Building a Single-Seater Kayak

PRACTICAL MECHANICS

1'3

APRIL : 1959

Contents

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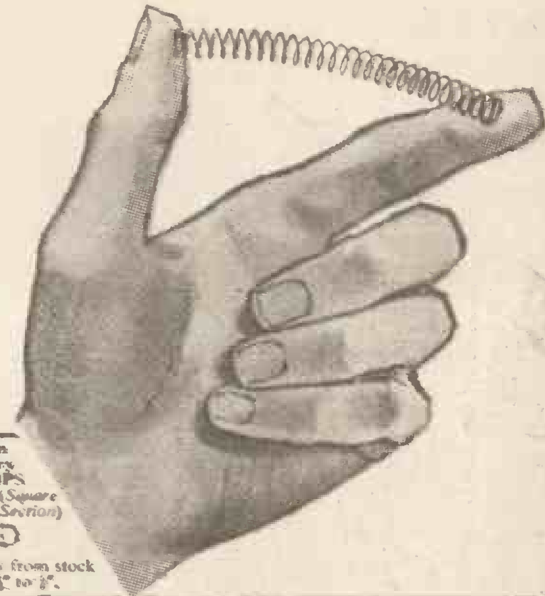

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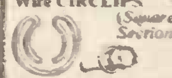

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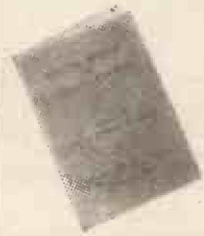

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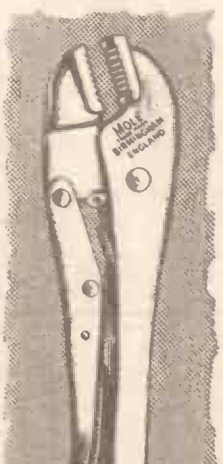

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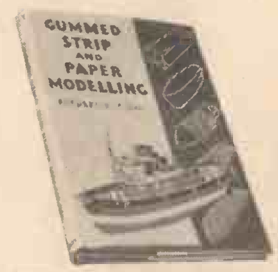

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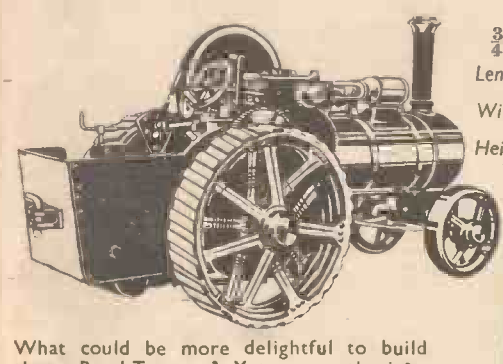

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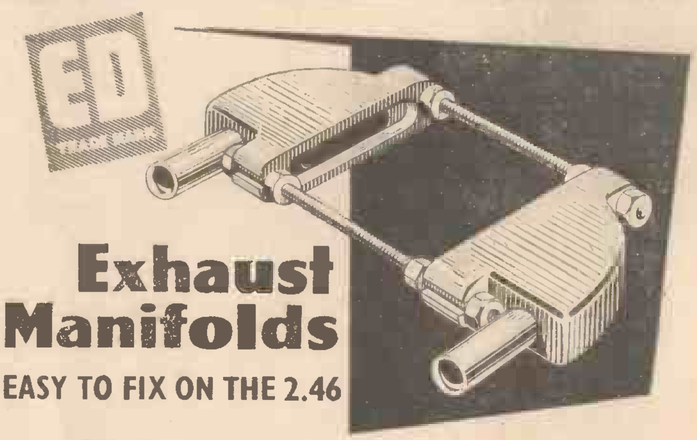

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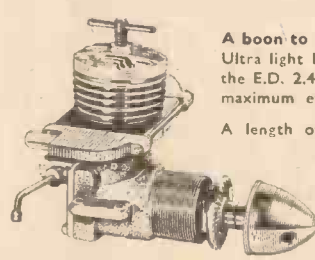

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APRIL, 1959

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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

THE U.S. MOON ROCKET

A SECOND artificial planet, the American Pioneer IV, is on its way into orbit round the sun. It was launched on March 4th from Cape Canaveral as the payload of a Juno II rocket. The otherwise perfect launching was marred by the rocket going a few degrees off course, a fact which caused the rocket to miss the moon, not by the expected 5,000 to 10,000 miles, but by some 37,000 miles. One disappointing effect of this was that the special device installed in the small but ingenious cone-shaped probe was not carried near enough to the moon to register the impact of light from it, as was its intended function. The American rocket men, however, have hailed the launch as a great success.

It is very reassuring to the West to know that the Americans have again caught up with the Russians and it must be hoped that soon they will pass them in space achievement. It might perhaps help the Americans to leap ahead if their Army, Air Force and Navy combined in future rocket attempts, instead of operating independently and in turn as at present. A pooling of information and resources could result only in speedier progress. Competition certainly acts as a stimulus, but it would be thought that sufficient competition was already being supplied by the Russians!

If the moon is ever to be colonised, the first space ship to land there would be able to annexe the whole planet for the power that launched the ship. If the Russians achieve this, a second landing by the Americans a few weeks later would be worse than useless. In space exploration everything will go to the pioneer and nothing to those who come after.

With the publication of this issue if is with deepest regret that we have to inform readers of the sudden death of our Editor, Mr. F. J. Camm, on February 18th.

For many years, Mr. Camm's name has been synonymous with the "Practical" Group of Journals, of which he was the originator, and the growth of which was largely due to his energetic and enthusiastic editorship.

He was one of the first to realise that there was a public demand for practical journals written in non-technical language, and he met this demand by producing the Practical Group of magazines that made his name a household word. Mr. Camm's extensive knowledge as a scientist and engineer enabled him to write many technical books in the engineering and radio field.

At the present time, due to the fog of secrecy which surrounds all the Russian attempts, it is difficult to assess who is in the lead, but the importance of being the first to succeed cannot be underestimated.

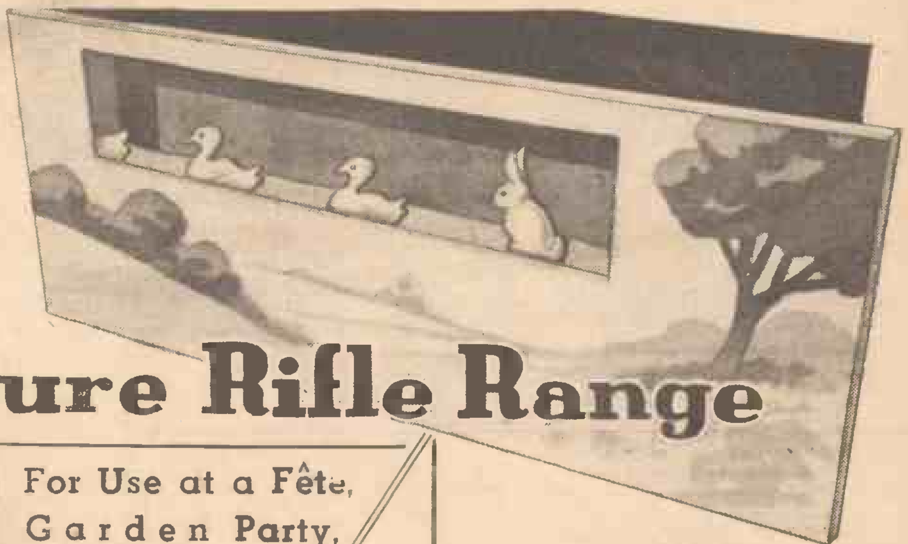
The main achievement so far is the escape of man-made bodies from the earth's atmosphere: the navigational side of the projects seems to leave much to be desired at present, but this will no doubt be much improved fairly soon. Probably the next step will be an attempt to orbit the moon and this is likely to be followed by the sending of a rocket to Venus and Mars, the nearest planets, apart from the moon, to the Earth. In America scientists have announced that these attempts may be made in 1959, but whether these more spectacular events take place or not, the launching of 40 sounding rockets and a dozen satellites is definitely scheduled for this year.

This is the space age and with all the exciting new discoveries being made, we are extremely disappointed that Great Britain, the country that discovered, explored and colonised much of the world's surface, is not taking a prominent part.

The May, 1959, issue will be published on April 30th. Order it now!

ALTHOUGH primarily intended for use as an outdoor range at garden fêtes, sporting events and fun fairs as a means of raising money for club funds, this range can quite well be made a permanent fixture in a hall or other building and be used for boy scouts, youth clubs, etc.

It is intended for use with air guns because their use is not subject to so rigid a control as that imposed on ranges using cartridges. Nevertheless, a gun licence, obtainable from any post office at a cost of 10s., is required if an air rifle is to be used outside the curtilage of the owner's premises.



A Miniature Rifle Range

For Use at a Fête, Garden Party, Club, etc.

By JAMESON ERROLL

The firing point can be from 20 yards upwards from the butts and should be governed largely by the type of air guns used and the average degree of accuracy of the contestants. For example, if the range is used at a public fête where the average competitor is unlikely to be a good shot then the range could even be brought down to 15 yards; if, however, competitive shooting is to take place, possibly with targets and among men who are reasonable shots or even marksmen—then the range can well be increased to 25 yards or more.

Fig. 1, which is a back view of the butts, shows an 18in. side protective screen on the right and a 4ft. 6in. screen on the left since it has to cover the mechanism and also furnish protection for an assistant who should be at hand to stop the motor if necessary and to watch for undue swing of any of the figures which might result in fouling the set-up. The screen also extends from ground level to the target opening and 6in. above it.

The system works on the endless-belt principle. To this belt, at desired intervals, the figures are attached; they come into the aimer's view for part of the time, then disappear and return on the underside of the belt. Each figure is hinged with a slight forward cant and, when struck by a bullet, will fall backwards and remain out of sight until its reappearance at the far end of the sighting opening.

Since speed of travel must be controlled—and is out of all proportion to that of the normal motor—some form of reduction gear is necessary. Specially geared motors can, of course, be bought, but it is more than probable that it would have to be "made to measure" and this would be costly. Robust reduction gears are expensive, too, so parts of a bicycle have been introduced as in Fig. 2. Derelict bicycles are always available at give-away prices, and only the rear frame and wheel are required; the unwanted parts being removed with a hacksaw.

Gearing and Speed Control

Fig. 3 shows the gearing arrangements, which are explained as follows:

The 1,425 r.p.m. motor (A) is fitted with a 3in. "V" pulley (B). Therefore, the pulley makes 1,425 r.p.m.

This is connected to a 26in. bicycle wheel, without a tyre or inner tube (C), making 164.5 r.p.m.

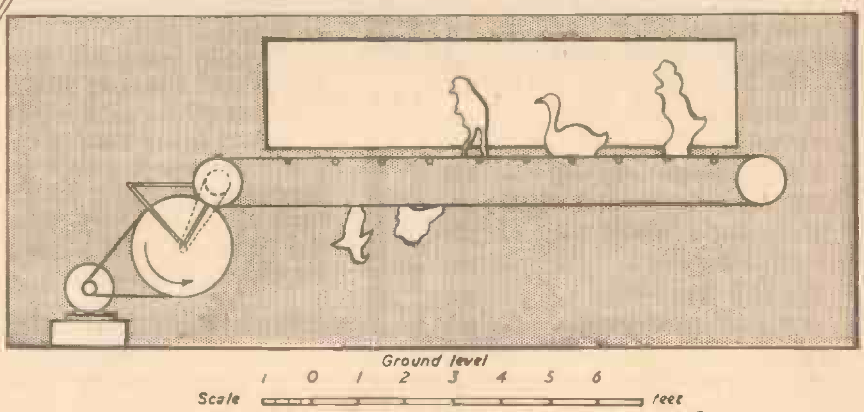


Fig. 1.—Rear view of range.

The fixed sprocket wheel (D) should have 18 teeth and is geared to a chain wheel (E) having 48 teeth. This will make 61.7 r.p.m.

On the same axle as the chain wheel, and firmly fixed to it, is a running wheel 12in. in dia. (F). This, at 61.7 r.p.m. will result in its surface having a travelling speed of 2.2 m.p.h.

This speed of 2.2 m.p.h. is that of a rather slow walk and will be found reasonable at short ranges. If, however, it is found to be too slow for the marksman—it will be quite fast enough for the average or poor shot—there is the great advantage that a 4in. "V" pulley can be fixed to the motor in a few seconds, and this will give a speed of 2.9 m.p.h.; in fact, a multiple pulley could well be used in any case and the figures speeded up for the finals of a competition.

If the sprocket and chain wheel are not toothed as above, any of the following combinations will give approximately the same speeds: 16 and 42, 17 and 45, 19 and 50. Similarly, if an old bicycle is available but the wheels are, say, 24in. or 28in., it is quite an easy matter to work out the necessary change in the sprocket wheel and/or chain wheel teeth.

The width of the sighting space is shown as 10ft. and each figure will be in sight for about 3 secs. at 2.2 m.p.h. and 2.35 secs. at 2.9 m.p.h. At the firing point, with this sighting width, from four to six guns can be accommodated at one time.

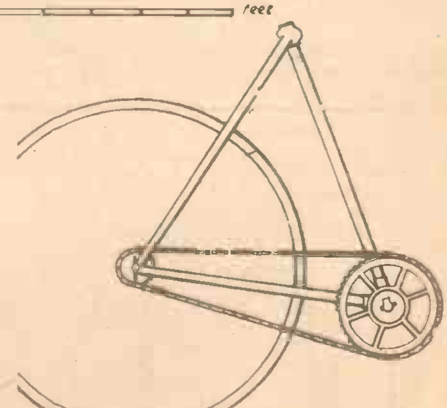


Fig. 2.—Parts of bicycle used.

The Mechanism

Referring again to Fig. 1, the motor is

shown mounted on a stand or box, the axle being about 15in. from the ground. The bicycle frame, with the seat-tube horizontal, is firmly fixed with pipe clips, etc., to the wooden framework on which the protective shield is built. A suitable length of 2in. chair webbing, folded and sewn in half along its length, makes an excellent belt between the motor and the bicycle wheel; it should be reasonably tight (webbing stretches) and will grip the flanged cycle wheel firmly and fold itself into the " V " of the motor pulley.

The Running Wheels

Two running wheels are required—one revolving freely on its axle—and Fig. 4 shows two methods of constructing these. They are 12in. in diameter and 2in. wide and have flanges 1in. deep. The circles can be cut on the bandsaw or fretsaw and trued up on the disc sander or by hand. Do not drill the centre holes to the necessary size until the wheels are trued up as a *small* centre hole can be used to fix the wheels to the bandsaw and disc sander tables and can be enlarged later.

The cranks of the bottom bracket cycle assembly will require to be sawn off at equal distances from their centres as they are not required and will be in the way. This is shown clearly in Fig. 5 which also illustrates the method of attaching the running wheel to the chain wheel. The centre hole of one running wheel is enlarged so that it clears the remaining portion of the crank on the chain wheel, and slots are cut to clear the cotter pin head and nut. The two may now be combined—at absolutely dead centre—and fastened with a number of woodscrews passing through holes drilled in the spokes of the chain wheel and so into the wooden running wheel. Note that it is necessary to employ a large distance washer (a locking ring will do) in order that the chain—which extends slightly beyond the teeth—will clear the running wheel by at least $\frac{1}{8}$in.

The second running wheel, or idler, should be mounted on a long $\frac{1}{2}$in. bolt and, preferably, bushed. Alternatively, it could be mounted in ball races. The bolt should be of sufficient length to enable it to pass through the main framework timbers (of 2in. × 2in.) and carry the wheel plus nuts and washers. The bolt will probably have to be threaded for about three-quarters of its length as, when diven through the protective shield and its timbers (from the front), it must be made immovable with a washer and nut and the running wheel then fixed with two thin locknuts.

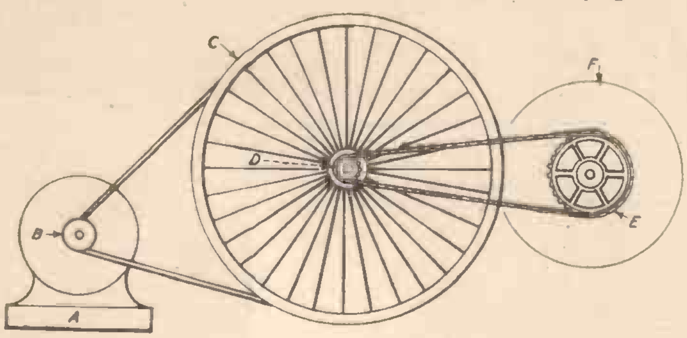
The box on which the motor is mounted must be firmly fastened to the ground with iron wall hooks passing through holes drilled in angle-iron brackets screwed to it, and the motor firmly screwed to the box top.

The Figures

These are cut from sheet iron or 16 G. mild sheet steel (according to the power of the guns to be used, which is discussed later) and Fig. 6 offers some suggestions as to the form they may take. These are best constructed by making full-size drawings on stiff paper ruled with 1in. squares and, from these, tracing the outline on the sheet iron or steel. They may then be cut with a metal coping saw or large tin snips and the edges filed smooth. Do not go into too much detail when cutting the figures—it is tedious, unnecessary, and will be hard work if sheet steel is used; aim for a reasonably fair outline, that is all. Similarly, too much time should not be spent painting the figures nor too many colours be introduced. In fact, the colours should be chosen in relation to the background most likely to be available. On professional ranges the figures are white against a black background.

(*To be continued*)

Fig. 6.—A few suggested figures for targets.



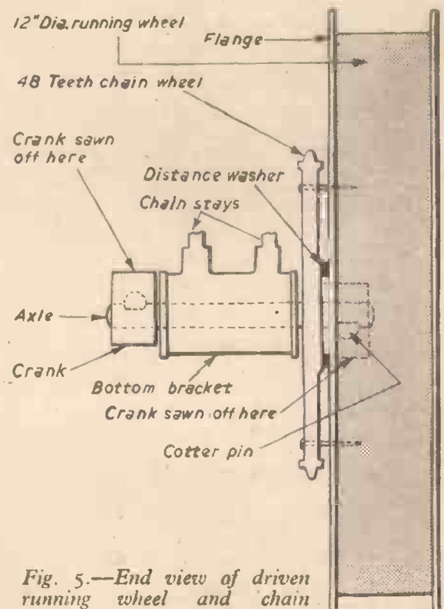


Fig. 5.—End view of driven running wheel and chain wheel mounting.

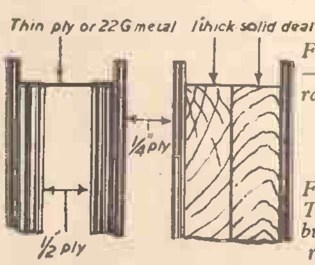
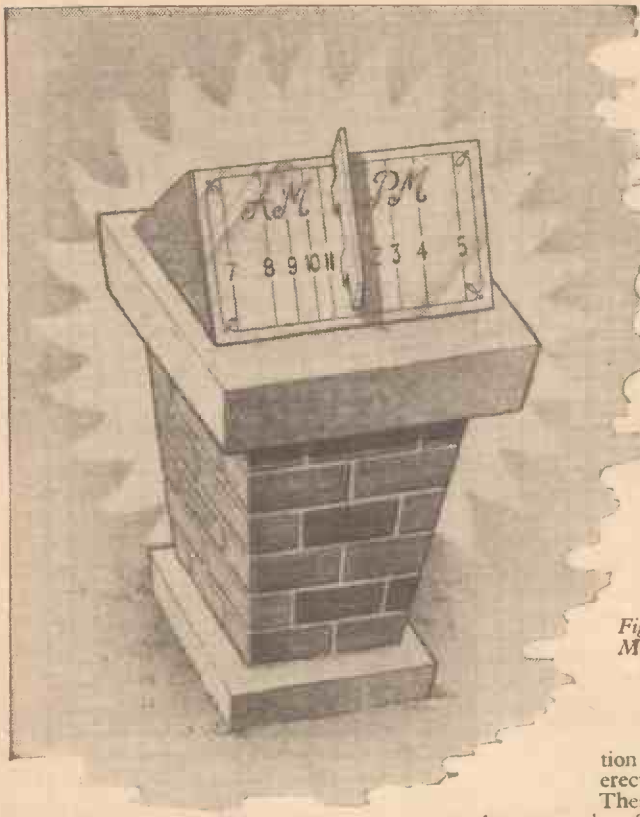


Fig. 3 (Above).—Diagram of ratios if bicycle wheel is used.

