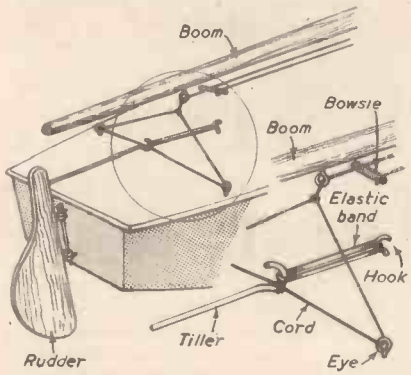
Neo Electrical Industries Ltd., Manchester, 4.

Pole finding paper may be obtained from Messrs. Armstrong & Co., Woodchurch, Ashford, Kent.

Model Yacht Steering Gear

CAN you please give me details of the general layout of a system of automatic steering for a model sailing yacht?—G. W. Burke (Bournemouth).

THE sketch below gives all the main details of a system suitable for a model yacht; this is a much simplified version of the Braine steering gear. A complete set of parts for assembling the Braine steering gear are available from Messrs. Bassett Lowke, 18-25, Kingswell Street, Northampton.



A simplified version of the Braine steering gear.

In the sketch above the elastic band keeps the rudder normally central. The port and starboard sheets are crossed over the deck, passed through screweyes and thence through an eyelet in the boom of the sail.

If the sail is blown over hard to, say, port by a gust of strong wind, the rudder is automatically put over so as to head the boat off the wind and back on to the correct course. Automatic steering systems should be dealt with more fully in a good book on model boat construction, one of which should be obtainable at your local library.

Rewinding Motor

IN your book "Wire and Wire Gauges" by F. J. Camm, you give in the table of B.S.I. standard sizes of annealed copper wires, current rating, amps at 1,000 per square inch.

Could you please explain how this rating is applied to the current carrying capacity of wires? I wish to rewind a motor taking a current of 0.65 amp, which, according to your book, would be between 21 and 22 gauge. It is obviously impossible to use this gauge of wire and some further information would be greatly appreciated. —B. A. Mugele (Sidcup).

THE table showing the currents which may be carried by various gauges of wire to give a current density of 1,000 amps. per square inch is merely intended as a guide. It is by no means the universal practice for electrical apparatus to be designed to carry 1,000 amps per square inch.

For example, if you wanted to adopt a current density of 2,000 amps per square inch for conductors which have to carry 0.65 amp, the size of conductor selected would be the same as that required to carry half the current (0.325 amp) with a density of 1,000 amps per square inch, i.e., 24 to 25 s.w.g. To carry 0.63 amp at 3,000 amps per square inch the conductor required would be the same as needed to carry 0.22 amp at 1,000 amps per square inch, i.e., 27 s.w.g.

We presume that the motor is of the induction type and that each of the coils has to carry 0.65 amp, i.e., that the coils in question are in series with each other. In this case you could adopt a current density of 2,000 to 3,000 amps per square inch, say 26 s.w.g.; or 27 s.w.g. if the winding space is very limited. It is, of course, advisable to use the largest size of wire which can be accommodated in the slots with the required number of turns.

In the armature of a high speed series motor of small size a current density of about 6,000 amps per square inch is sometimes used this being permissible on account of the small size and efficient cooling, and also because such motors are often not run for prolonged periods. The armature of a motor has more than one circuit in parallel, generally there are two parallel circuits between the brushes. In this case if the armature current is 0.65 amp, each wire would have to carry 0.325 amp. At 6,000 amps per square inch 35 s.w.g. could be used. Larger wire would be required in the field coils.

Information Sought

Readers are invited to supply the required information to answer the following queries.

Candle Making

PLEASE tell me where I can obtain moulds for casting candle wax, so that I can make artistic candle novelties in the form of beer mugs, apples, artistic figures, etc.?—P. J. McIvor (Dublin).

Steam Iron Element

I HAVE a steam iron of well-known make, the element of which has burnt out. The duty payable makes it impractical to send it back to the makers and I should be grateful if you would tell me how to replace the element and the substance in which is is embedded myself.—C. J. C. (Ireland).

Painting with Water

I ONCE saw a lecturer who illustrated his talk by means of what was apparently a prepared picture. As he made a point, he would touch the picture with a brush dipped in water and a colour would appear. He continued in this way until the picture was complete. Can you tell me how it was done? —A. H. Hasler (Australia).

Paraffin Flame Refrigerator

I HAVE seen a refrigerator which operates by the use of a paraffin flame, and wish to construct one on these lines. Could you supply me with a diagram of the circuit of the cooling liquid and tell me how it is laid out, and the liquid used?—G. Lewis (Wilts).

"Unaccustomed as I am—

"I . . . er, er . . . a . . . don't know just what to say on the subject."

"I wasn't expecting to be called on to speak."

"Mr. Bell can tell you more about the idea than I can."

"Er . . . that is not very clear, but that's the best I can do."

Yet 4 Weeks Later He Swept Them Off Their Feet!

In a daze he slumped to his seat. Failure . . . when a good impression before these men meant so much. Over breakfast next morning his wife noticed his gloomy, preoccupied air.

"What's the trouble dear ?"

"Oh . . . nothing, I just fumbled my big chance last night, that's all !"

"John ! You don't mean that your big idea didn't catch on !"

"I don't think so. But, Great Scott, I didn't know they were going to let me do the explaining. I outlined it to Bell—he's the public speaker of our Company ! I thought he was going to do the talking !"

"But dear, that was so foolish. It was your idea—why let Bell take all the credit ? They'll never recognise your ability if you sit back all the time. You really ought to learn how to speak in public !"

"Well, I'm too old to go to a class now. And, besides, I haven't got the time !"

"I've got the answer to that. Where's that magazine ? . . . Here—read this. Here's an internationally known institute that offers a home study course in effective speaking. They offer a free booklet entitled *How To Work Wonders With Words*, which tells how any man can develop his natural speaking ability. Why not send for it ?"

He did. And a few minutes' reading of this amazing book changed the entire course of John's business career. It showed him how a simple and easy method, in twenty minutes a day, would train him to dominate one man or thousands—convince one man or many—how to talk at business meetings, lodges, banquets, and social affairs. It banished all the mystery and magic of effective speaking and revealed the natural Laws of Conversation that distinguish the powerful speaker from the man who never knows what to say.

Four weeks sped by quickly. His associates were mystified by the change in his attitude. He began for the first time to voice his opinions at business conferences. Fortunately, the opportunity to re-submit his plan occurred a few weeks later. But John, this time, was ready. "Go ahead with the plan," said the Managing Director, when John had finished his talk. "I get your idea much more clearly now. And I'm creating a new place for you—there's room at the top in our organisation for men who know how to talk !"

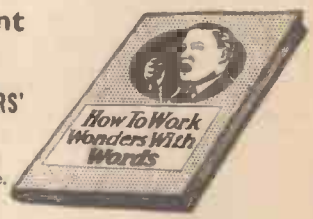
And his newly-developed talent has created other advantages for him. He is a sought-after speaker for civic, banquet and lodge affairs. Social leaders compete for his attendance at dinners because he is such an interesting talker. And he lays all the credit for his success to his wife's suggestion—and to the facts contained in this free book—*How To Work Wonders With Words*. For twenty-five years the Speakers' Service has been proving to men that ability to express oneself is the result of training, rather than a natural gift of a chosen few. Any man or woman can absorb and apply quickly the natural Laws of Conversation. With these laws in mind, the faults of timidity, self-consciousness, stage-fright and lack of poise disappear ; repressed ideas and thoughts come forth in words that sparkle with with brilliance, charm and power.

Have you an open mind ? Then send for this free book *How To Work Wonders With Words*. Over 100,000 men and women in all walks of life have found in this book a key that has opened a veritable floodgate of natural speaking ability. See for yourself how you can become a popular and dominating speaker ! Your copy is waiting for you—free—simply for the posting of the coupon.