Fig. 4 (Left).—Two methods of building up the running wheels.



Making a Polar Sundial

By E. Rolfe Hunter, Who Also Gives a Simple Method of Finding the True Meridian

IN this rather unusual type of sundial both the dial plate *and* the shadow casting edge of the gnomon—called the "stylo"—would, if produced, cut the north celestial pole. In other words, both are inclined at an angle equal to the latitude of the sundial site. Because, however, the sun is always due east at 6 a.m., and due west at the same time in the evening, the polar sundial shows only the time between 7 a.m. and 5 p.m.

The Dial Plate and the Gnomon

The dial plate (Fig. 1) is made of soft engraving brass 14in. × 8in. × ⅛in. The gnomon is made from a piece of ¼in. brass cut to the measurements shown in Fig. 2.

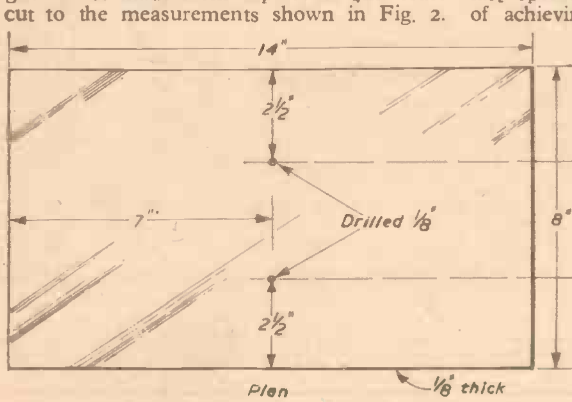


Fig. 1.—Plan view of the dial plate.

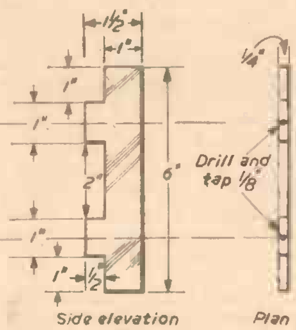


Fig. 2.—Side elevation and plan of the gnomon.

It will be noticed that it has the shape of a double "T." The legs of the "T's" are drilled and tapped to take ⅛in. bolts for securing it in a vertical position on the dial plate and in the noon-line.

Marking Out the Hour Lines

Using a sharp pencil before finally incising the hour-lines with a suitable tool, draw the line AC (see Fig. 3). In the middle of AC equidistant from the ends erect the double noon-line B1 D1, B2 D2 at a distance apart equal to the thickness of the gnomon, i.e., ¼in. The lines B1 D1, B2, D2 should be exactly equal to the vertical height of the stylo above the dial plate (1½in.). With centres at D1 and at D2 draw radii 15 deg. apart cutting AC in the direction of A and C respectively. Through the points of intersection of these radii with AC erect lines vertical to AC. These are the hour lines and they may be further subdivided in the proportion of 1 deg. to four minutes of time.

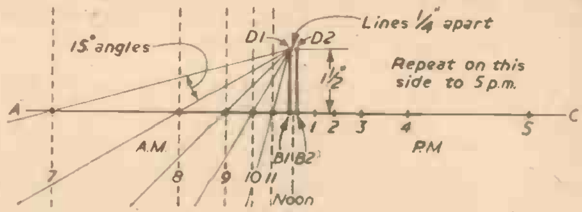


Fig. 3 (Right).—Marking out the hour lines.

Mounting the Polar Sundial

A brickwork or stone pedestal should be built in a suitable position facing towards the south. The completed dial plate can be temporarily supported with wooden props at an angle exactly equal to the latitude, using a plumb line and the largest protractor available. Afterwards the underside can be filled in with bits of small rubble and neatly mortared up (Fig. 4). It is vital to align the edge of the stylo exactly *true* north and south before completing the last operation. A less well-known method of achieving this, and one which requires neither a compass nor calculations involving ephemiris such as equation of time and difference of longitude, is given here.

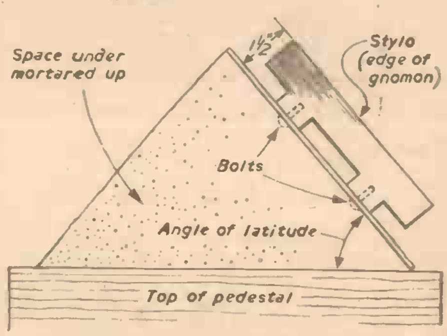


Fig. 4.—End view of dial and gnomon.

Finding the True Meridian or North-South Line

In a suitable position near where it is proposed to erect the sundial, carefully arrange a perfectly flat wooden board horizontally above the ground, using a builder's level. The board must not be disturbed at any time during the process here described.

Somewhere near the south edge of the board, in the middle line, bore a small hole and in it insert a stout length of stiff narrow wire or a long double-ended knitting needle. The wire must be exactly vertical (Fig. 5).

At some time in the morning, preferably after 9 o'clock, note the position of the shadow cast by the tip of the wire and carefully mark it with a pencil. Remove the wire and, with the hole in which it fitted as centre, describe a long arc the radius of which is equal to the length of the shadow. Carefully replace the wire and in the afternoon note when the tip of the shadow again touches the arc and again mark it with a pencil. Remove the wire and draw lines through these two points to the centre. Bisect the angle so formed and the resulting line runs true north and south.

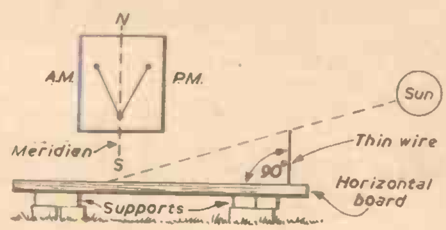
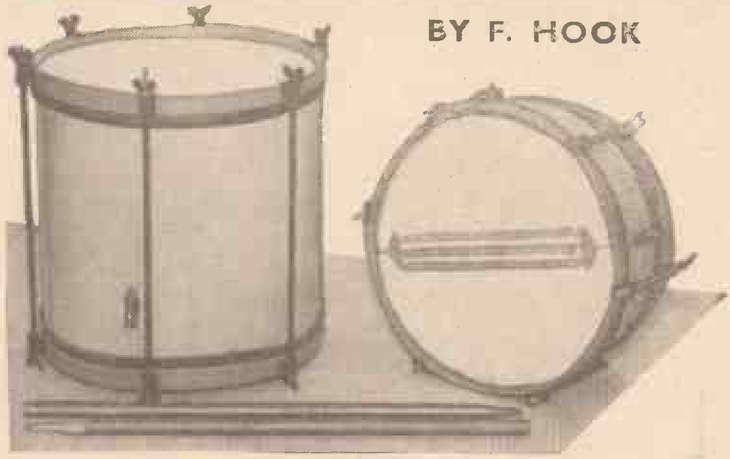


Fig. 5.—Finding the Meridian.

Home Made Musical Instruments

A Tenor Side Drum

BY F. HOOK



A pair of completed drums.

Part 4 Commences the Construction of Percussion Instruments

VARIOUS percussion instruments, including the tenor side drum, are shown in Fig. 1. The drum is often misused by the novice, but nevertheless it is as delicate an instrument as any other and needs as careful tuning.

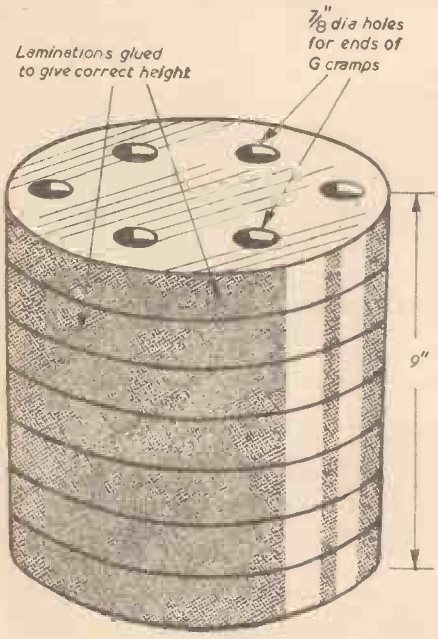
There are three types of drum used in the orchestra—the side drum (so often miscalled the kettle drum), the kettle drum or tympani and the bass drum so well known in the brass band. The side drum is cylindrical in shape with a wooden shell. Across the ends are stretched the heads made of parchment. The drum is played on the batter head. The movement of the head skin causes the air inside the drum to make the opposite end or snare head to vibrate in sympathy. Across the snare head are stretched gut strings the vibration of which cause the familiar "rattle" of the side drum. Without the snares the note of the drum would be that of the tom-tom drum. This is an effect used sometimes in orchestral work and calls for an automatic device which will quickly release the snares from contact with the snare head.

The tympani usually has a shell of silver or copper fashioned to the familiar hemispherical shape. There is, of course, only one head and no snares.

The heads of drums are usually made of calf or sheep skin. For these small drums parchment such as is used for valuable documents may be used. Some of the drums in the photographs have heads made from old deeds and indentures of no further use to the owner.

The head is first cut circular in shape and then soaked in water. It is then tucked around a narrow hoop called the flesh hoop and this hoop fits snugly over the shell of the drum. Other wider hoops rest on the top of the flesh hoops and these are held together with six rods which pass through small clips which are secured to the hoops. As the wing nuts on the ends of the rods are tightened the heads are stretched and thus the pitch of the note given is raised or lowered over quite a wide range.

Possibly the reader may not like to undertake the work of tucking the heads round the hoops; in this case. if the hoops are taken to a music shop, the skins may be fitted by a professional quite cheaply.



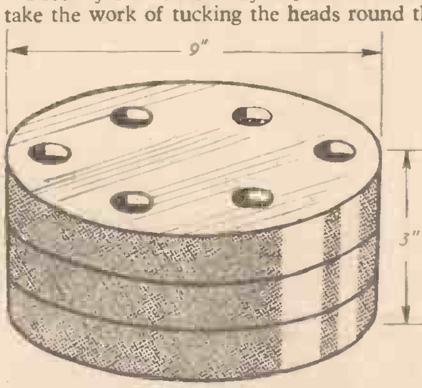


Fig. 2.—(Above and Left) Formers for the tenor side drum and small side drum.

Making a Tenor Side Drum

The shell of this drum is 9in. deep. A smaller side drum is also shown in the heading photograph which is only 3in. deep. The method of making these two drums is the same; they differ only in size.

The Shell

A former is necessary around which the plywood shell is shaped (Fig. 2). It is 9in. dia. and 9in. in length and can be turned up from a solid log of the approximate size or may be built up from a number of laminations as shown in Fig. 2. If turning facilities are not available then the former could be worked up by hand methods. Six $\frac{7}{8}$in. dia. holes are drilled equidistantly round each end to take the small G cramps.

Cramp down to the end of the bench the long strip of plywood for the shell and for a distance of about 5in. from the end bevel

Fig. 1.—Various percussion instruments including the tenor side drum.

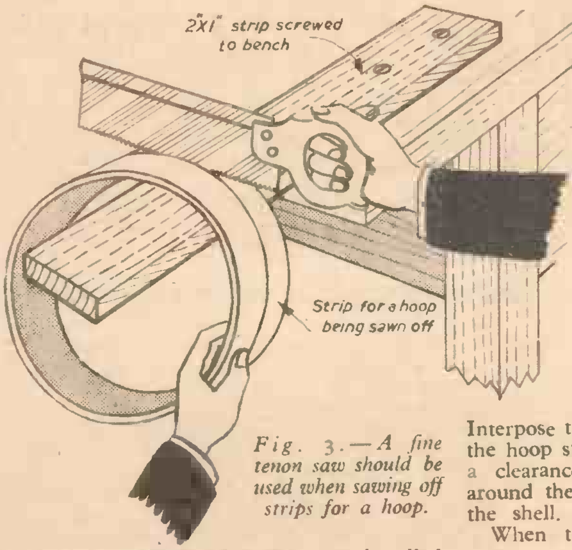


Fig. 3.—*A fine tenon saw should be used when sawing off strips for a hoop.*

Making the Hoops

This is a similar operation to that of the shell. First bevel the end of the strip of plywood and then soak in warm water for about half an hour to render it more pliable. The four hoops required are sawn off from the 3in. strip when it has been glued up and planed.

When the plywood strip is ready bend it around the shell while the latter is still in place upon the wooden former. Interpose two layers of thick paper between the hoop strip and the shell so that there is a clearance for the skin when wrapped around the hoops. Cramp the joint as for the shell.

When the hoop strip is finished the various width hoops are sawn off to parallel lines scribed round the hoop strip. This is done with a fine tenon saw holding the hoop on the edge of a piece of board held in the vice, sawing through a little segment at a time and gradually working round the whole strip (Fig. 3).

The edges of the hoops may then be smoothed off with glasspaper. The edges of the shell, top and bottom, must be slightly rounded (Fig. 4) so that the skin will pull over smoothly.

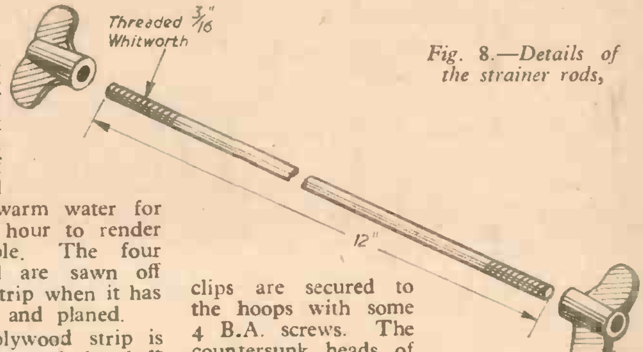


Fig. 8.—Details of the strainer rods.

the wood, making sure that the bevelled surface is quite flat.

The strip of plywood is now soaked for a short time in warm water and then bent around the former, first of all securing the bevelled end to the former with a pair of cramps. It is a good plan to use some strips of wood about 9in. × ¾in. × ¾in. under the cramps to prevent marking the plywood and to hold securely to the former.

When the plywood is wrapped right round, the first pair or two of cramps must be removed to allow for the overlap. It is necessary to allow the plywood to dry out before gluing the joint. Use a waterproof glue such as Aerolite for the joint.

When the glue is set remove the cramps near to the joint and trim off the odd piece of plywood. With a smoothing plane, plane down the overlap until an even thickness is obtained. Finish off with various grades of glasspaper.

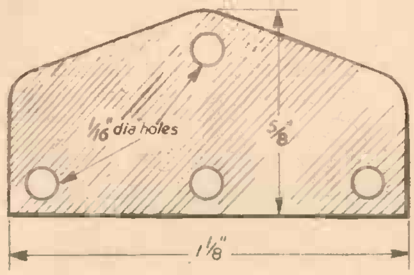


Fig. 6.—Details of the snare plates.

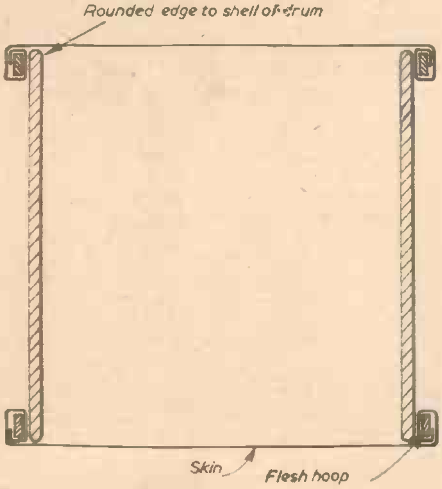


Fig. 4.—(Above) Details of how the skin is tucked round the flesh hoops.

The Hoop Clips

Twelve hoop clips are required. They are made from a strip of ½in. width × 20 g. brass (Fig. 5) and are bent with a pair of round-nosed pliers so that when they are fixed to the hoop, the straining rod will pass easily through the space. The clips are secured to the hoops with some 4 B.A. screws. The countersunk heads of the screws are on the inside of the hoop and any surplus thread above the nuts may be sawn or filed off.

The six strainer rods are 12in. in length and are screwed 3/16in. Whitworth for a distance of about 1in. on each end (Fig. 8).

Two snare supports are required, the details of which are shown in Fig. 7. They are fixed on opposite sides of the shell at a distance of 2in. from the end.

Two snare springs are required and can be made quickly by winding some 22 g. piano wire round a piece of ⅛in. rod which is held in a brace as shown in Fig. 9. The wire is run through a saw-cut in a piece of wood so that it is kept taut during the winding process. Stretch out the spring so that the coils are about ⅛in. apart and then cut off two 6in. lengths. With the pliers form a small hook on each end of the springs.

The ends of the springs fit into two small brass plates shown in Fig. 6. A ¼in. dia. hole is drilled in the side of the shell to relieve the air pressure within the shell.

(*Continued on page 329*)

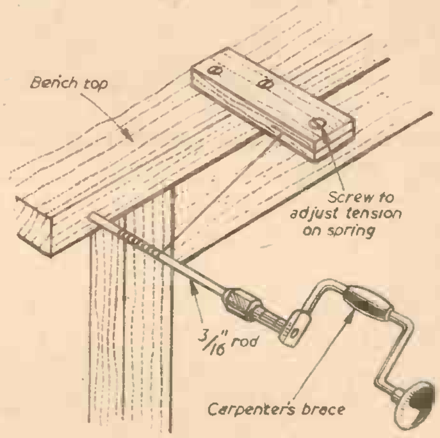
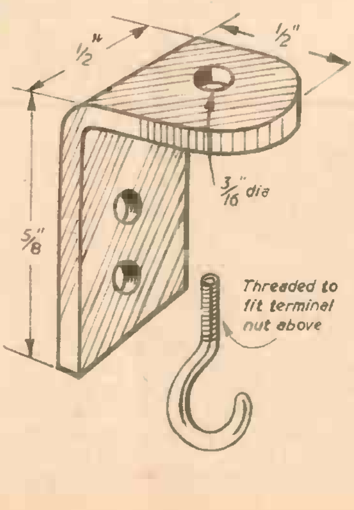


Fig. 9.—Winding the snare springs.

Fig. 7.—(Below) Dimensions of the snare bracket.



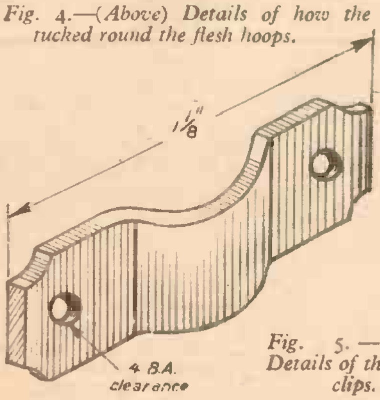


Fig. 5.—(Left) Details of the hoop clips.

MATERIALS REQUIRED FOR TENOR SIDE DRUM

- A wooden former, cylindrical in shape, 9in. diameter × 9in. deep.
- 1 piece of plywood for shell, 34in. × 9in. × 3/16in. (direction of grain at right angles to the length).
- 1 piece of plywood for hoops, 34in. × 3in. × 3/16in. (direction of grain with the length of the strip).
- 1 dozen 3in. G-cramps.
- 6 strainer rods, 12in. long × 3/16in. diameter, threaded 3/16in. Whitworth for a distance of 1in. at each end.
- 1 dozen 3/16in. Whitworth wing nuts and washers.
- Parchment for the heads.
- 28 4B.A. nuts, countersunk head screws and washers.
- 4 yards No. 22 gauge piano wire for the snares.
- 3 ft. ½in. × 18 or 20 g. brass strip.

AN ADAPTABLE TIMING DEVICE

By F. Gosling

It Can Be Used for a Number of Purposes

THIS device, which operates at pre-set times during the day, was designed to ring a bell automatically at the end of each lesson period in a school. It could also be used in a factory to denote the lunch and tea breaks, as well as being suitable for process timing, sequence switching, flashing signs and in hotels for early morning calls to guests.

Operation

A synchronous clock motor, final speed one revolution per hour, is fitted underneath a plywood "dial" and drives a piece of screwed rod used as an hour hand. A metal disc with a nut at the centre, screws on to the screwed rod so that as the rod sweeps round the plywood clock-face, the disc rolls and gradually travels outwards along the rod, so the path of the disc is a spiral. At appropriate points of the spiral, contacts are located over which the disc will travel, thus completing the bell circuit. The motor is frequency-operated and so automatically keeps correct time as checked at the power station. The general arrangement of the device can be seen from the two views in Fig. 2.