Send for this Amazing Book

Now Sent FREE

THE SPEAKERS' SERVICE
(Dept. PR/ESI)
Marple, Cheshire.



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(Dept. PR/ESI), MARPLE, CHESHIRE.

Please send me my FREE copy of your inspiring book, *How To Work Wonders With Words*, and full details of your methods for speaking effectively.

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If you do not wish to use coupon, apply by letter.

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WHAT I THINK By F. J. C.

The Late Sir Edmund Crane

THE late Sir Edmund Crane (Ted Crane to most of us) was a quite remarkable man. From a very humble start in the cycle industry, with a capital of a few pounds, his business expanded to the point where he was able to sell it for over three millions. His machines were sturdily built mainly for the utility cyclist, and he preferred to paddle his own canoe rather than be tied in his business methods to those which had been laid down by older established manufacturers through their union. Instead of exhibiting his bicycles at the Cycle Show, he preferred to run his own exhibition at the same time, for he was not then a member of the Manufacturers' Union, and membership was necessary before a manufacturer could be permitted to exhibit. The company was taken over by Tube Investments Ltd. and they continued to manufacture the Hercules bicycle.

He commenced making bicycles in 1911 with his brother Harry, with a capital of £25, and they worked for 16 hours a day in a three-roomed cottage, as self-employed persons. Their first week's output was about 20 machines. Edmund did the material buying and the selling of the machines. By 1922 they had opened a larger factory at Aston, and the output had increased to 20,000 machines annually. This increased until in 1939 they had made 6,000,000 bicycles. Thus passes another manufacturing pioneer. Although he was a member of the Centenary Club, and occasionally went on their cycling pilgrimages, it cannot be said that he was a keen cyclist, either as a tourist or time trialist. His main interest was business, at which he was remarkably successful.

The Lighting Laws

CYCLISTS should see that their machines comply with the law as it relates to lighting, specified in the Road Transport Lighting Acts, 1927/53, under which many new regulations have been made. The 1954 regulations, for example, make it compulsory that bicycles with or without a sidecar must carry a red rear lamp and a red rear reflector, each of which must be fixed on the centre line or to the off-side and not more than 1ft. 8in. from the extreme rear of the machine. Moreover, the highest point of the illuminated or reflecting surfaces must not exceed 3ft. 6in. from the ground, nor must it be less than 1ft. 3in. from the ground to the lowest part of the surface. In the case of machines such as juvenile bicycles, which are fitted with wheels not more than 1ft. 6in. in diameter, the minimum height is 12in. The reflectors must be fixed squarely to the line of motion, in other words, vertically, and it is compulsory to keep them clean. The law permits a combined reflector glass and rear lamp. Rear lamps must have an illuminated area not less than 1½in. in diameter if they are circular. If of any other shape the area must be equivalent. In any case, it must be possible to inscribe a 1in. diameter circle within the area. Everyone knows that under the 1927 Act a bicycle without a sidecar, as well as tricycles, must show a single white light at the front, and it must be "visible from a reasonable distance." It is also legal that when wheeled by a person on foot they do not need lights if the machine is wheeled as near as possible to the nearside of the road. A machine with a sidecar must have two front lights and may not be wheeled after dark without lights. It is important to remember that a motor-assisted bicycle is not considered as a cycle, the legal definition being that the cycle is a pedal bicycle or a pedal sidecar. Shortly, it will be illegal for a bicycle not to have lights when it is stationary.

Arguments About Braking

THE owner of a scooter was recently prosecuted for having an inefficient front brake. It was stated in evidence that with the brake hard on the machine could still be pushed along the road. It was admitted that his machine was up to manufacturers' standard, but nonetheless, the rider was fined. This means that every rider of that particular make is now liable to prosecution. It seems a pity that the police did not take action against the manufacturers, who are now in the invidious position of being liable to any of their customers for any fines they may pay on the score of poor braking, since there is an implied warranty when you purchase a machine that it complies with the law. In the case quoted, evidence was given that instructors at the Hendon Police College advised that maximum braking pressure should be on the front wheel. This is so contrary to standard practice that I wrote to the Metropolitan Police for supporting evidence, and I was informed that the instructions on braking given to students at the Metropolitan Police Driving School are :

1.—All braking should be carried out when the machine is upright and travelling on a straight course, using both brakes in conjunction with the gearbox.