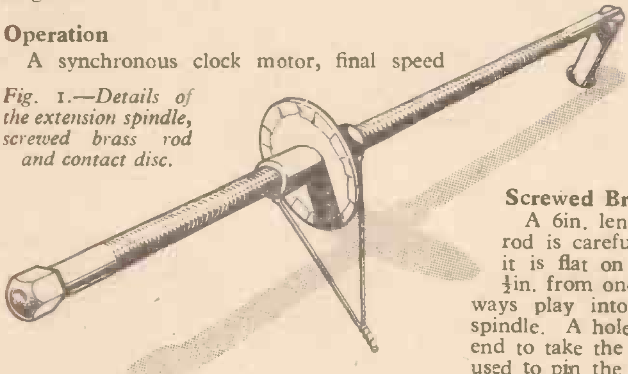


Fig. 1.—Details of the extension spindle, screwed brass rod and contact disc.

Construction

Remove from the synchronous clock motor any hands and unwanted calibration dials which are already fitted, and drill three holes in the chassis plate on to which the clock face would normally be fitted, taking care that the drilled out bits of metal do not lodge in the wheels of the motor or they may cause damage. These holes are for bolting the motor to the underneath of the plywood.

Drill axially into a $1\frac{1}{4}$in. length of brass or steel rod of $\frac{3}{8}$in. dia. to a depth of $\frac{3}{8}$in. with a twist drill of the same diameter as the hour hand spindle of the clock motor. About 3/16in. from the same end of the rod drill and tap a hole of bore, say, 6 B.A., to take a grub screw. The other end of the rod has a slot of about 1/16in. width cut into its end axially to a depth of $\frac{3}{8}$in. and at right-angles to this a hole is drilled through the sides to take a $\frac{3}{8}$in. length of about 16 s.w.g. wire which will be used to pivot the screwed rod in the slot. When the drilled and slotted rod is fitted to the hour hand spindle of the motor it forms an extension to it. This can be seen in Figs. 1 and 3.

The plywood face should be cut to 1ft. sq. (or 1ft. dia. if a circular finish is required) and a $\frac{1}{2}$in. hole made in the centre. Four legs are attached at the corners made of $1\frac{1}{2}$in. or 2in. sq. wood and $\frac{1}{2}$in. longer than the thickness of the motor. After three more holes are drilled near the centre of the plywood, to correspond with those made previously in the motor chassis, the motor can be bolted to the plywood with only the extension spindle protruding upwards through the centre hole.

Screwed Brass Rod

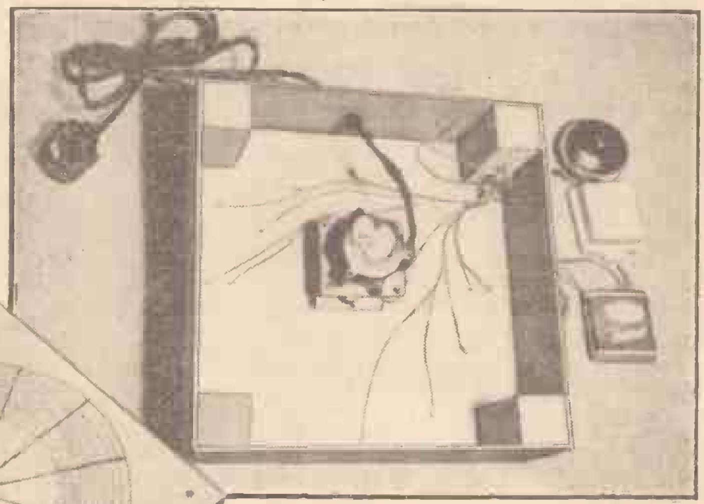
A 6in. length of 6 B.A. screwed brass rod is carefully filed at one end so that it is flat on two sides to a distance of $\frac{1}{2}$in. from one end, and fits without sideways play into the slot of the extension spindle. A hole is drilled through this filed end to take the 16 s.w.g. wire which is now used to pin the screwed rod to the extension spindle so that the rod can be raised or lowered slightly.

The disc should be the size and thickness of a halfpenny with a hole drilled at the centre over which a 6 B.A. nut is soldered at one side of the disc. The disc can now be spun on to the rod and will rest on the plywood. Fig. 1 shows the completed extension spindle.

Mark six equidistant diameters in pencil on the plywood and number them in fives from 5 to 60 for the minutes. Loosen the grub screw in the extension spindle and with the rod pointing along the 60 minute line and the disc near its outer end, dust chalk over the plywood evenly and thinly. Then rotate the arm anti-clockwise until the disc reaches the centre, blow the chalk dust away gently and a spiral track will remain marked by the chalk. This can then be pencilled in. Remove the arm and extension spindle, mark the outermost end of the spiral with the number of the latest hour at which the apparatus is intended to operate, and work inwards. Each intersection of the 60 minute radius and the spiral line represents the hour previous, the number of which should be pencilled in lightly. Work up to the earliest hour at which it is intended to operate. Details of the dial are shown in Fig. 4.

Ringing Programme

At appropriate points on the spiral, according to the required timing of the bell ringing, pierce two tiny holes for contact wires, one on each side of the line and halfway between the line itself and the previous and succeeding laps of the spiral. If these two holes are sited too far apart the wheel may touch the contact wire on its next lap as well; the holes should, however, be as widely separated as possible without running this risk.



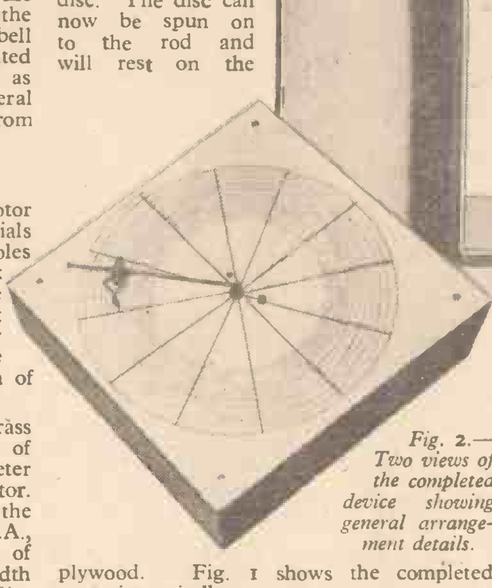


Fig. 2.—Two views of the completed device showing general arrangement details.

Completing the Dial

At this stage it would be better to finish the surface of the plywood dial, either staining the wood and painting in the numbers neatly, or just painting or inking the numbers on the natural wood. A glossy finish should be avoided as the disc might slip.

Underneath the dial and near the edge fix a short screw and cover its head with a generous amount of solder. Using about 26 s.w.g. wire, d.c.c., the contacts are now made.

The Contacts

Cut a length of wire a few inches longer than the distance between a contact point and the soldered screw head. Bare $1\frac{1}{2}$in. at one end of the wire and thread this end through the pair of holes previously made in the dial, knotting the wire on the underside. Similarly wire up all the other contact points and as this work proceeds the loose ends of the wires can be anchored in a piece of modelling clay temporarily. If any of these wires should tend to foul the motor, they should be taken round guide posts screwed into the wood on each side of the motor.

Gather the loose ends, take them to the soldered screw head and bind them together with thread or tape so that when they are all cut to an even length and the cut ends are bared and tinned, they can be soldered *en masse* into the solder on the screw head.

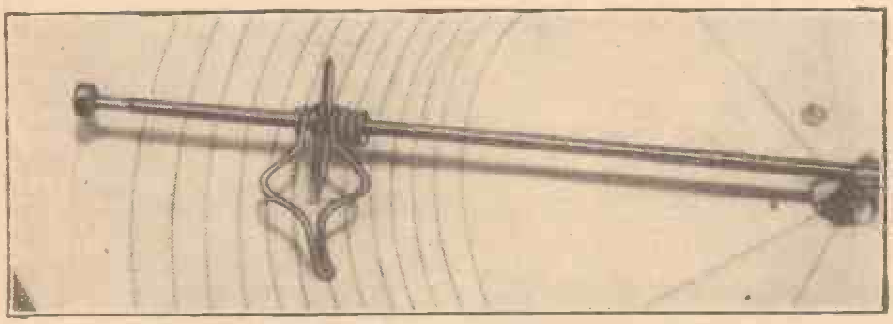


Fig. 3.—A close-up view of the threaded rod and contact disc.

Two terminals are screwed underneath the board, one on each side of the soldered screw which is then connected to one of the terminals. The other terminal is connected to the framework of the motor, secured under a bolt head.

The Bell and Battery

The external circuit of bells and battery is now connected in series with these two terminals and when the arm and extension spindle are replaced and rotated (do not tighten the grub screw), the various contact points can be tested.

Screw on a 6 B.A. nut at the very end of the rod (see Fig. 1), secure it with shellac and then, with a narrow file, remove the adjoining thread so that as the disc reaches this part it will "freewheel" without running off the end, and as the arm keeps time it is in the right position for resetting the disc on the first lap of the spiral each morning.

The grub screw is now tightened and the A.C. mains connection to the motor is made —through a mains type switch.

Modifications

That is the device in its simplest form and various modifications will prove useful.

An automatic stop can be incorporated to switch off the motor at the edge of the plywood or spiral. Heat the ends of a 3in. long strip of clock spring and after allowing it to cool slowly drill two small holes at one end and one small hole at the other end. Through this last hole put a short screw into a button of indiarubber or wood shaped like a thick billiard cue tip, taking care that the screw does not go right through the button. Drill a hole slightly wider than this button through the plywood at the end of the spiral and place the spring underneath the plywood as a continuation of the spiral with the button protruding up through the hole in the plywood. A short screw through one of the other two holes in the spring will fix it in place. Cut one of the mains leads to the motor at a suitable distance from the motor so that the mains end of this lead can be tucked under or soldered to the third screw when it is fixed through the third hole in the spring to the plywood.

About $\frac{3}{4}$in. from the button another screw is fixed through the plywood from above so that when adjusted its tip just makes contact with the spring. Alongside this screw a hole is drilled through which the motor end of the cut mains lead is pushed and the bared end of the lead soldered to the head of the adjusting screw. Final adjustment is made with an insulated screwdriver when the supply is switched on, so that the weight of the screwed rod and disc is sufficient to press on the button and disconnect the spring from the screw.

Insulating

For safety all bare mains-carrying metal parts above the plywood, viz., the contact screw and the filed off stumps of the fixing screws if they have protruded, should be covered with sealing wax or other insulating material, leaving only low voltage parts in view. The adoption of this automatic motor switch may involve forcing the arm round to the correct time each morning.

Flashing Lights

Another obvious modification is to box the apparatus in with plywood sides and base, and fit a hinged lid with a glass top.

If the apparatus is to be used for flashing lights, the contact wiring would consist of radial wires on the dial with a circle of wire connecting the ends rather like a dartboard "spider." On the other hand, the screwed rod could be replaced by unscrewed rod with a disc at its outer end "freewheeling" all the time, sandwiched between two locating nuts soldered to the rod, in this case only the outer part of the spider need be used. If, however, the lights are worked from mains, a suitable mains switch, e.g., a mains carrying relay, should be incorporated.

If two or more external bell circuits are required, all contact wires relating to bell circuit A go to one terminal and those relating to bell circuit B go to another terminal, and so on, each terminal being connected to its own set of bells—though the same battery and a common negative could be used.

A Guest Caller

As an hotel guest caller a separate switchboard could be made with rows of sockets labelled for five-minute intervals during the normal calling hours. These sockets would be connected by wire to the appropriate contact points on the spiral of the timing apparatus. Wires from the guest rooms would terminate in a numbered wander plug, the type with a head which is itself a socket so that others could be plugged in if more than one guest were to be called at any one time. These wander plugs would be plugged into the appropriate socket of the switchboard at the reception desk the previous night.

There is no point in using a wider pitch of thread than 6 B.A. unless more hours need to be covered, in which case a finer thread will give smaller outward travel of the disc per rotation of the arm. Alternatively or in addition a larger disc can be used giving the same effect, or yet more hours still could be covered by using a larger board. A more compact apparatus can be made by using a larger disc and/or finer thread on the rod, if this is carried too far, however, the separation between laps of the spiral may be too small to accommodate contact wires of sufficient length.

Ringing Time

It has been found in practice that the bells ring for about nine seconds near the inner end of a 12 hour spiral, decreasing to five or six seconds at the outer end. If this is considered to be too long a ringing time, the following addition could be made. Cut two pieces of metal tubing about 3/16in. long and of sufficient bore to be a sliding fit on the screwed rod. Make a V-shaped piece of wire (about 16 s.w.g.) and solder a $\frac{1}{2}$in. length of similar gauge wire at the point of the V at right angles to the plane of the V. Solder the ends of the arms of the V to the pieces of tubing and put the tubings on the screwed rod with the disc sandwiched between them. The $\frac{1}{2}$in. wire at the point of the V then acts as a trailing contact, when the circumference of the disc is protected by insulating material such as Sellotape. The trailing contact will ring the bells for a shorter period than that taken for the disc itself to roll over the contact wires.

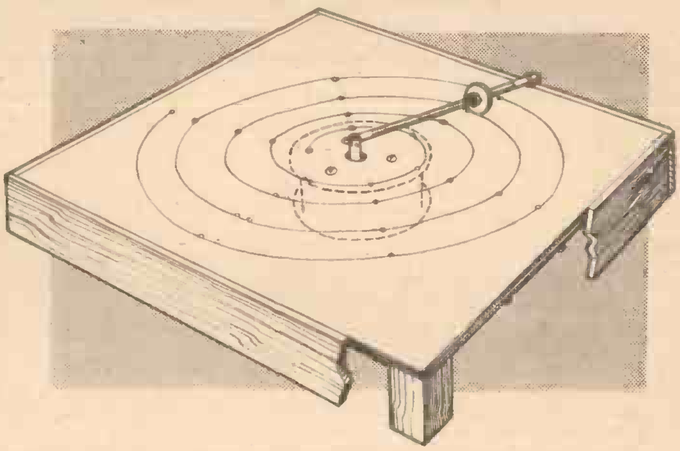
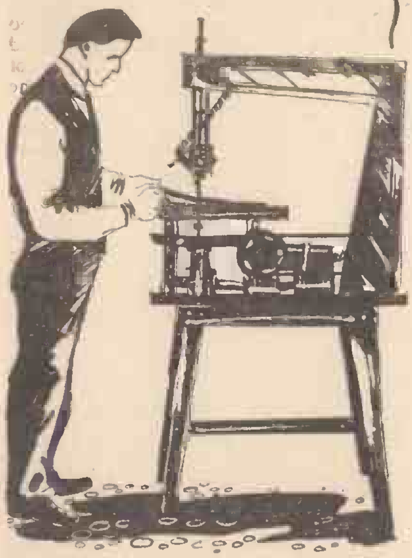


Fig. 4.—How the contact disc rotates in a spiral path on the table top.



AN IMPROVED JIG SAW

With Positive Double-drive 3-way Blade-chucks, Tilt and Rise and Fall Table

(Concluded from the March issue)

By Jameson Errol

THE hold-down shown last month in Fig. 7 is cut and bent from a piece of 1/16in. steel and closely resembles that found on a sewing machine; this is bent so that it falls about ½in. below the bottom of the guide-roller. The blade guard is made from a length of ⅛in. steel rod, one end of which is threaded for about ½in. Fig. 7 (last month's issue) shows the shape to which this guard should be bent. The blower consists of a 2½in. length of suitable brass or copper tubing, slightly flattened at one end. It is supported by means of a piece of thin metal bent around the tube and bolted at its free ends between two thicker plates of brass which are attached to a short length of right-angled metal which, in turn, is fastened to the length of slotted steel by means of passing over the threaded end of the blade guard and the whole secured by two nuts. The completed head unit is bolted to the cross-bearer with two 3½in. × ¼in. Whitworth bolts and nuts.

The toe unit, Fig. 9, is simpler in construction since it needs no adjustment when in action. The unit is similarly enclosed between two brass or steel plates, and although shown in this model as consisting of two sets of such plates, they could well be combined. Countersunk holes are bored to fasten the plates to the wooden base-block, and non-countersunk holes to carry the bobbin and the rollers. Note again that the top pair of rollers are set ⅛in. apart, whereas the bottom pair—which will engage with the steel strip *and* the leather strap—are ¼in. apart. The top "side-to-side" guide is shown differently from that shown in Fig. 7 for the head merely because a piece of solid brass was used, a notch being cut to guide the steel strip and two grooves to engage in the edges of the plates for fastening purposes. The fitting could well be the same as that employed for the head. Also, although a thin metal bracket is shown as a guide at the base ("A" Fig. 9) this could be omitted since the wooden block itself must be slotted to take the steel strip and, if done carefully, can act as an efficient guide. Note, at this point, that it will also be necessary to cut a similar slot in the baseboard since the steel strip may protrude below that level. Note also that the bobbin must be so positioned that its bottom bearing surface falls level with that of the bobbin at the base of the upright and that both should be level with the underside of the stationary plate already screwed to the general structure. The tray, marked "B" in Fig. 9 and detailed in Fig. 8 last month is to catch small pieces of wood which might otherwise fall through the saw gap in the table and perhaps foul the mechanism. It it attached to the side plates by two small brackets.

The Saw Chucks

Fig. 10 furnishes enlarged details of these. They are made for "pinned" blades, the pins resting in the wider cross-slots while the blade rests in the vertical grooves. These latter are quite easy to cut with a hacksaw. It is advisable, however, to clamp a guide for the hacksaw blade when cutting these grooves as it is almost impossible to keep the blade dead straight and to prevent unwanted widening at the ends of the cut. The cross-slots present a rather more difficult problem if a milling machine is not available.

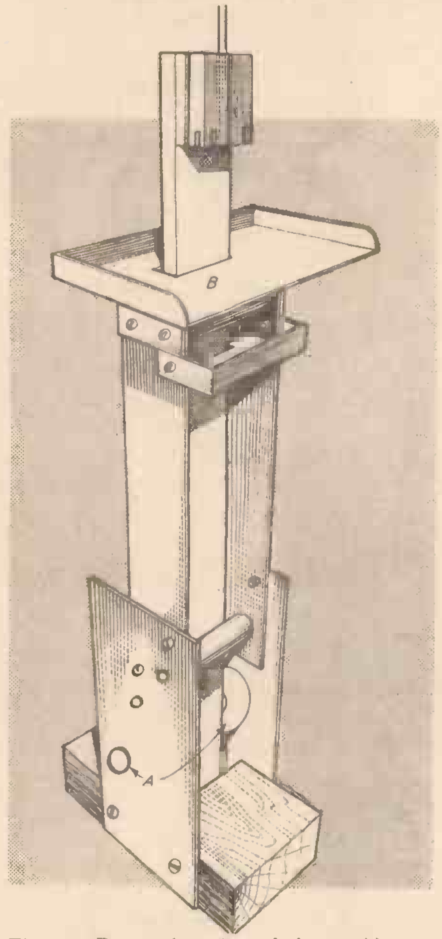


Fig. 9.—Perspective view of the machine toe.

It was found best to cut right along the entire width when cutting the side slots. These slots will have to be widened with a thin file since the hacksaw blade is thinner than the pins on jig saw blades; they need only be about ⅛in. deep. The chucks are fastened to the steel strips with 4 B.A. R/H bolts threaded into the bulk of the chucks from the back. Be careful to see that the ends of the bolts do not protrude into the back of the front vertical groove. It is advisable to run the hacksaw along this groove after the chucks are fitted and thus ensure free entry for the saw blade. The head chuck is, of course, fitted with the pin slots uppermost, while the toe chuck is fitted with them in the down position.

The toe unit may now be fastened to the baseboard, care being taken to ensure that both chucks are in perfect alignment vertically and laterally by threading on a saw blade and testing in all directions with a large square.

Preparing and Connecting the Strap

A substantial leather belt about 5ft. long and approximately ⅝in. wide and ⅛in. thick should be bought and the buckle, etc., removed. One end is then fastened to the rear end of the moving plate (see Fig. 4 March issue) by two countersunk 4 B.A. bolts ½in. long. The strap is fastened centrally about 1½in. in from the end; file away any portion of the bolts which project. The holes in the leather should be made with a punch and then countersunk; the holes in the moving plate are threaded 4 B.A. The belt is then passed under the rear bobbin, along the inside of the upright, over the tensioning bobbin, along the underside of the cross-bearer, through the slot in the spacing block, and over the bobbin in the head unit. See that the tensioning device is at "minimum," i.e., the wood spacing block at right angles to the cross-bearer, and pull the belt as tight as possible by

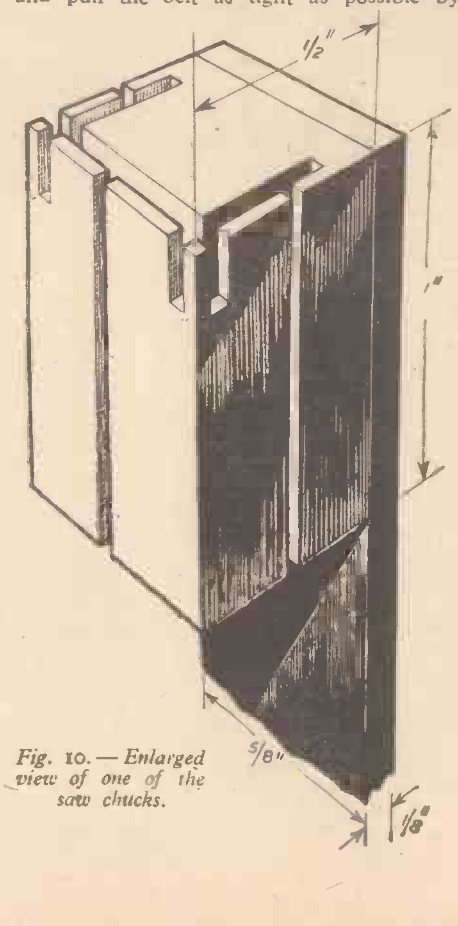


Fig. 10.—Enlarged view of one of the saw chucks.

hand. This should pull the rocker arm over—and, of course, the moving plate with it—so that its lower end is as close to the rear of the machine as the driving pin will permit. With the top of the upper chuck within about ½in. of the bottom of the head plates, note where the end of the steel strip comes and cut the belt at this point. Punch and countersink two holes in the belt and mark their position on the steel strip, remove the latter and drill and tap for the two 4 B.A. C/S bolts which will fasten the belt to the strip.

Now fasten one end of the remaining piece of the belt to the toe end of the moving plate and thread the belt under the toe bobbin and through the lower pair of rollers. Again pull the belt tight but do not let the moving plate or the rocker arm move from the position it occupied when the first piece of belting was fitted. Now, with a saw between the chucks, mark the position of the lower steel strip as before. Be sure that the belt is pulled as tightly as possible in order to give full play to the tensioning device. With this latter in the "minimum" position it should require quite a considerable amount of pressure to free the blade from the chucks. Make sure that the top side of the moving plate remains constantly in close touch with the underside of the fixed plate for it must be borne in mind that at present there is nothing but the tightness of the belt to keep it there.

Reference to Fig. 3 (March issue) will show that two small ball-bearing runners are fastened to the baseboard to keep the moving plate in contact with the fixed plate. These runners must be very narrow in order not to foul the leather strap; 3/16in. is the maximum, and they must be so positioned that they ride on the extreme edge of the moving plate, the back edge of which can be supported by a brass strip suitably packed and screwed to the underside of the general structure. Both plates should now be well oiled and the action tested by repeated movement (in both directions) of the mechanism *by hand* before attempting to switch on the motor. When satisfied that everything is working smoothly and that no jamming is taking place anywhere, the machine can be connected to the motor but only at the slowest speed possible. If all is in order it may be run at higher speed and careful watch maintained to detect any weakness or unwanted movement in any of the working parts.

Making the Table

A glance at Figs. 11 and 12 will show that the table proper rests on two trunnions hinged to a main frame which rides vertically in a skeleton metal framework. This latter should first be made and Fig. 13 shows the construction. It is made of ¾in. angle aluminium (or brass) framed by lateral cross-struts. The size is approximately 12in. square × 6in. high. The corner posts are bent over for 1in. at their lower ends to enable them to be screwed to the baseboard. The holes for the fixing screws (½in. R/H No. 6 woodscrews or 4 B.A. R/H bolts) should be drilled before the ends are bent. Similarly, the fixing holes for the cross-struts should be bored at the same time, and these will have to be countersunk on the inside of the angle since there must be no impedance to the sliding action of the main frame. The angle metal is too thin to carry a thread and 4 B.A. bolts will, therefore, have to be used, with the nuts on the outside of the posts. Note that the front and back struts are only 3in. from the bottom of the frame—to clear the trunnions—while the side struts may be fixed at the top of the posts. With all holes drilled the skeleton framework may be placed in position on the baseboard and firmly screwed to it.

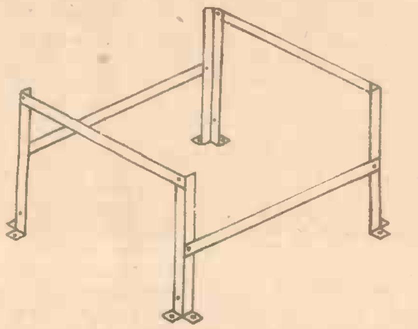


Fig. 13.—The framework which guides the rise-and-fall movement of the table.

The wooden main frame is next constructed and, as will be seen in Fig. 14, is of ⅜in. or ½in. plywood back and front connected by 2in. × 1 in. side members. Before screwing this together a hole should be cut in the rear piece of ply to clear the belt and ¼in. holes bored to carry the trunnions and their fixing flybolts. The size of the frame is, of course, such as will allow it to slide within the metal skeleton with reasonable ease but without undue play. Other essential measurements are given in Fig. 14.

The trunnions are 12in. wide and 6in. deep and are of ½in. plywood. The outer curve is not critical provided the trunnions clear the top of the posts of the skeleton framework. But the curved slot along which the flybolt will travel should be accurately and neatly cut. It is ¼in. wide and has a centre radius of 3in. from the point where the trunnion hinges on the main frame. The best way to cut these slots is to pivot the trunnion to the drill table and fix a ¼in. router tool in the drill chuck. If this cannot be done, the slot should be marked out plainly and carefully, drilled with a number of 7/32in. holes, and finished with a fret saw or a thin round file. The trunnions are fixed to the table top by means of two lengths of ¾in. metal angle, and these may now be fastened to the trunnions having first been drilled on their undersides so that when the table is temporarily placed in position it can be marked preparatory to fixing.

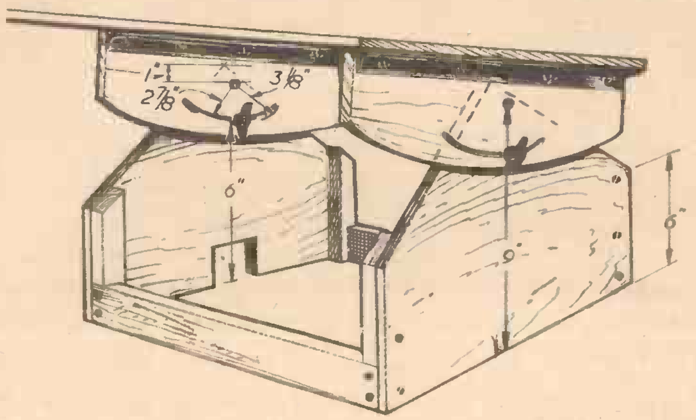


Fig. 14.—Details of table, trunnions and brackets; the latter ride in the framework shown in Fig. 13.

The table top is 24in. long and 12in. wide and can be of ½in. or ¾in. good quality plywood. With the main frame in position inside the metal skeleton, lay the table top on the trunnions and clamp it down

(*Concluded on page 318*)

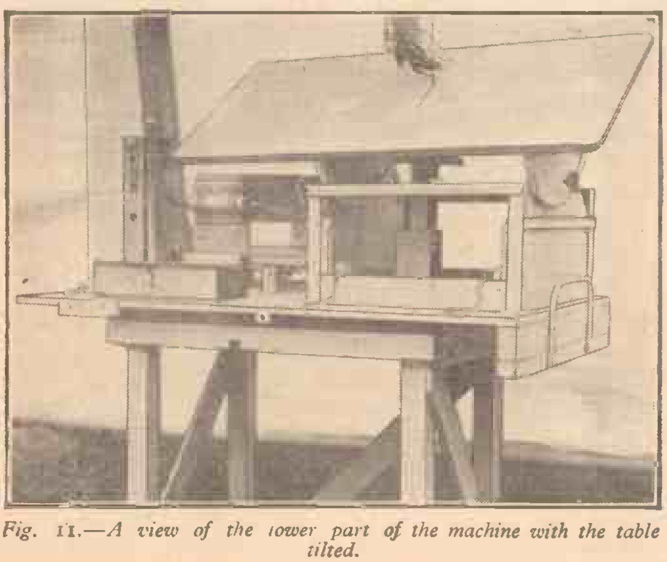


Fig. 11.—A view of the lower part of the machine with the table tilted.

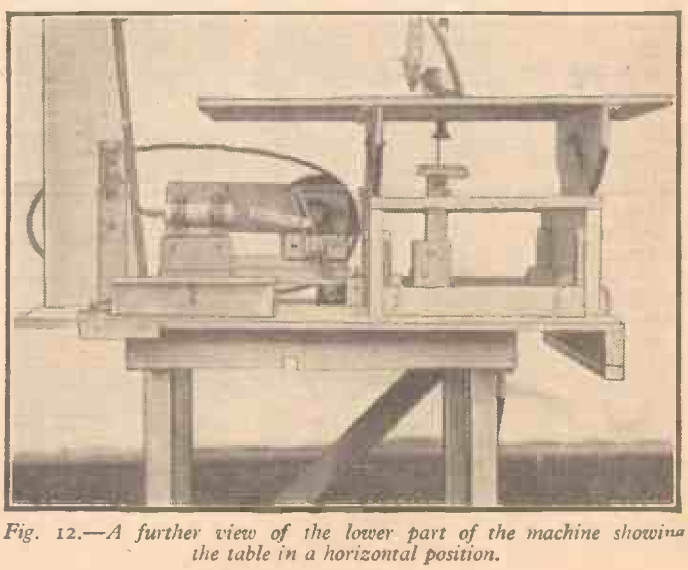


Fig. 12.—A further view of the lower part of the machine showing the table in a horizontal position.

Trade Marks

A TRADE MARK is a symbol of commerce. It is adopted to identify the goods of the trade mark owner and is used or advertised with the aim of persuading potential customers of the desirability of the goods in connection with which the trade mark is used. When this is achieved, the trade mark owner has acquired something of value and if another poaches upon this, the owner naturally wishes to be in a position to obtain legal redress. The registration of a trade mark is an important step to facilitate the owner's right to prevent infringement and to take other steps. The procedure for obtaining registration and the rights flowing from registration are governed by the Trade Marks Act and Rules, 1938.

What Constitutes a Trade Mark and How to Get it Registered.

By "Attorney"

Registration

The registration of trade marks takes place at the Trade Marks Registry, 25, Southampton Buildings, London, W.C.2, which is a separate branch of the Patent Office. The official register is divided into 34 classes, each containing a specified list of goods and registration is obtained in the class or classes covering the goods for which a trade mark is used or proposed to be used. A duplicate register relating to textiles is kept at the Manchester branch of the Patent Office whilst another register known as the Sheffield Register is kept by the Cutler's Company in Hallamshire, County of York and contains registered trade marks relating to metal goods in certain classes. The Official Register is divided into two parts, viz., Part A and Part B. A trade mark that is without the necessary degree of distinctiveness for registration in Part A may be registered in Part B, in which, however, the protection obtained is not so comprehensive as that obtained in Part A.

Choice of Trade Mark

A trade mark in order to be registered must conform to the requirements of the Trade Marks Act which debars from registration a word that directly describes the character or quality of the goods. For instance, the word BRIGHTLIGHT could not be registered in the class covering electric bulbs. Mis-spellings of descriptive words are not allowable for registration so that, for instance, the word BRITELITE could also not be registered for electric bulbs. The best form of trade mark to adopt is one that has been coined or invented. A well-known example of this is the trade mark KODAK. There is, however, no objection to registration of an ordinary known word that has no descriptive allusion to the goods; for instance, the word BREEZE would be acceptable for registration in connection with furniture.

Surnames

The Trade Marks Act debars the registration of common surnames on the principle that, in general, anyone is entitled to trade under his own name. It sometimes happens, however, that a particular trader through having used a surname as a trade mark for many years may be entitled to registration of the surname, limited essentially to the goods in connection with which the surname has been used in a trade mark manner. To secure registration, however, the owner of the surname trade mark needs to provide the Registrar of Trade Marks with almost overwhelming evidence in the form of Statutory Declarations from traders and, frequently also, members of the public throughout the United Kingdom to prove that the surname has, in fact, become exclusively distinctive of the owner's goods. These special requirements for registration of a surname also apply to other trade marks that are officially not regarded at the outset as distinctive, for instance, a trade mark made up of capital letters which do not result in a pronounceable word.

Finally, a word that according to its original signification is a well-known geographical name cannot be registered. For instance, the word LIVERPOOL could not be registered as a trade mark. Sometimes, however, a little known geographical name may be registered, usually in Part B of the register, unless it is the name of a place having considerable repute for the goods with which the geographical trade mark is concerned.

Application for Registration

Assuming that a trade mark is suitable for registration, it is necessary for the applicant or his authorised patent or trade mark agent to complete the appropriate application form, T.M. No. 2, on which the name, address and nationality of the applicant has to be stated together with other particulars including whether registration is sought in Part A or Part B of the register, the class in which and the goods for which registration is required, and whether the mark is being used or proposed to be used. The form must also bear a representation of the trade mark and must be accompanied by four Forms T.M. No. 4, each bearing an identical representation of the trade mark. Form T.M. No. 2 after completion must be stamped at an Inland Revenue Office with a stamp fee of £2. For the convenience of applicants, a stamping office is situated in the Patent Office.

In view of the special procedure for registration of a trade mark, it is usually wise to entrust the task to a patent agent or a trade mark agent from whom preliminary advice is available. After stamping of the application it must be filed in the appropriate room of the Trades Marks Registry at the Patent Office, but in the case of trade marks relating to textiles the application may be lodged at the Manchester branch of the Patent Office and if relating to cutlery at the office of the Cutlers' Company in Hallamshire.

Search

After the filing of an application it is the duty of the Registrar to examine the application to make sure that it conforms with the Trade Marks Act and Rules. The primary question is whether the trade mark sought to be registered is suitable for registration in the sense referred to above under "Choice of Trade Mark." A further task of the Registrar is to carry out a search to make sure that the same trade mark, or one closely resembling it phonetically or visually, is not already entered on the Register in Part A or Part B by some other trader in respect of the goods for which registration is sought or goods of the same description. This frequently entails examination of a number of classes. Trade marks are placed in a class either according to the use of the goods concerned or the material of which the goods are principally made. For example, if a trade mark is to be used and registered in connection with metal containers it would have to be applied for in class 6. The Registrar, however, would carry out a search in other classes in which other containers are classified, for example, in class 20 which covers coal or coke hods and in class 21 which covers various kinds of bins, including waste paper bins. Facilities are available in a public search room at the Trade Marks Registry for an applicant or his agent to carry out a search, i.e., before the applicant incurs the expense of an application for registration of the trade mark. There is an official search fee amounting to 2s. for each quarter of an hour spent in the search room.

Objections

After the official search has been completed the applicant is informed by the Registrar of any objections to registration and reference is made to the section of the Act under which objection is taken. It is then open to the applicant to submit written arguments or to apply for a Hearing before the Registrar in order to argue against the objections. This often requires a considerable knowledge of the law and practice relating to trade marks and for this reason it is wise at the outset to seek the assistance of a patent or trade mark agent.

Advertisement of Acceptance

After an application has been examined and objections, if any, have been overcome, the Registrar sends to the applicant or his authorised agent a form bearing all the finalised application particulars, which the applicant has to check and confirm as correct. The particulars include a representation of the trade mark, the application number, class, the accepted goods and name and address and trading style of the applicant. After this form is signed and returned to the Registrar, he makes arrangements for the particulars to be published in the Official Trade Marks Journal which is issued weekly and is available for purchase at 2s. 9d. per copy. The provisionally accepted application is thus advertised before registration. Each journal bears official notices including information about the right of any person, who has grounds of opposition to the registration of any of the marks advertised, to lodge Notice of Opposition on Form T.M. No. 7, bearing an Inland Revenue stamp of £3. The period of Opposition is one month from the date of the Journal in which the relevant mark is advertised. The Registrar, however, has power to extend this period if application for this purpose is made to him before the expiration of the one month period.

Opposition to Registration

Before lodging in the Trade Marks Registry formal Notice of Opposition to an application, it is advisable to give reasonable notice in writing to the applicant to registration so as to give him an opportunity of withdrawing his application. If Notice of Opposition is lodged without such notice having been given, the Registrar takes this into account when making an order for costs in the proceedings.

The Notice of Opposition must set out a statement of the grounds upon which the opponent objects to the registration. If reliance is placed on a previously registered mark or marks it is necessary for the opponent to give the registration numbers of such marks and the numbers of the Trade Mark Journals in which they have been advertised. The notice must be accompanied by an unstamped duplicate which is relayed by the Registrar to the applicant. The subsequent opposition procedure must be conducted accordling to trade mark rules and practice and is carried out in stages. The applicant has the right to file a counter-statement, in duplicate, setting out the grounds for contesting the opposition. Thereafter, the opponent has the right to support his opposition. This is usually done by evidence in the form of Statutory Declarations which have to be lodged with the Registrar in duplicate so that one copy may be sent to the applicant who then has the right to file counter-evidence.

Evidence from both parties usually includes supporting evidence from independent traders, or in suitable cases, from members of the public. Upon completion of the evidence the Registrar gives notice to both parties of the appointment date of a hearing when he is prepared to receive arguments. Either or both parties or their authorised Agents may file T.M. No. 9, stamped £3, as notice that they intend to appear at the hearing in order to present arguments. It is the practice of the Registrar to reserve his decision which is given in writing in due course to both the applicant and the opponent. If either party is dissatisfied with the decision he is entitled to lodge an appeal which is made at the option of the applicant or opponent to the Board of Trade or to the High Court. The appeal tribunal, after hearing the parties and the Registrar, makes an order deciding whether the application is to be accepted and, if so, whether it should be subject to any conditions.

Registration Period

After the expiration of the advertisement period of one month or after the conclusion of opposition preceedings, if any, in favour of the applicant, the latter may file in the Trade Marks Registry Form T.M. No. 10 impressed with a stamp fee of £3 requesting the Registrar to place the mark on the Register together with a future address for service which must be notified to him on Form T.M. No. 33. This does not require to be stamped if it is lodged simultaneously with Form T.M. No. 10. Thereafter, the Registrar issues the Registration Certificate to the applicant or his Agent. The initial term of registration is seven years from the date of registration which, in practice, is the date of application. Before the end of the seven years' period the trade mark owner is entitled to apply on Form T.M. No. 11, bearing an impressed stamp of £5, to extend the registration for a further period of 14 years. The registration may thereafter be renewed at the end of each 14 years.

Registered Users

The rights flowing from registration of a trade mark include the right of the owner to apply to the Registrar to enter the name of another person or firm on the Register as a permitted user of the trade mark. A registered user application has to be made on Form T.M. No. 50 and the proposed registered user must join in the application which sets out the conditions or restrictions to which the registered user has to conform. These restrictions or conditions have to be carefully formulated to satisfy the appropriate Rules of Trade Mark practice and, in particular, must set out the degree of control by the trade mark owner over the permitted use, which can be for a specified period or without limit of period, depending on the arrangements entered into between the trade mark owner and proposed registered user. The Registrar may at any time cancel the registration of a person as a registered user of a trade mark upon application by the registered proprietor or by the registered user on Form T.M. No. 52. There are a number of miscellaneous provisions relating to registered users.

Infringement

Registration confers on the registered proprietor the exclusive right to the use of the registered trade mark in relation to the goods for which it is registered. Any unauthorised person using an identical mark or a mark which resembles it so closely as to be likely to deceive or cause confusion may be deemed to infringe the trade mark rights, provided such use is in relation to any goods in respect of which it is registered. The Trade Marks Act sets out many qualifications and before a trade mark owner initiates infringement threats or proceedings, advice should be sought from a Patent or Trade Mark Agent, experienced in the Law and practice of trade marks.