2.—Select the best portions of the road on which to do firm braking.

3.—If in an emergency you must brake on a bend, use the rear brake only, but lightly and progressively.

4.—Avoid using the front brake when banked over, turning on wet, cambered surfaces or where the road surface is loose, greasy, icy, highly polished or covered with leaves.

5.—On a good, dry surface, at any speed, and for straight ahead braking, the distribution of total braking force required at each wheel to obtain minimum stopping distance is about 75 per cent. front and 25 per cent. rear, but on a slippery road surface maximum deceleration is obtained with a distribution of about 50 per cent. front and 50 per cent. rear. The percentages of braking are slightly different from those shown in the appendix to the report submitted by the Ministry of Transport Committee on Road Safety in 1952, which inquired into the problem of motor cycle accidents and advised measures for their prevention.

I do not think that many pedal cyclists will agree that maximum braking pressure should be applied to the front wheel, and my own rough assessment is that it should be two-thirds to the back wheel and one-third to the front. Perhaps my readers would like to debate the point.

The Cycle Industry

THE industry should adopt a more progressive policy. Bicycle design has been static for the past 40 years. There has been no basic improvement except perhaps in appearance since the original introduction of the safety bicycle. Flamboyant finishes appeal only to teenagers ,and those with a gipsy-like love for garishness and bright plating.

There is a section of industry—the retailers—who think that it is the price of bicycles which has caused the great drop in sales and they have appealed to the Chancellor of the Exchequer to give the industry some relief on the purchase tax on bicycles.

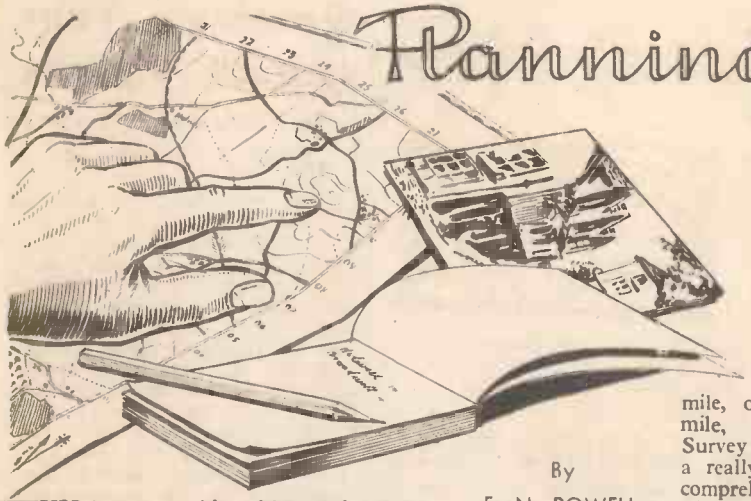
Now that the industry and its press are interested in mopeds, they should reflect on the judgment or lack of it of those who have severely opposed this vehicle.

Linenfold Panelling

I WAS amused to read the comments of a lady writer who was reporting on a visit to Lord Montagu's museum of bicycles. She was shown round the ancestral home and referred to the "beautiful linenfold panelling." It may have appeared beautiful to her, but perhaps she did not know that linenfold is an imitation panelling which is hung like wallpaper. To me it would seem anachronistic to see this modern imitation panelling in one of the stately homes of England !

Planning Next Year's Tour

Size of Party : The Daily Distance : Accommodation : Cycle and Equipment



By E. N. POWELL

THIS is a very wide subject and arrangements will vary a great deal according to several factors—the number in the party, the area to be toured and the capabilities of the riders.