Commercial Use of Registered Trade Mark

Trade mark law requires the owner to indicate to the public that a trade mark is registered. This is usually effected by placing the words "Registered Trade Mark" (or an abbreviation thereof) on the goods to which the trade mark is applied or on advertising or publicity matter relating thereto. The owner must take care that the legal effectiveness of the trade mark is not weakened by mis-use of the trade mark. A trade mark may be legally damaged if the owner uses it in such a way as to make it a generic term or name of the product rather than a symbol of the commercial origin of the product. The best rule to follow is to use a trade mark adjectively, for example, UNIBEAR furniture.

The Trade Marks Act is an extremely complicated piece of legislation and contains a large number of special provisions, some of which serve to qualify the procedures briefly described above.

PUZZLE CORNER

1.—Jumped Up

HERE is a problem reminiscent of the old silent film days. A man, standing on the roof of a coach of a moving train, leaps straight up in the air. Will he land back on the same spot from which he jumped?

2.—Is It the Same?

A NAVVY was told by a surveyor to lay a 12in. dia. drainpipe. Being short of pipes of this size, he promptly laid two 6in. pipes, thinking that it was the same thing. What's your opinion?

Answers

1.—Most people will probably say "No" and they will be wrong. If the man jumps straight upwards he *will* land in the same spot. If the train is travelling at 40 m.p.h., the man at the moment of leaping is not only travelling upwards but also forwards at 40 m.p.h. You can easily test this by jumping upwards in a corridor of a train, although on the open top of a carriage the wind may have some tendency to divert the jumper's course. In the same way, when jumping from the earth into the air on a calm day, a landing would be made on the same spot in spite of the fact that the earth is spinning and would have travelled far in space during the leap.

2.—A 12in. dia. pipe has a cross-sectional area of 113.1 sq. in. A 6in. pipe has a cross-sectional area of 28.274 sq. in. Two such pipes would have a combined area of 56.55 sq. in.—half that of the larger pipe! A very simple sketch would have shown you this.

Transistor-Operated Counters & Alarms

Part 6

This Final Article of the Series Deals With a Night-day Photo-switch

By E. V. King

FOR operation on low light intensity it was found easier to use a barrier layer selenium cell in lieu of the photo-transistor, using a different circuit. The photographs (Fig. 51) show a unit constructed to the circuit of Fig. 50. This was found to be very reliable and easy to get working without meters, etc., for the initial setting up. The unit described will be this one, but other circuits are given and mentioned in the text for those who are experimentally inclined.

Construction

The base and end pieces are made and screwed on as for the "Photo-switch" already described. The terminal blocks and two switches are mounted on the back panel (Fig. 52b). The barrier layer cell is not fitted until last as it is easily scratched. The other components are mounted as in Fig. 52a or the layout may be altered at will. B9 is fixed with a small tinplate clip or strong rubber band. VR4, if of the sliding type, needs two small brackets to hold it; if an ordinary round one, one with a large hole to suit will do. VR4 could be mounted on the back panel but the author wished the unit to be preset, so that no one could alter it without his knowledge.

The Barrier Layer Cell and its Mount

This is a small round disc of metal with a thin coating of active material, covered with a transparent varnish for protection. The outer active layer is probably only one molecule thick and is very easily damaged by scratching. Do not rub the surface to clean it. Keep it clean and only use a mild air blast if it does get covered in dust. Any form of celluloid solvent li'e acetone or amyl acetate will dissolve the varnish protective cover. When light falls on the unit energy is transferred to electricity at the rate of something like .1 to .6 micro watt per foot candle sq. cm. of active surface. In practice it is difficult to use the full output as the resistance of the cells differs individually. A relay could be operated directly with a large cell. The author did not try this method, but worked on the idea of a transistor D.C. amplifier so that a less delicate relay would suit.

The active side of the cell shows a bright ring of metal (probably selenium) round the edge of the circumference; this is the negative output contact. The back of the cell is bright in the middle with the letters "Made in England, etc." just visible; this is the positive contact. Contact is made by a light pressure applied over the whole of the contacting surfaces. Brass is probably the best metal to use, but steel was used in the prototype and was satisfactory.

A steel clamp was made as shown in Fig. 53. The inner circle was made by drilling a series of ⅛in. holes and chiselling out the centre. The hole was then filed smooth with a half-round file. This clamp must be carefully made, and must be strong, clean and very smooth. A small piece of brass shim (from the local garage) or other very thin metal is cut to about the size of a penny and a wire is soldered to the centre. The cell is then mounted on the front panel as shown in Figs. 52c and 53. The four holding bolts (⅛in.

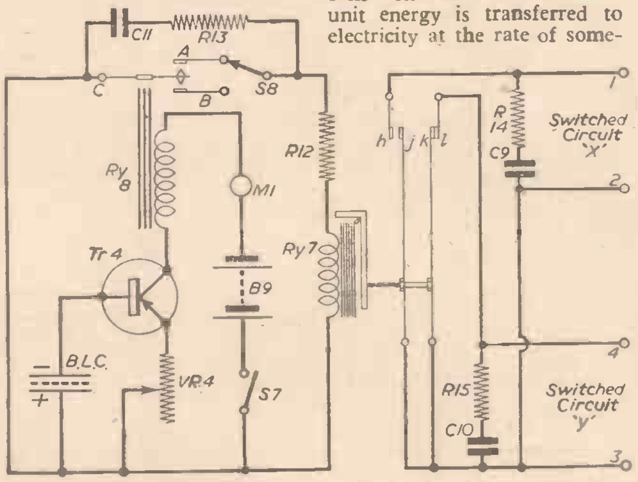


Fig. 50.—Full circuit of night-day switch.

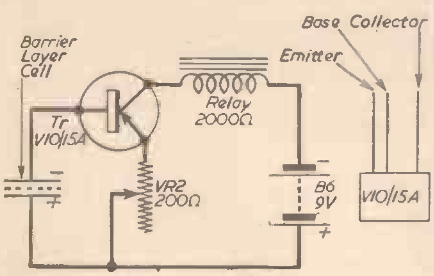
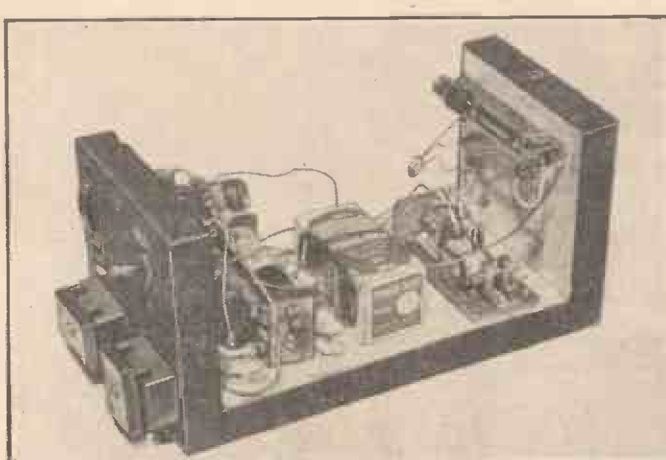


Fig. 48—Basic circuit of night-day switch.



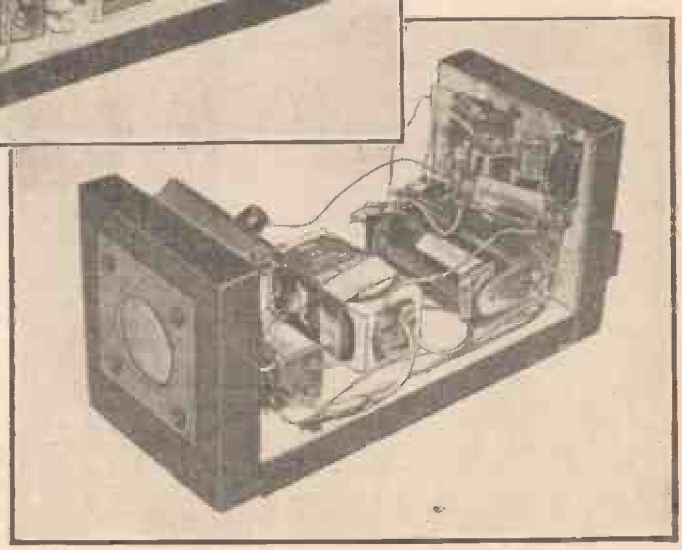


Fig. 51 (Above and right).—Two views of the completed night-day switch.

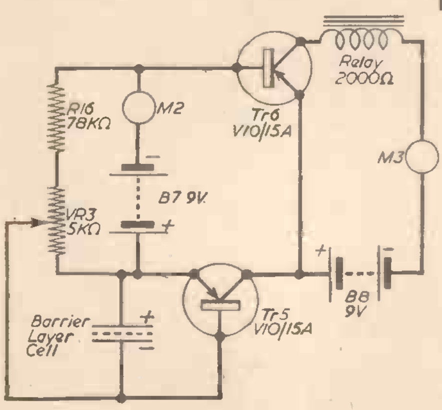


Fig. 49 (Left).—Modified circuit for night-day switch.

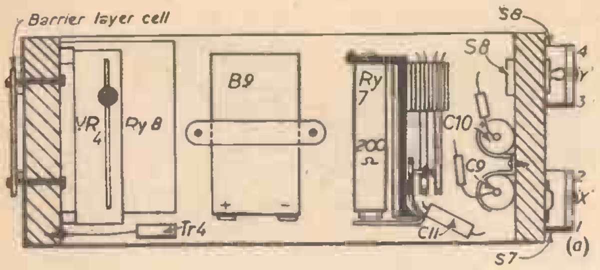
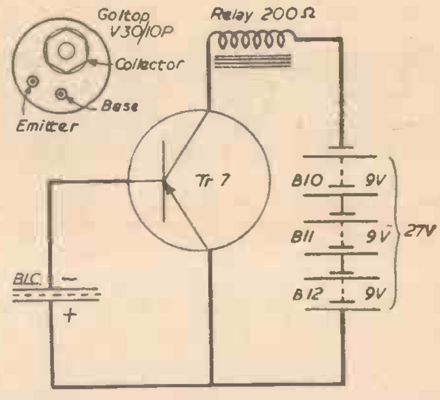


Fig. 54 (Right).—Circuit using power type transistor.

Fig. 52 (Left and below).—Plan view showing layout and views of the back and front panels, switch positions, etc.



Whit. in prototypes) are done up carefully and evenly until the cell is firmly fixed in place. The positive connection is the wire soldered to the shim and the negative is taken to a tag fixed to one holding down bolt on the inside.

Test the cell by connection to an 0-to-1 mA meter. Do not place in very bright sunlight for long, but for a few seconds will do no harm. An output of about 1 mA will be obtained. In "light" cloud in summer, expect an output of about ½ mA. If the cell is likely to get scratched, a glass or celluloid cover could be fitted. For outside operation this is necessary.

Wiring

No special precautions are required. One end of VR4 is left open circuit and correct polarity of the battery is essential. The relays should have been tested before wiring into position.

Testing the Unit

If a meter is available, connect it on the 10 mA range in position marked M1 (Fig. 50). Set VR4 so that in the dark the current flow is 250 μA (use lower range of meter when it is safe to do so). Expose to dull cloud and 3 mA should flow with at least 5 mA in bright sunlight. A small further adjustment of VR4 can be made keeping as much resistance in as possible. After the original setting VR4 may be used as a sensitivity device.

Operation

Sufficient light will hold Ry.8 in. Using S8 in the A or B position will cause Ry.7 either to close or remain open until the light source is diminished according to the setting of VR4.

In operation the maximum drain on the battery is 5 mA but about 12 to 20 mA will be drawn when Ry.7 is closed. So the setting of S8 should be such that Ry.7 is closed as little as possible. The correct circuit "X" or "Y" may then be chosen as already described at the beginning of this series.

S8 could be omitted and only one set of contacts used in Ry.7 for a specific purpose, the unit made was universal.

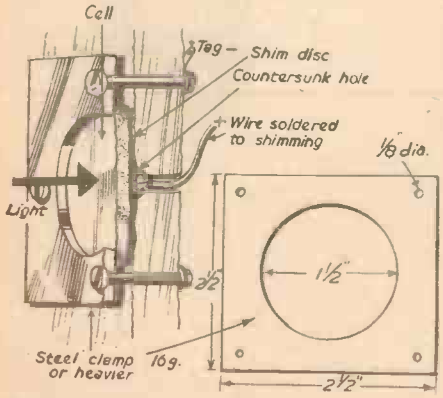
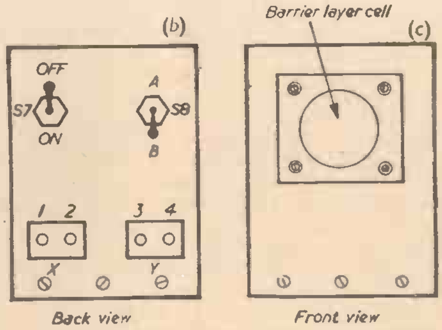


Fig. 53.—Clamp details and method of mounting cell.



PARTS REQUIRED FOR NIGHT-DAY SWITCH

Same case and cover as for other units but no lens hole is required; in lieu a small ¼in. hole is drilled and countersunk as in Fig. 53.

Ry. 8 Siemens High Speed 1,000 plus 1,000 ohms, modified as previously described. Sources already given.

Ry. 7 P.O. Type 3,000 Relay with one set of "throw over" contacts. Sources of supply already given.

B.L.C. selenium barrier layer photo cell, round type 45 mm. dia. active area. Obtainable from G. R. Products Ltd., 22, Runnymead Avenue, Bristol. This source was used for the prototype shown. A rather better but more expensive cell is obtainable from Messrs. Griffin and George as Radiovisor Barrier Layer Cell Type RPL45. This was tried in all circuits and was also satisfactory.

Tr 4 Audio Transistor, Goltop V10/15 A.

R13, 14 and 15—47 Ω ½ watt.

C9, 10 and 11 .1 μF (Omit C9 and C10 with associated resistors if X or Y circuit is to be used on A.C.).

R12 470 Ω ½ watt.

S7 On/off toggle switch, sliding type used on prototype.

S8 One pole change-over toggle switch.

Two junction boxes with 2 contacts in each, or one with 4 contacts.

VR4 200Ω potentiometer of any type. T.V. sliding type is shown in prototype but round type is quite suitable.

Small piece of 16 g. or heavier brass or steel and various nuts, tags and bolts for mounting the barrier layer cell if it is bought unmounted (as in prototypes).

B9 Ever Ready PP6 with connecting clips (source already given).

Other Circuits

An attempt was made to operate the second relay directly using a power transistor immediately after the photo-cell. This was possible but was rather wasteful of current. Using the circuit of Fig. 54 and a Goltop V30/10P transistor the dark current was 2½ mA and from medium cloud illumination 10 mA. This was sufficient to operate the P.O. type 3000 relay with two contacts provided it was carefully set with not too much tension on the "springs." If the Siemens 2000 Ω relay was substituted using only 9 v. (in lieu of 27 v.) the system was very sensitive, dark current .8 mA with medium cloud illumination giving 5 m/A.

One 45 mm. selenium cell would not operate these circuits or the one of Fig. 50 satisfactorily. On testing the cell (resistance range) on a meter, it showed readings of 200 and 500 Ω respectively, according to the polarity of the connections. It is assumed that this cell was damaged by scratching. The best cells showed a very high resistance of 5000 Ω or more one way and 600 to 1000 Ω the other way.

A circuit which will operate with even a bad cell is shown in Fig. 49. It is reliable when once set. Two cells are necessary and VR3 is set initially for a dark flow of .8 to 1 mA with meter in place marked M2. The meter is then placed in circuit at M3 and the VR3 set *very* carefully until .9 mA flows. Then it will be found that medium cloud illumination gives 3 mA, normal daylight 4 mA and sunlight over 5 mA. The relay must be set so that it releases of .9 mA. It is best to do up contact "B" so that the armature cannot quite touch the magnet.

Suggested Uses for this Unit

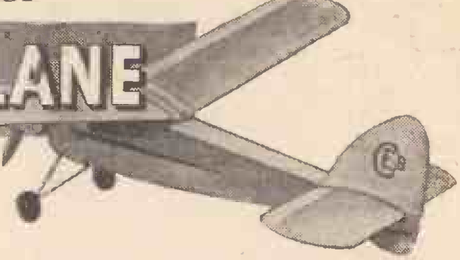
The unit will operate a porch light automatically without the use of an expensive "solar dial," and it will save current by not putting the light on until the sun has really gone down. On the other hand, should the evening be very cloudy it will come on early to relieve the darkness. The unit would be operated from the power pack already described, output No. 1 being used and R12 reduced in value a little if necessary (say, to about 200 or 300 Ω). Not enough current would be used from the mains to work the meter should nothing else in the house be on. On A.C. no anti-spark condensers are necessary in the "X" and "Y" circuits.

Other uses will occur to readers.

The devices described have been thoroughly tested and only experienced readers should deviate. In all cases of faulty operation observe the primary relay armature first to see if the fault lies in its circuit or in the primary coil circuit. Do not adjust the relays once they have been set as described. Remember to test the batteries if the unit is not power operated.

Part Two Gives the Concluding Details of

A SMALL POWER MONOPLANE



A Simple Model; Easy to Adjust; Portable and Almost Indestructible

By C. E. Bowden

The Wings

FIG. 12 shows how the wings are built on the full-scale plan (scaled up from Fig. 17) and covered with grease-proof paper. The tailplane is built in similar manner over the plan (scaled up from Fig.

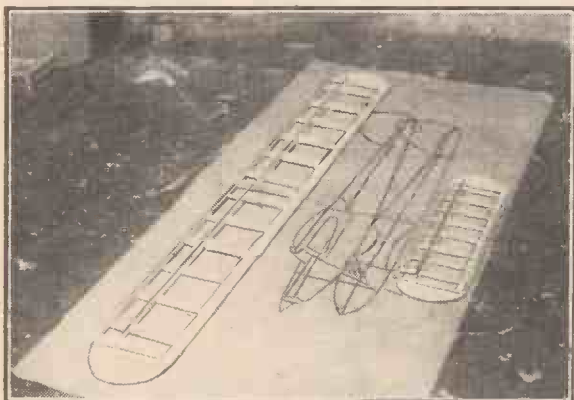


Fig. 12.—The plan is covered with greaseproof paper and the wings and tailplane built on top.

Fig. 13 (Right).—The top of the trailing edge and the top and bottom of the leading edge to the main spars are covered with sheet balsa. The wing is then split in two.

14), and can be seen on the right of the photograph.

Pin the trailing edge spar of $\frac{1}{8}$in. × $\frac{1}{4}$in. on to the 1/16in. sheet rear length with cement between, Then place the lower central spar in its place over the plan. Cement in all the ribs to the spar and on to the trailing edge structure. Allow all to set central ribs so that the correct dihedral angle is given, with the two wing tips raised up to their correct heights. When the cement is set, cover the top of the trailing edge with soft 1/16in. sheet as shown on the plan, and then do the same with the leading edge, top and bottom back to the main spars. When set, withdraw all retaining pins and sand the whole wing smooth. Now fit wire hooks as shown in Fig. 17, using plenty of cement and plastic wood, for these hooks have to hold the wing halves together, and take all flying loads to the fuselage through their respective rubber bands. Cover the centre section with sheet balsa, after also cementing with plastic wood the two short stubby wing locating

dowels into one wing half. When set, make the two holes in the opposite wing half for these stub dowels and smear plastic wood around the holes to stiffen the balsa wood central ribs. The wing halves are now ready

When the tailplane has been constructed in the same manner, using the balsa specified in Fig. 14, the laminated fin should be cemented on top of the sheet covered tailplane centre section, exactly vertical and "square" fore and aft. Retain with pins until set, and then fillet with plastic wood at the base of the fin to give strength and rigidity.

This laminated fin is made as shown last month in Figs. 2 and 5. Cut out the fin shape in soft $\frac{1}{8}$in. sheet balsa and hollow out the centre and then cut out two fins from 1/16in. soft sheet. Now smear the central $\frac{1}{8}$in. outline with cement on both sides and laminate with the 1/16in. sheets each side, leaving to set under weights on a perfectly flat building board. When the cement has set after 24 hours, sand off the edges to a streamline shape and cement the fin on to the tailplane. Fig. 15 shows the plastic wood fillet at the bottom of the laminated fin.