Any cycle in working order can, of course, be used, but it is advisable to avoid both extremes of cycle equipment. A suitable gear and a comfortable position are essentials. A lightweight frame is suitable, but should be equipped with sturdy wheels and tyres. A comfortable saddle and efficient brakes have obvious merits.

Size of the Party

When issuing invitations to join a party for a cycle tour, care should be exercised in choosing people with approximately the same views and aims. It would be hopeless to mix "potterers" and "speed merchants" or, say, people interesed in cathedrals and others interested in the countryside. Many riders for this reason will only consider touring in pairs, but four is often considered the ideal number. It enables riders to travel side by side and gives everyone a change of companion.

A happy group of tourists.

It is worth remembering too that if accommodation is not booked in advance, it may be difficult to find enough beds for a large party. A small party is less of a nuisance to other road users and there is less chance of a disagreement starting a breakaway group.

By the time the party is made up, the area to be toured has usually been decided, and the next step is to meet, bringing all the available maps and guide books covering the area. The maps used should show the contours and be at least four miles to the inch. A larger scale is even better for the initial planning and a ½in. to the mile, or 1in. to the mile, Ordnance Survey map will give a really accurate and comprehensive picture of the district. A map of this large scale will show a number of interesting tracks and minor roads leading to places which are probably seldom visited. Most of the finest views are situated away from the main roads.

The type of road to be traversed and the hills to be climbed are of paramount importance when estimating the daily ride and this information is only contained on a reliable large-scale map.

The Daily Distance

The greatest mistake in planning a tour is to overestimate the distance which can be comfortably ridden. Most keen cyclists can manage 100 miles in a day comfortably and have probably done so many times in the past, but it would be futile to try to ride this distance every day of a two-week holiday. Apart from the fact that there would be no time to visit the interesting places en route, the day-by-day fatigue mounts up and the rider would be very tired indeed at the end of the fortnight. For a rider of this calibre, 50 miles per day is quite sufficient and a day or two without any riding at all would probably be found very welcome.

Accommodation

The cycle tourist has choice between two main types of accommodation, the youth hostel and the inn, restaurant or private house offering "bed and breakfast."

The youth hostel is the obvious choice for the tourist travelling on a restricted budget. The annual membership is not high—7s. 6d. for those under 21 and 15s. for those over 21. Members may then purchase a night's sleep for 2s. 6d. per night.

Meals are very often available at the hostel quite reasonably—2s. 6d. for each supper and breakfast. Members are required to do a small job of work in the morning before they leave, which might be sweeping a dormitory, peeling potatoes or perhaps chopping wood or washing up.

There are certain rules to be observed when staying at a youth hostel, but they are few and are certainly not restrictive.

Two of the chief advantages of staying in a hostel are the chance to meet others enjoying the same sort of holiday, fellow travellers who are only too willing to pass on information concerning routes, restaurants, etc., and to be able to join in the communal entertainment of the common room.

"B. and B."

A great variety of accommodation comes under the above abbreviation, and price and facilities available range from simple country cottage accommodation for as little as 7s. 6d. to inn accommodation at 15s. or more. Lists of addresses for bed and breakfast, including prices, are published by the cycling associations.

During the summer months it is advisable to book in advance at both youth hostels and bed and breakfast addresses, particularly at the week-ends.

What to Take

When travelling as a party, it is often possible to cut the amount of baggage carried, by avoiding unnecessary duplication, particularly of tools, spares, etc. Weight should be reduced as much as possible and only necessities carried. A large touring bag should hold everything for a two-week tour.

In the Youth Hostel dining room.

Clothes of nylon and drip-dry fabrics can be washed through and dried overnight and the wearing of these reduces the amount of spare clothing necessary. Never carry any weight in a rucksack when cycling—it becomes very uncomfortable.

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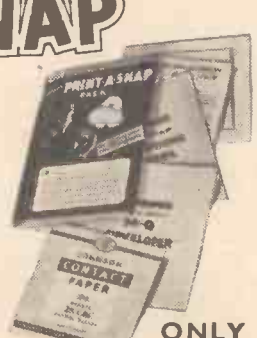

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