Covering Wings and Tail

A good method is to use lightweight butter-muslin, which sticks on to the framework easily with photopaste, and pulls up easily dry. The rather open mesh is then filled with two "flowed on" coats of full-strength Cellon clear glider dope—full-scale dope of the tautening variety. This set-up will wear like a full-size plane and rain will have no effect. Butter-muslin costs just over 2s. a yard, and is suitable for models up to 11ft. in span.

When using light silk it should be put on to the framework with photopaste, and pulled up gently so that there are just no wrinkles. Many people ruin model covering by pulling up too taut and damaging the weave. Silk should then be damped very gently by water from a scent spray, or even by a damp sponge very carefully applied, and left to dry. The silk will then be quite wrinkle free. When absolutely dry, apply

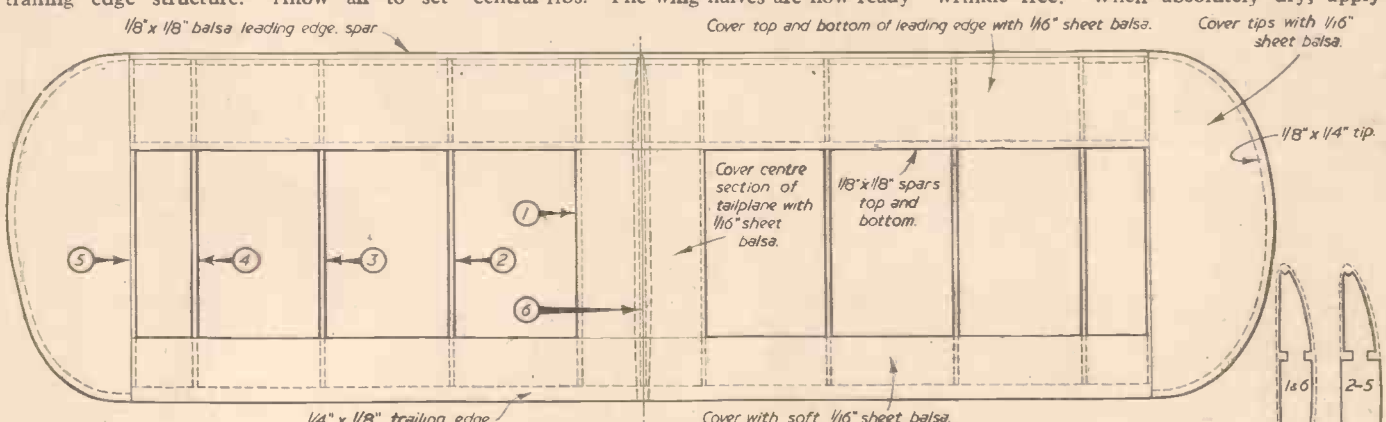


Fig. 14.—One-third scale plan of the tailplane.

and then cement in the top main spar and the balsa nose spar of 3/16in. × 3/16in. stock. Cement on the $\frac{1}{8}$in. balsa sheet wing tips, pinning and cementing around the edges "cracked" $\frac{1}{8}$in. × $\frac{1}{4}$in. balsa. When set, take the whole wing off the plan, withdraw all pins, split the two wing halves and sand everything smooth. Reset the two for covering. See Fig. 13.

The size and type of wood for the two central wing main spars has not been specified, as the author always uses $\frac{1}{4}$in. × $\frac{1}{8}$in. spruce for main spars. If spruce is not obtainable, use 3/16in. × 3/16in. hard balsa spars; the sheet covering makes a very strong box spar.

two coats of clear full-strength glider dope. The covering will sag at first, creating much alarm, but as the dope dries and tautens, the original water-shrunk surface will appear without a wrinkle.

With tissue paper, use the

stoutest available, sticking to the framework by photo-paste, not overstretching, but getting the paper up nicely even. Damp with water, allow to dry taut and wrinkle free, and then apply two coats of clear dope.

For a genuine flying model do not add too much unnecessary weight by many coloured finishes. The model shown has a white doped silk fuselage, and the butter-muslin covered wings and tail are left clear glider dope.

Nosepieces

There are two types suitable for this model. If it is likely that a variety of motors will be fitted during the model's life, the engines can be mounted on cast metal mounts, all of similar size and interchangeable. The motors can be cowled by a light glass fibre or balsa cowl. The average modeller will require a detachable engine nose made from wood as shown in Figs. 18 and 19.

Finally, Fig. 20 shows the model ready for transport, except that the detachable undercarriage has not been taken off. It is quite compact and easy to assemble in a few moments. It is ready to fly by merely attaching the various units to the fuselage by looping rubber bands on the appropriate hooks.

How to Fly and Trim the Model

If the wing and tail angles are constructed according to plan (Figs. 5 and 17), the sides of the fuselage being traced on to balsa sheet ensures the correct angles of attack of these components. It must be remembered that the "Longitudinal Vee" angle between wing and tail is one of the vital factors of good longitudinal stability, provided the centre of gravity, or point of balance position is correct. The builder should therefore trace and cut out the fuselage sides accurately.

One thing the builder has to do is to get the C.G., or balancing point in the right place, to suit the weight of whatever motor is fitted, by altering the length of the nose-

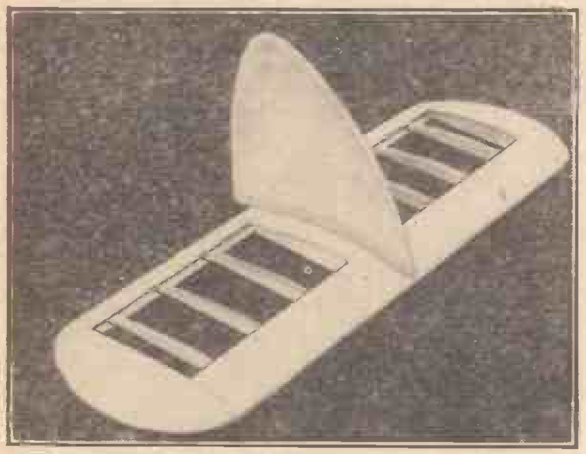


Fig. 15.—The laminated sheet fin fixed to the tailplane with a plastic wood fillet at its base.

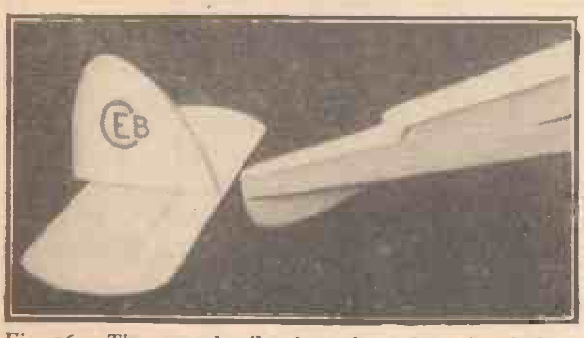


Fig. 16.—The covered tail unit ready to fix to its platform by means of rubber bands and wire hooks.

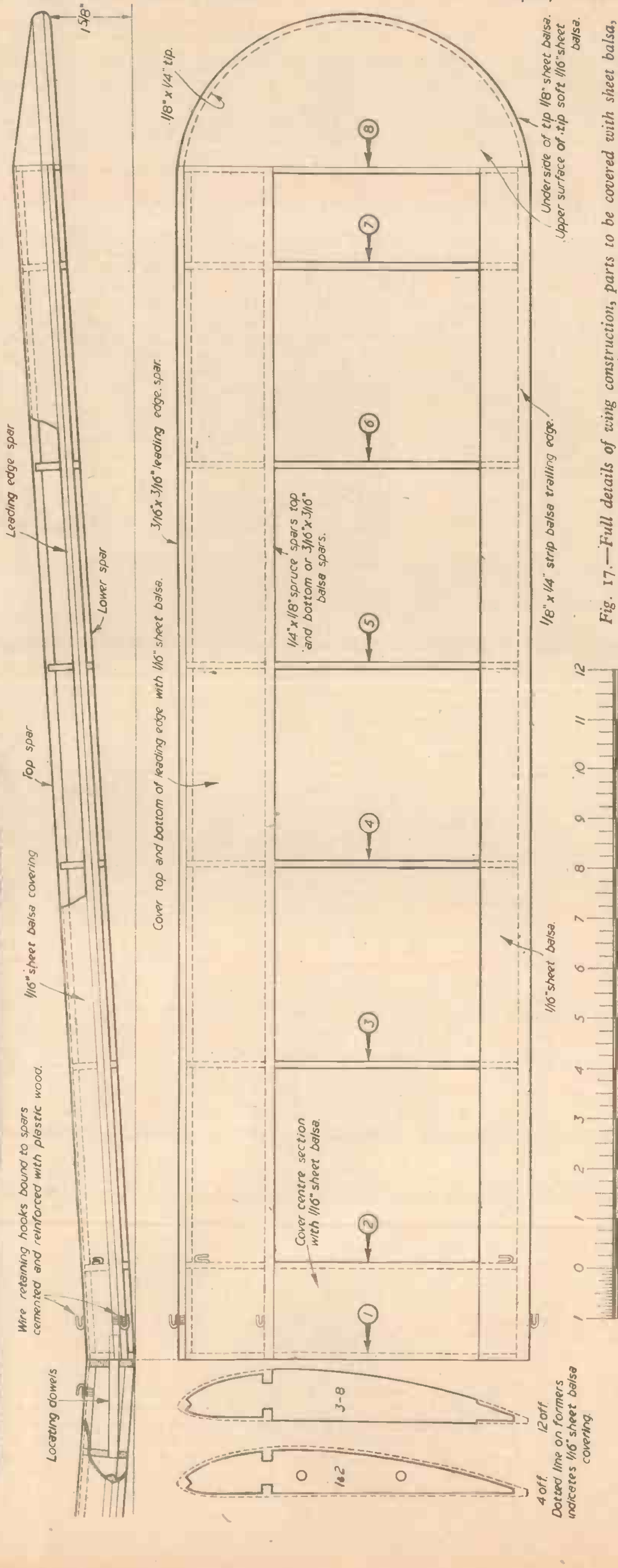


Fig. 17.—Full details of wing construction, parts to be covered with sheet balsa, dihedral, etc.

piece. (The details in Fig. 5 suit average 1-5 c.c. motors.)

Next make any small adjustments of the tail angle by packings described, and within the tolerances permitted, in order to obtain good glide. Now adjust the offset to engine thrustline to counteract torque effect of different powered engines used, so that a safe easy circling to the left under power-flight is obtained. Right turns against engine torque can be dangerous for the novice. Alter "downthrust" if found necessary, to compensate for the more powerful motors. It should be mentioned here that torque effect is varied, not only by greater power, but also by bad propellers with greater drag than is desirable. Too great a pitch will also create too great a turning effect, and should be avoided on free-flight models. A propeller of around 5in. pitch should always be fitted for free-flight sport flying. It should have thin blades of the greatest diameter that the motor will carry for good power, for this model. Propellers should, of course, be balanced, or excessive vibration upsets flight and wears out the engine.

The technique of good trim and reliable flying on a sports model, where great stability counts heavily, *is to trim the model first as a good glider, and then never materially alter this trim, but to control turn in the air under power, and climb, by offset and downthrust of the nosepiece.* This alteration to thrustline and downthrust is very easy to do on this model, with its detachable nose held on by rubber bands, by inserting suitable balsa packings, which when correct are cemented and silk covered in position.

Many individuals make the mistake of trimming a power model to fly under power by tail and rudder trim to control climb and turn. Thus when the engine stops they are surprised to see the model either dive or stall on the glide, because they have been fighting an incorrect engine thrustline by tail or fin trim. As the power dies the incorrect glide trim becomes apparent, resulting in a crashed model.

If the model has been trimmed in the first instance as a glider, it will obviously fall into a pleasant flat glide down to a safe landing. The model may over turn to left or right under power in too tight circles. This is very dangerous to stability and causes cartwheel crashes on models, due to excessive engine torque effect (the normal anti-clockwise turning model engine wants to turn the model to the left). This fault should be trimmed out by giving the nosepiece a little packing so that the motor looks slightly to the right from above looking from the tail forward. The offset shown on the plan (Fig. 5) will suit most average powered motors and propellers suggested. A few powered flights making these adjustments stage by stage, will get a gentle and safe repeatable circling flight to the left under power. Fly free-flight models with straight set fin, and turn under power with engine offset for stable sport flying. On radio models, give a little more offset to the motor to the right to get straight flying under power, and then turn by radio rudder.

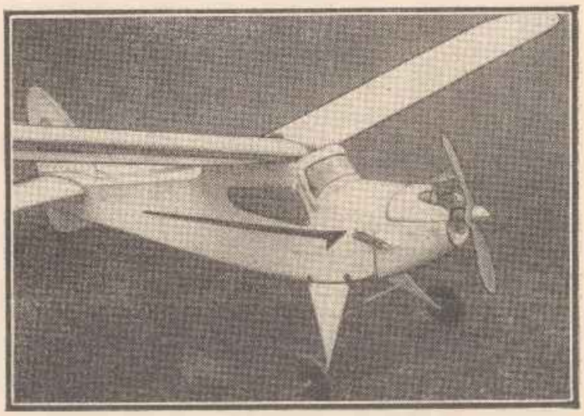


Fig. 19.—The engine mount with wooden balsa cowling in position.

Check that there are no warps on tail, fin or wings, and no twists on fuselage, and then get glide correct, after balancing the model on the finger in still air, so that it balances one half of the wing's chord back from the leading edge. The tail is what is termed a "lifting section" and therefore the point of balance of the model can be a little farther aft than the normal one-third back.

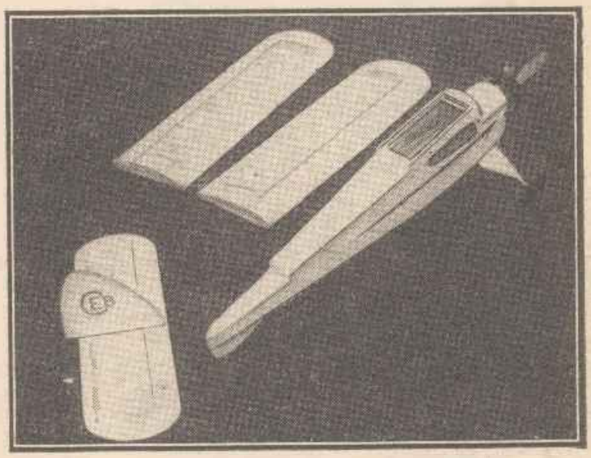


Fig. 20 (Right).—The model dismantled for transport.

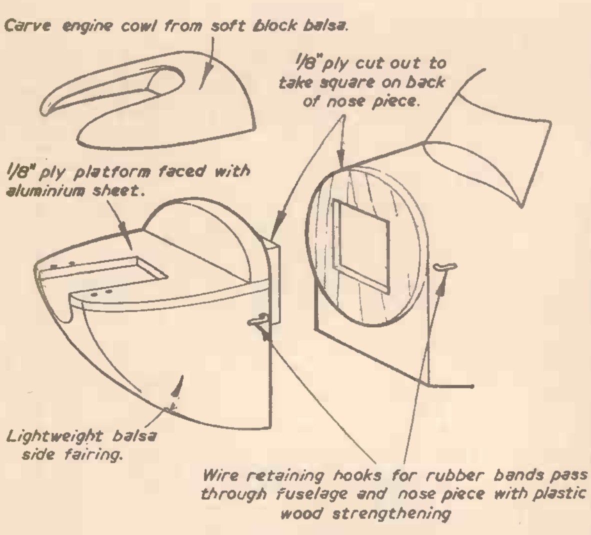


Fig. 18 (Left).—Details of the detachable nosepiece.

Getting the Glide Correct

Gliding a model requires a little practice and experience to throw it at the approximately correct speed to suit the wind speed. Therefore, choose a moderate and steady breeze, and throw fairly hard, like a dart, very slightly nose down, dead into wind with tail fin set straight fore and aft. Do this over long grass for the first few glides, until you have a nice flat glide which will land the model, without damage, on its wheels.

Assuming you have got the model correctly balanced with the point of balance as described above, halfway back from the wing's leading edge, and have made a longer nosepiece for the lighter motors by adding balsa ¼in. sheet packings at the rear of the nosepiece, to obtain any adjustment in this respect, you will only have to make a few slight alterations to the tail angle, and maybe none at all.

If the model rises too steeply on the glide to a stalling angle, put not more than 1/16in. balsa packing below the leading edge of the tailplane. If the model dives down too steeply on the glide, put not more than ⅛in. packing below the trailing edge of the tailplane. These maximum amounts of packing are specified because the designed longitudinal vee angle for stability will be upset if exceeded. If more is required, it will mean you have your central point of balance incorrect, or have not built the angles of wing and tail correctly from the plan.

All you can try here is to add an ounce or so of lead to the nose if the model tends to stall, or up to ½ oz. to the tail if the model is nose heavy. Before making these last resort adjustments, be sure that you are throwing the model correctly forward at approximately the correct speed to suit the wind.

Final Adjustments

These are a matter of very slight alterations to thrustline as you get to know the model, and perhaps the thinnest slivers of balsa packing below leading edge or trailing edge of the tailplane to check any slight tendencies to stalling or diving on the glide. These may be seen when the model has settled down to a long glide from a considerable height; not being obvious when glide trimming by hand throwing.

An aid to Composition

Construction of an Accurate Negative-sized Screen for Picture Composition with the Non-reflex Camera is Described by H. R. Hodgkinson

IN the composition of a picture, particularly a landscape, the owner of a reflex camera, whether of the single or the twin lens type, has a tremendous advantage over the user of an optical direct vision viewfinder. Even though in any camera of quality the image seen through the viewfinder corresponds approximately to the boundary of the picture taken (provided that the range is sufficient to make parallax error negligible), one does not actually see the whole of the image unless the eye is consciously and deliberately trained into each corner of the frame in turn. This in black and white is not a serious matter, since the old adage of get-it-on-the-film, compose-it-on-the-easel can be followed. In reversal colour work, on the other hand, the amount of correction that can be made by the introduction of black masking paper into the transparency frame is limited by the necessity of not reducing the size of the picture too much.

To solve this problem ultimately a right-angle viewer as shown in Fig. 1 was produced. This comprises a lens, mirror and ground-glass screen in a light metal case. The lens should be chosen to have the same focal length as that of the camera and the frame of the ground-glass screen made to the same size and shape as the negative produced by the camera. If no lens of the same focal length is available, then the dimensions of the screen frame should be increased or decreased in the same ratio as the focal length of the lens chosen is greater or less than the focal length of the camera lens.

Construction

The body of the author's 35mm. viewer is a baby talcum powder tin of square cross-section. The dimensions of these tins vary according to the brand between 1¾in. × 1¾in. and 2¼in. × 2¼in. If available, the smallest of these should be used. An old anastigmatic doublet of focal length 45mm. was selected; this fortuitously had an externally threaded mount and mating sleeve for focusing. In the absence of a screwed mount a push fit lens mount in a brass outer tube would suffice.

The top half of the powder tin is cut off and discarded and a hole cut in the centre of the bottom of the tin to accommodate the screwed sleeve, which is then soldered in place. The bottom of the tin thus forms the front of the viewer. The triangular sides are made by scribing lines at an angle of 45 deg. to the front of the viewer and cutting away the surplus metal. A piece of 1/32in. thick brass is cut to shape to form the sloping bottom and soldered in position. A hole of the dimensions of the 35mm. negative, 36mm. × 24mm., is next cut in what is now the top of the viewer Two small pieces of tinplate (from the discarded scrap) are bent to form angle brackets and soldered to the inner surfaces of the sides of the box in a suitable position to support the glass screen underneath the cut hole. Main details of construction can be seen in Fig. 2.

An old quarter-plate can be utilized for the glass screen. The surface should be ground with carborundum flour; do not use a coarse grade of abrasive in order to speed the grinding since this will result in a grainy surface which will reduce the clarity of the image.

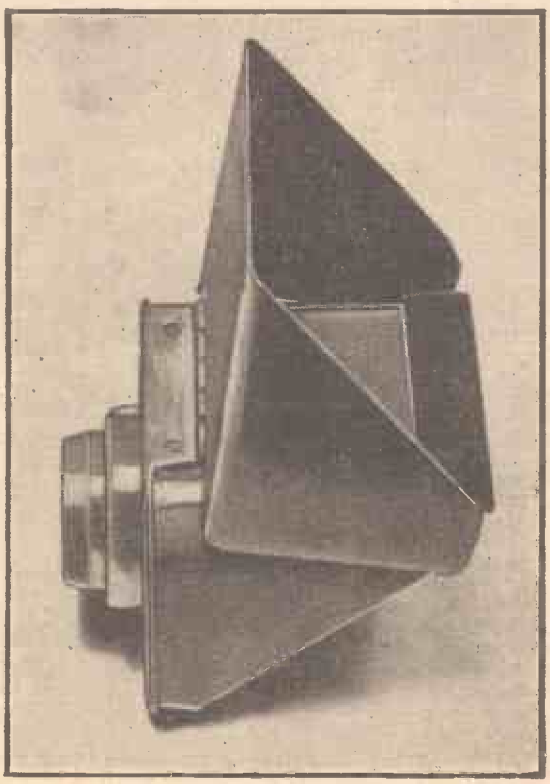


Fig. 1.—The completed viewer.

The Hood

To form the hood a piece of 1/32in. thick brass is cut out approximately 6in. × 2in. —at this stage only one of the long sides need be filled straight. Two right-angle bends are made on lines scribed at right angles to the straight side and positioned about 1/16in. farther apart than the overall width of the body. The result is a channel section which fits snugly over the viewer. One side of a 1¼in. long brass hinge is soldered to the inside of the channel and the other side of the hinge soldered to the strip of metal which remains on top of the viewer at the front end. With the hood in the closed position the remaining three sides are trimmed level to the outline of the body, the inside then being painted matt black.

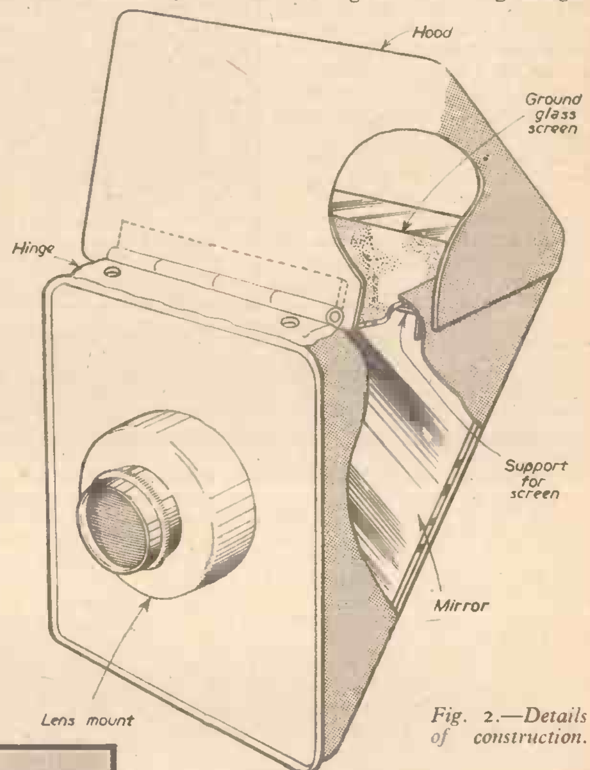


Fig. 2.—Details of construction.

The ground-glass screen and the mirror are slid into position, each with spots of cellulose cement to retain them and the gap between them at the back of the viewer sealed with a strip of adhesive linen tape.

Focusing the Lens

In the prototype the lens was focused on an object at more than 30ft. distance, and locked in position by the coat of paint. Irrespective of the colour adopted the inner sides of the hood and the frame around the screen should be painted with matt black.

The procedure recommended is to survey the scene through this device, to select a suitable composition, and then, having noted a prominent object at the centre of the composition, discard the viewer and aim the camera viewfinder at this prominent object. The completed article makes a useful little accessory for the landscape enthusiast.

A NEW TRANSPORT AIRCRAFT

A New Freight Transport for Strategic Military and Long Distance Civil Operation

An artist's impression of the Short Britannic in flight.

SHORT BROTHERS AND HARLAND LIMITED announce details of the Short Britannic Freighter (S.C.5), designed to fill the needs of strategic military and long distance civil freighting. It is based upon the use of the Britannia wing and systems (already in production at Belfast) with a specially-designed and entirely new fuselage of very large dimensions and having a rear-loading door.

The aircraft is powered by four Rolls-Royce Tyne turboprops.

The first prototype aircraft is due to fly in April, 1961, and it is hoped that production aircraft will become available towards the end of 1961 or early 1962.

The use of many Britannia parts in the S.C.5 means that it can be developed at much less cost than an entirely new aeroplane. It would also mean reduction in the cost of providing spares and maintenance bases along the routes over which it would operate alongside Britannias, and would shorten the training both of flight and ground crews.

The Britannic uses the standard Britannia wing and tailplane; an undercarriage almost identical with that of the Britannia, but installed in the fuselage instead of the wings; and many of the standard systems such as fuel, controls, electrics and the flight deck installation itself.

The Fuselage

The new fuselage is 17½ft. in diameter and has a rear loading door to enable freight to be loaded and unloaded rapidly. Military loads can also be parachuted—an essential feature of a military freighter. The fuselage floor itself is at "truck bed height" to facilitate loading and unloading. The volume and cross section of the fuselage of the new freighter are among the largest in the world, the clear hold dimensions being 12ft. × 12ft. × 80½ft.

The design all-up-weight is 195,000lb. A maximum payload of 75,000lb. can be carried at a mean speed of 360 m.p.h. over a still air range of 1,400 miles. With full fuel tanks, 30,000lb. of payload can be carried over 5,500 miles.

The aircraft is capable of delivering a 33,000lb. payload to a 1,000 yard strip advance base 860 miles from main base and to return either empty or with a payload of 30,000lb.

Design Features

The Britannic is a high-wing, four-engined monoplane having a large fuselage which carries the cruciform tail unit by what is commonly known as the "beaver-tail" layout in which there is a large, sloping ramp door. The aircraft is fully pressurised to maintain a cabin altitude of 8,000ft. at all altitudes up to 30,000ft. The rear door can, however, be opened in flight for parachuting of large loads.

The crew compartment seats a maximum of five. The captain and second pilot have full dual controls and both can reach all normal and emergency controls. The navigator is positioned on the port side, a flight engineer to starboard behind the second pilot, while the radio operator, whose station is to starboard, faces aft.

Behind the flight deck is a permanent galley and lavatory section and a staircase leading to an upper deck. In the troop transport role a detachable second floor can quickly be fitted to the forward end of the fuselage hold allowing a total of about 200 troops to be carried in comfort. Normally, 140 troops can be carried on the main floor without fitting the second floor.

The aircraft hold has a flat, level floor with a 2ft. high skirting on each side. The top of this skirting provides a walkway giving access to the hold when loaded. The cross section of the freight hold is 12ft. × 12ft. In addition to the freight floor of the hold itself which is 60ft. long, there is a further 20ft. length of sloping floor, 12ft. wide, which forms the loading ramp and can be used for loading and carrying freight. Head room on the centre line at the extreme aft end of this floor is 10ft. 6in.

Loading Doors

The ramp loading door is controlled by hydraulic rams. Vehicles can be driven up the ramp, or the ramp can be lowered part way so as to rest on the bed of a lorry and provide an approach for loading.

To facilitate the loading of smaller freight, a side door 7½ft. × 8½ft. is provided in the fuselage at the forward end of the hold.

A grid of standard lashing points extends over the interior floor and up the side of the wall to a height of 4ft. The permissible load alternates between 5,000lb. and 10,000lb. on the floor and is 2,000lb. on the walls. Further points of 25,000lb. and 35,000lb. are provided for special cases.

Heavy military equipment dropped by parachute is lashed on a strong platform fitted with air packs on the underside. These inflate automatically during descent and break the fall of the platform. The parachutes are stowed on top of the load. The Britannic can carry four such platforms each 16ft. long, or two 24ft. platforms of the type now under development.

Additional side doors can be opened to allow parachute troops to jump from the aircraft.

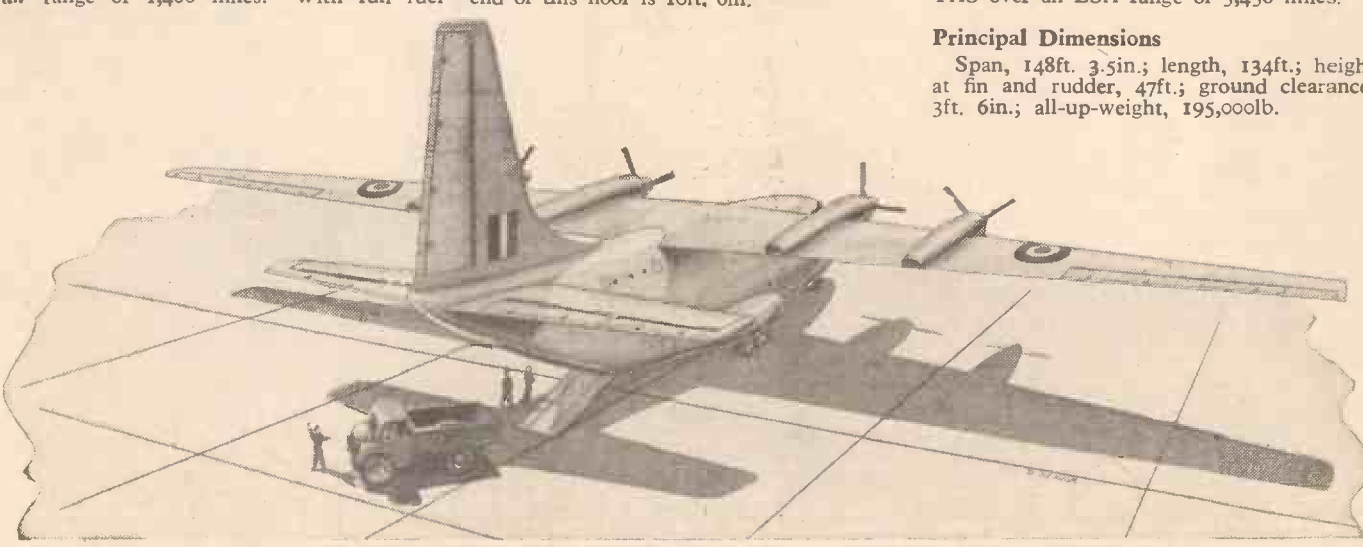
The S.C.5 would be capable of carrying the following typical loads: two 1-ton trucks (laden), two 25-pounder guns, one scout car (laden), 41,000lb.; or four 1-ton trucks (laden), 40,000lb.; three 3-ton trucks (laden), 52,800lb.; or two scout cars (laden), two ¼-ton utilities (laden), two ½-ton trailers (laden), 32,036lb.

In addition, the Britannic is capable of carrying large special vehicles such as: a 30-ton heavy artillery tractor, a 10-ton Albion crane, a 10-ton Leyland re-fueller, or large radar trailers used with GW installations.

As a passenger transport, the Britannic can carry the capacity payload of 197 passengers at 356 m.p.h. TAS over an ESA range of 2,600 miles for a direct operating cost of 0.77d./seat/SM. With capacity fuel 90 passengers can be carried at 356 m.p.h. TAS over an ESA range of 5,450 miles.

Principal Dimensions

Span, 148ft. 3.5in.; length, 134ft.; height at fin and rudder, 47ft.; ground clearance, 3ft. 6in.; all-up-weight, 195,000lb.



An artist's impression of the Short Britannic taking on board a load of freight through its rear loading door.

Building a Single-

By F. HOOK

Fig. 1.—The 11ft. single-seater kayak.

THE design of this 11ft. single-seater kayak exploits the use of thin resin bonded plywood in order to make a strong but light craft with a minimum of constructional work (Fig. 1).

Canvas covered canoes necessitate the use of many frames. In the following design only three frames are used. The frames at the bow and stern are made solid so that they form water-tight compartments fore and aft to give buoyancy in the case of a capsize. The middle frame is not a complete frame (except during construction) and its main use is to form the foundation for the butt joints of the pieces of plywood forming the skin.

Using 4 mm. thickness plywood, the weight of the completed canoe is about 44lb. so that little effort is required to stow the boat on the roof rack of a car or to launch it easily in the water. If one is prepared to sacrifice a little strength in order to save some weight, the skin could be made from 3 mm. plywood.

Because of the likelihood of the kayak being used by young persons, the design incorporates the hard chine form of construction with a beam of 28in. in order to give good stability. The cockpit is roomy so that, if required, two persons could be carried (Fig. 2). The open nature of the cockpit is also an advantage in the case of an upset, when the crew would be thrown clear. The constructor could quite easily modify the finish of the cockpit to his own personal taste without involving any radical change in the main construction. A smaller oval cockpit could be fitted with a waterproof cover in true kayak style, but such arrangements are not for the younger canoeist who might be trapped in the case of an accident.

MATERIALS REQUIRED

- 2 sheets of resin-bonded plywood 8ft. × 4 mm.
- 4 pieces 12ft. × ¼in. × ¾in.
- 2 pieces 12ft. × 1¾in. × ¾in.
- 1 piece 3ft. × ¾in. × 6in.
- 10 pieces ⅝in. half-round moulding 6ft. long.
- For the cockpit—2 deck beams 2ft. 6in. long × ¾in. × 6in. 2 side members 4ft. long × 1¾in. × ¾in.
- Strengthening pieces for the two small frames 1½in. × ½in.
- For the coaming (if required) 8ft. length × ⅜in. × 6in.
- ½lb. flat-headed brass escutcheon pins.
- 1 packet ¼in. × No. 2 brass C.S. screws.
- Aerolite glue (3s. 6d. pack).
- Paint.
- Seelastic and plastic wood.

Fig. 2.—The kayak can take a passenger.

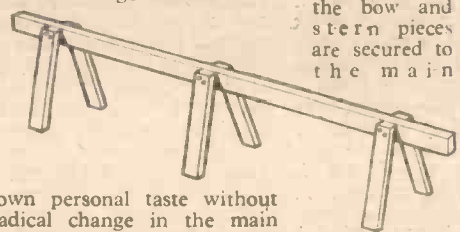


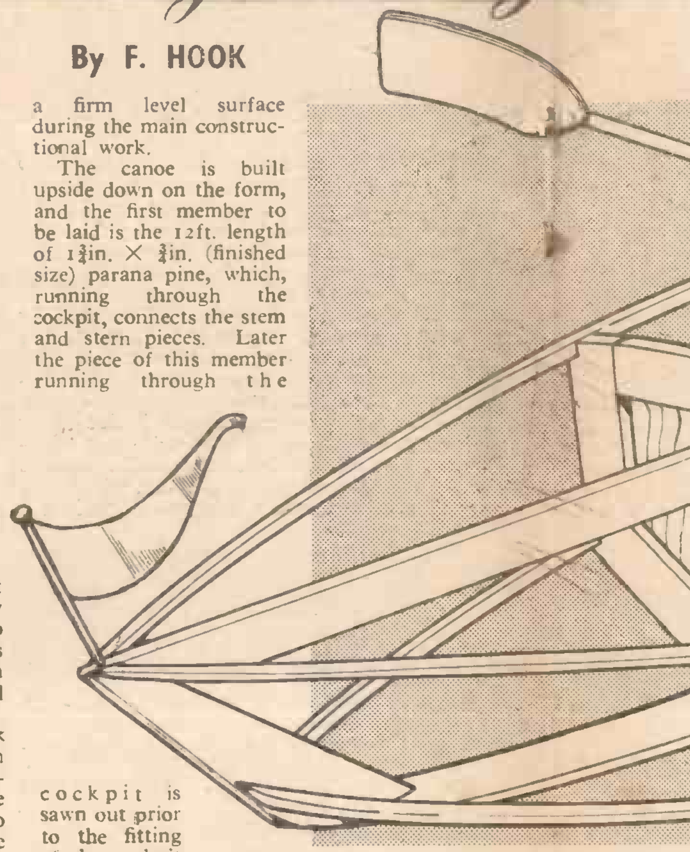
Fig. 4.—Alternative arrangement for supporting the building form.

Construction

Main details of construction and general layout can be seen in Fig. 3.

The kayak is constructed upon a simple form made from a 12ft. length of 4in. × 2in. deal—planed or sawn. This form can be supported in several ways at a convenient height above ground level for working upon the boat. In the case of this kayak, as shown in Fig. 5, two sawing benches were used as the supports. An alternative way would be to convert the piece of 4in. × 2in. into a kind of long saw bench as shown in Fig. 4 with six pieces of 3in. × 2in. screwed on to form the legs. Ensure that the building form stands upon a firm level surface during the main constructional work.

The canoe is built upside down on the form, and the first member to be laid is the 12ft. length of 1¾in. × ¾in. (finished size) parana pine, which, running through the cockpit, connects the stem and stern pieces. Later the piece of this member running through the cockpit is sawn out prior to the fitting of the cockpit frame. Until the bow and stern pieces are secured to the main



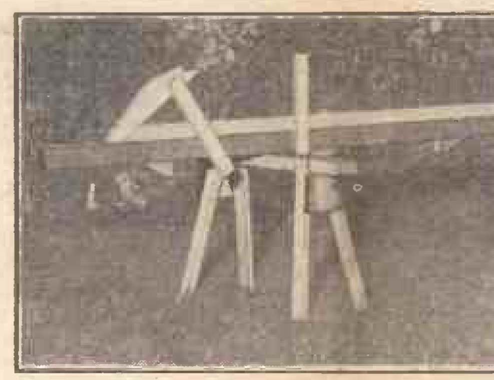


Fig. 5.—The building form is s

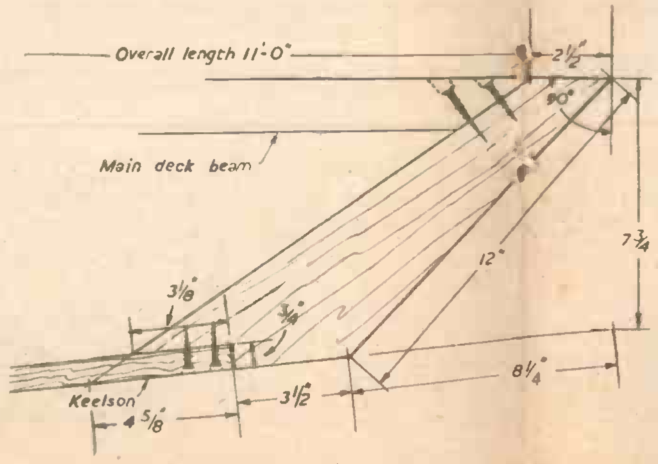


Fig. 6.—Dimensions of stem and stern posts.

Seater Kayak

Designed in Resin-Bonded Plywood with the Minimum of Constructional Work

No. 1 of a New Series

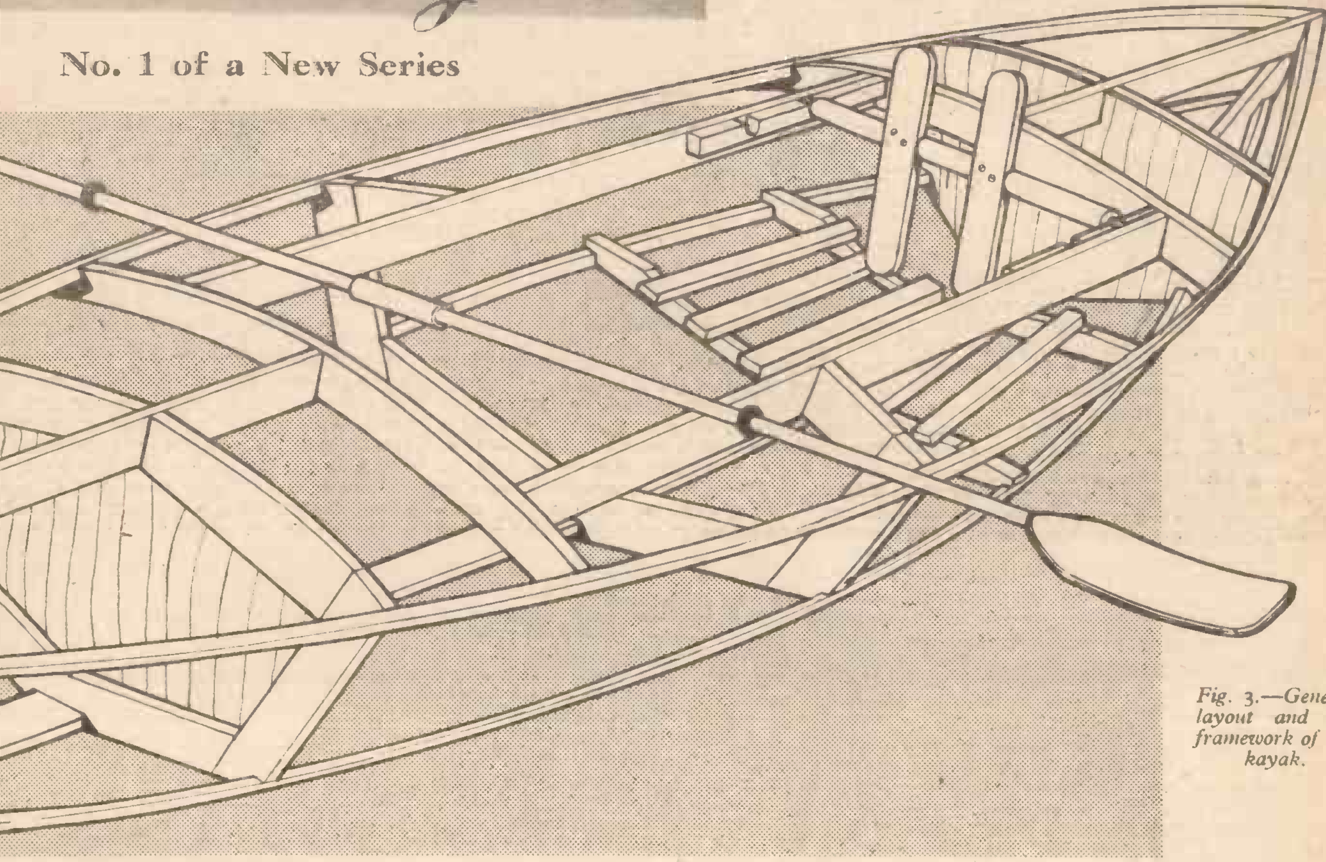


Fig. 3.—General layout and the framework of the kayak.

upported on two trestles.

member, the latter piece may be held temporarily to the form with one or two G cramps.

Parana pine is quoted as the timber to be used for the construction of the kayak as it is readily obtainable from local merchants and it is a timber of straight grain with a freedom from knots. Spruce would be the ideal wood and should be used if obtainable.

The Stem and Stern Pieces

The stem and stern pieces are identical and are sawn from a piece of ¾in. × 6in. parana pine. Make a full-size paper template to the dimensions given in Fig. 6 which also shows the points for fixing the keelson and the main deck beam. From this template a bevel can be set to mark off the angle to which the two ends of the deck beam must be cut to butt against the stem or stern pieces. Bear in mind that the overall length from stem to stern is 11ft. when trimming off the deck beam to correct length.

The deck beam is glued and screwed to the stem and stern as illustrated. Use Aerolite No. 309 Waterproof Glue (or any other similar type glue) and brass screws. Ensure that these pieces are fixed squarely in place. Whilst screwing the pieces together it is helpful if the joint is temporarily secured in place with two odd pieces of plywood tacked on over the joint on either side. Let the tacking be quite light so that the brass screws will pull home the butt joint without undue effort. Remove the tacking pieces as soon as the joint is screwed and then wipe off all surplus glue.

The Deck Beam

Now the deck beam with the stem and stern attached may be placed back on the building form. The assembly is placed off centre of the 4in. × 2in. but so that one side of it is flush with the side of the deck beam. Temporary struts are screwed to the deck beam, stem and stern and building form as shown in Fig. 7.

(*To be continued*)

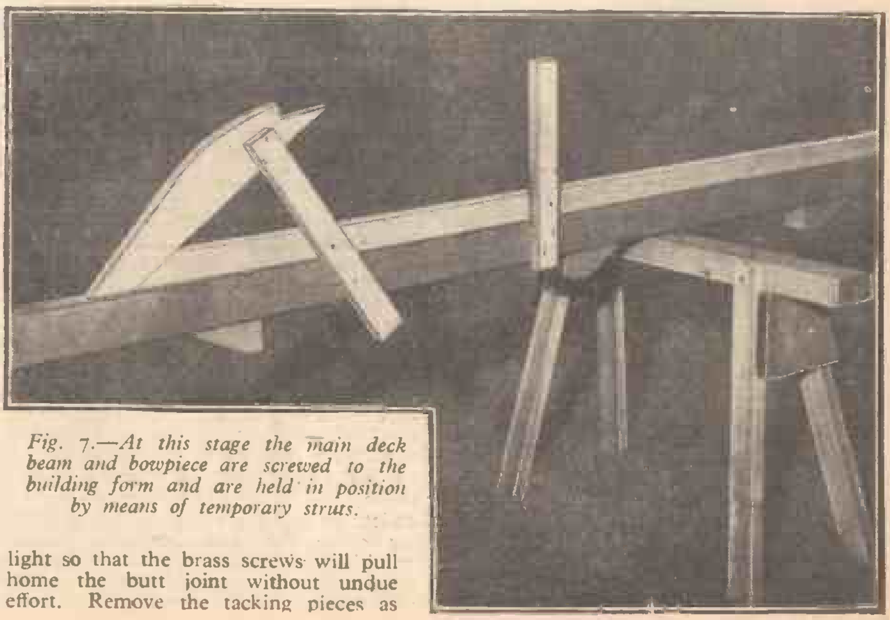
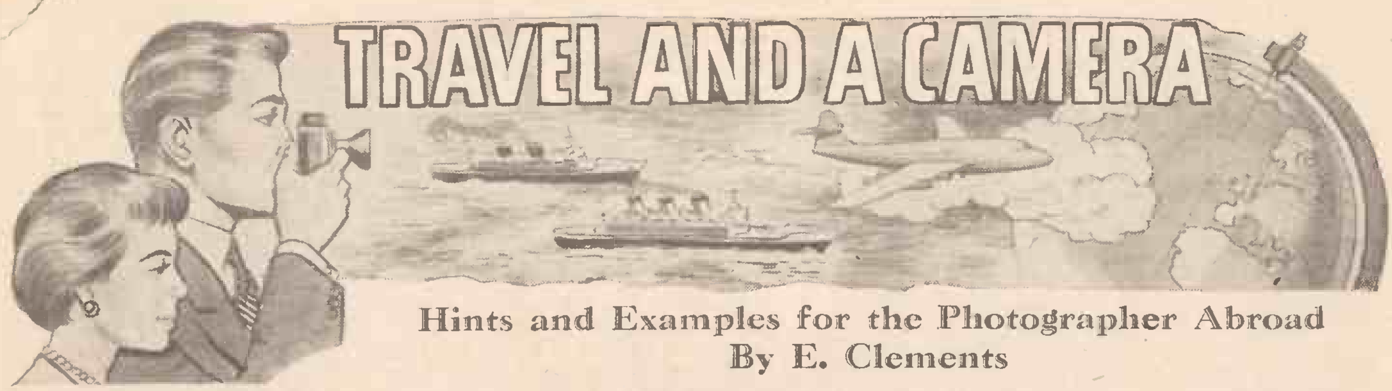


Fig. 7.—At this stage the main deck beam and bowpiece are screwed to the building form and are held in position by means of temporary struts.

TRAVEL AND A CAMERA



Hints and Examples for the Photographer Abroad

By E. Clements

THE very keen photographer can, if he does not plan in advance, wear himself out by his exertions in attempting to make the most of the trip. Much extra work can be occasioned by having to visit any given place more than once to obtain the most suitable lighting. In this connection it is very useful when about to visit a city such as Paris or Rome to obtain a large-scale map beforehand; then by discussion with people who have already been there—travel agents are often very familiar with foreign cities—find out the position of the sun at any given time in respect of the various places to be seen. An itinerary can then be arranged to coincide with the best conditions for colour photography. By marking this information on the map one can eliminate to a great extent the necessity for second visits and so make greater use of one's time.

Equipment for photography abroad should be of the simplest; the less one is encumbered with accessories the better and a small, handy camera such as the 16 on Super Ikonta, with which most of the photographs shown opposite were made, is ideal. If used for colour, one obtains a larger picture (much more acceptable for reproduction purposes) at about the same cost as 35 mm. and if used for monochrome a happy medium between the 120 size and 35 mm. The camera can be carried all day in the hand without inconvenience and can be ever ready for the "grab shot" which so often typifies a national situation or character.

Judging by the queries in photography magazines at holiday time many amateurs seem uncertain about exposures and filters to be used in southern countries such as Spain and Italy. There is, however, little cause for concern. In fact, I would go so far as to say that an exposure meter is unnecessary in these countries during the summer. With a basic exposure of 1/300 at f11 with FP3 one can vary this by about two stops either way for subjects of unusually dark or light characteristics. For colour one has only to refer to the exposure guide in every carton and provided the shutter is accurate a 90 per cent. success should be obtained. The greatest cause of failure in colour photography is undoubtedly connected with trying to record too high a contrast, and whilst high contrast subjects are often just acceptable they are seldom really successful. By sticking to safety first methods, that is frontal or only slightly side lighting, disappointment with results which one may never have the opportunity of repeating will be avoided. Batteries of filters are also unnecessary; a medium speed pan film will render any given scene with almost 100 per cent. visual accuracy. The only filter carried for monochrome is a fairly heavy contrast one (X4 of any colour), which is useful when it is required to picture something dramatic. For colour a faintly pink UV can be kept on the camera at all times.

Film Supplies

Supplies of film vary from country to country; they are adequate in most but if one has a real bias towards one type it is as well to take a supply along. This is essential in Spain where supplies are erratic and not always available, at least in my experience. Kodachrome is more expensive in some countries, notably in Belgium, and Agfacolor, even in Germany, is only a little cheaper so if it is necessary to conserve currency then take your film with you. Below is given a list of the main holiday countries and details of the cameras and films allowed to be imported.

Processing films on return is always exciting and the first should be thoroughly inspected before proceeding to the next. For southern climates a developer such as Promicrol or Microphen is most useful as they give full shadow detail without clogging of highlights. If, however, the first film is rather dense, the subsequent ones, which will no doubt have received the same general level of exposure, could be developed in a soft working developer where some loss of film speed can be expected. On the other hand, if under-exposure is indicated, which is unlikely, one can turn to Ergol.

Cameras and Films Allowed

France.—Two different sized cameras per person with 20 rolls of film.

Germany.—Ordinary and ciné cameras admitted duty free with a reasonable supply of plates or films.

Holland.—One camera with up to six rolls of film admitted duty free. One ciné camera with three 16mm. films duty free.

Italy.—One ordinary or one cine camera per person free of duty together with a small number of films.

Spain.—In practice tourists' cameras are admitted duty free, but in certain cases a deposit must be paid which is refunded upon leaving.

Switzerland.—Two cameras and one ciné camera per person with five rolls of film for each still and two for the cine.

Norway, Sweden, Denmark, Austria.—Cameras and films for personal use admitted temporarily free of duty.

An Improved Jig Saw

(*Concluded from page 306*)

temporarily. Now mark where the saw blade will require to pass through the table, remove the top, and from the mark cut a ½in. slot 4in. long at right angles 2in. each side of the mark. Replace the table top, reclamp, and check that the saw blade clears the slot in all positions, i.e., with the table both heightened and tilted and with the blade fixed for side cutting. If satisfactory, mark the underside through the holes in the angle metal, remove, drill and countersink, replace, and bolt down.

The rise-and-fall motion offers two positions only as it is thought this will be sufficient; more, at shorter distances, can easily be introduced if thought desirable. Four short lengths of metal chain are fastened to the horizontal main-frame members, their other ends carrying 1in. split pins: these can clearly be seen in Figs. 11 and 12. Holes are drilled in the sides of the angle posts of the skeleton framework to take these pins. With the main frame in position inside the skeleton, the former is raised 1½in. by the temporary insertion of wood blocks, and holes in the wooden side members are bored to correspond with those in the metal side posts. The split pins are then inserted, the temporary blocks removed, and the table perforce remains 1½in. higher than when in its normal position. The holes in the metal posts to take these split pins are best drilled before fixing the frame to the baseboard.

Push the tensioning device forward about 1in. by turning the shutter bolt clockwise, and the machine is now ready for use.

Using the Machine

Apart from ordinary curved and shaped fretwork which can be carried out on this machine, it can be used for other purposes where precision and neatness are demanded. Perfect circles can be cut by pivoting the work to the table with a screw and turning it with a circular motion. This process should not be hurried; forcing the work round too quickly may cause the saw blade to wander. Repetition pieces of specific width in curved or straight work can be cut speedily and accurately by temporarily fixing a thin dowel pin or straight guide at the required distance from the saw and running the pieces between.

For all inside work it is necessary first to bore a hole to admit the saw blade; the tensioning device is first slackened; the saw removed from the head chuck, threaded through the hole in the work, and refitted in the chuck; and the belt retightened. Curves meeting in acute angles should be cut along both lines towards the angle; do not attempt to turn the work while the saw is in the acute angle. The work will either be spoiled or the saw broken—or both!

Never force work forward at too great a speed. It is easy to "feel" the correct cutting speed (which, of course, varies with the thickness and hardness of the wood being cut) and an even forward pressure should be maintained. Do not attempt to "back" the saw through a cut already made; turn the work so as to cut a small clearance on the waste side and withdraw the saw forward along the cut.

Keep all moving parts well oiled; do not overstretch the belt, i.e., be sparing with the tensioning device; and be sure to slacken the belt when not in use.

(Above) *Monastery of Montserrat, Spain. Super Ikonta camera, 1/100 f11, Panatomic X, Microphen developer.*

(Below) Young and old in Rome. Retinette camera, 1/200 f8, Panatomic X, Microphen developer.

(Above) The Aquaduct, Segovia. 1/300 f8, Panatomic X, Super Ikonta camera, Promicrol developer.

(Left) A corner in Venice. 1/200 f11, Panatomic X, Plaubel Makina camera, Microphen developer.

(Right) Gipsies of Sacro Monte, Spain. 1/200 f16, FP3 film, Promicrol developer. Plaubel Makina camera.

(Right) The trip across. 1/200 f16, FP3 film, Leica camera, Microphen developer.

(Above, left) Evening over the Seine. 1/50 f8, FP3 film, Plaubel Makina camera.

A MOON BUILDING

Designs are Already Being Developed for the First Lunar Explorers

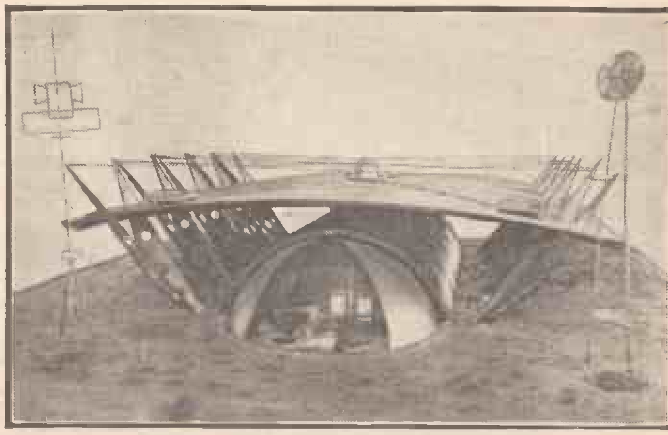


Fig. 1.—Scale model of the moon building.

PLANS were made public recently in America for a permanent "moon building" to house living quarters for moon explorers, laboratories for scientific research, maintenance shops for space vehicles and stations for earth-moon communications.

Fig. 1 shows a detailed 5ft. by 6ft. scale model of the structure, a cigar-shaped corrugated metal cylinder covered by a protective metal meteoric shield. It was designed and engineered by the Wonder Building Corporation of America.

Because of the present lack of knowledge and great divergence of opinion concerning the moon's surface, the moon building has been designed for the worst conditions anticipated—a sea of dust upon which the building would float, anchored by heavy weights suspended by cables from the body of the structure. If the moon's surface proves to be sufficiently solid, it could then provide normal support for the building.

In actual size, the moon building would be 340ft. long, 160ft. wide and 65ft. high. Including air lock and plastic observation bubble, it would measure 520ft. in length. The building would be fabricated of metal alloys which combine high strength and low weight with ease of fabrication.

Above and separated from the roof of the building is a slightly curved umbrella-shaped protective meteoric shield, designed to ward off the gnat-like rain of interplanetary meteoric dust which descends with great velocity on the barren surface of the moon. The shield would be 460ft. long, 380ft. wide and 83ft. high.

The entire shell of the building, and the protective barrier, would be fabricated from pre-engineered metal sheets secured by simple nut and bolt fasteners and welded structural connections. A unique "Truss-skin" design provides completely usable interiors, without internal supports of any kind.

With space at a premium inside the moon building, the trussless concept would eliminate space wasted by ordinary structural supports, while the pre-engineered design would permit quick erection with minimum labour and tools.

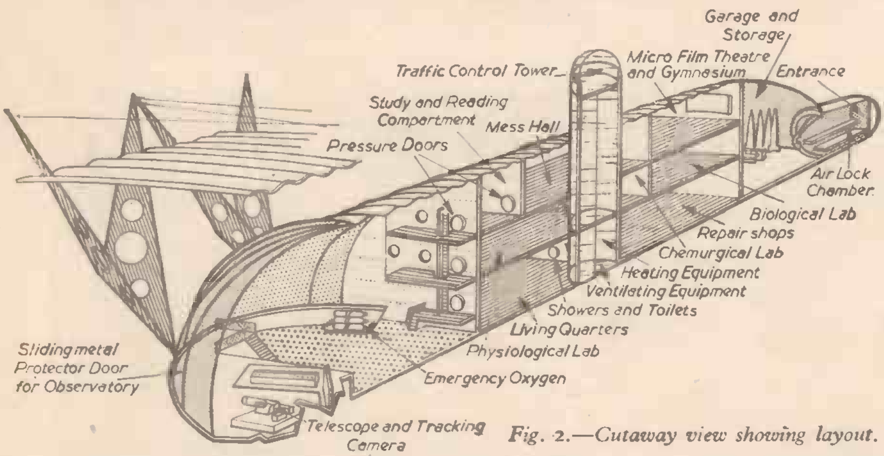


Fig. 2.—Cutaway view showing layout.

Inside the moon building are living quarters, including rooms for sleeping, cooking, eating and recreation; physics, chemistry and biological laboratories; a control tower for communication, meteorological studies, earth observations, astronomical observations, and traffic control, etc.

Also included are air conditioning, heating, power and refrigeration plants, oxygen producing units, extreme-temperature regulating devices, water supply and sewage processing plants, as well as machine shop and equipment maintenance areas. See Fig. 2.

Entrance to the moon building is made through an air-lock at one end, adjacent to which would be constructed a rocket landing area. Complete internal pressurisation of the hermetically-sealed building provides an air pressure of at least 10lb. per sq. in., close to earth's normal atmospheric pressure of 14.7lb., the same as pressure used in high altitude airliners.

Special refrigerating and heating plants cope with the extreme temperatures and tremendous temperature gradients which abound on the moon. Day and night on the moon are about two weeks long, with temperatures at lunar midday reaching 214 deg. F.; at sunset 32 deg. F., and at midnight −243 deg. F.

There are no windows in the moon building since ultraviolet radiation, normally absorbed by the earth's atmosphere, would be sufficiently intense to render panes of glass or plastic useless through discoloration. Metal shutters protect the plastic observation bubbles.

It has been estimated that man could establish a building on the moon in ten years' time.

New Magnets

MADE from precipitation-hardened ferromagnetic alloys (Magloy), these new magnets have many applications in the radar, television, electronics, communications and aircraft industries. Magloy materials enable precision cast magnets even of small sizes to be produced to close tolerances. They possess excellent magnetic resistance to shock and vibration at any frequency and are stable to within ± 0.02 per cent. per deg. C. temperature rise up to 500 deg. C. Their resistance to external magnetic fields is such that their gap field strength will remain constant in use even after the influx of such external fields. Jackets are provided against damage and for mounting. Further details are available from Press Relations Division, Roles and Parker Ltd., 22, Red Lion Street, London, W.C.1.

Standard Yard and Pound

STANDARDS laboratories in Canada, New Zealand, U.S.A., Great Britain, South Africa and Australia have agreed to adopt an international yard and an international pound (avoirdupois) having the following definitions:

International yard, 0.9144 metre.

International pound, 0.45359237 kilogramme.

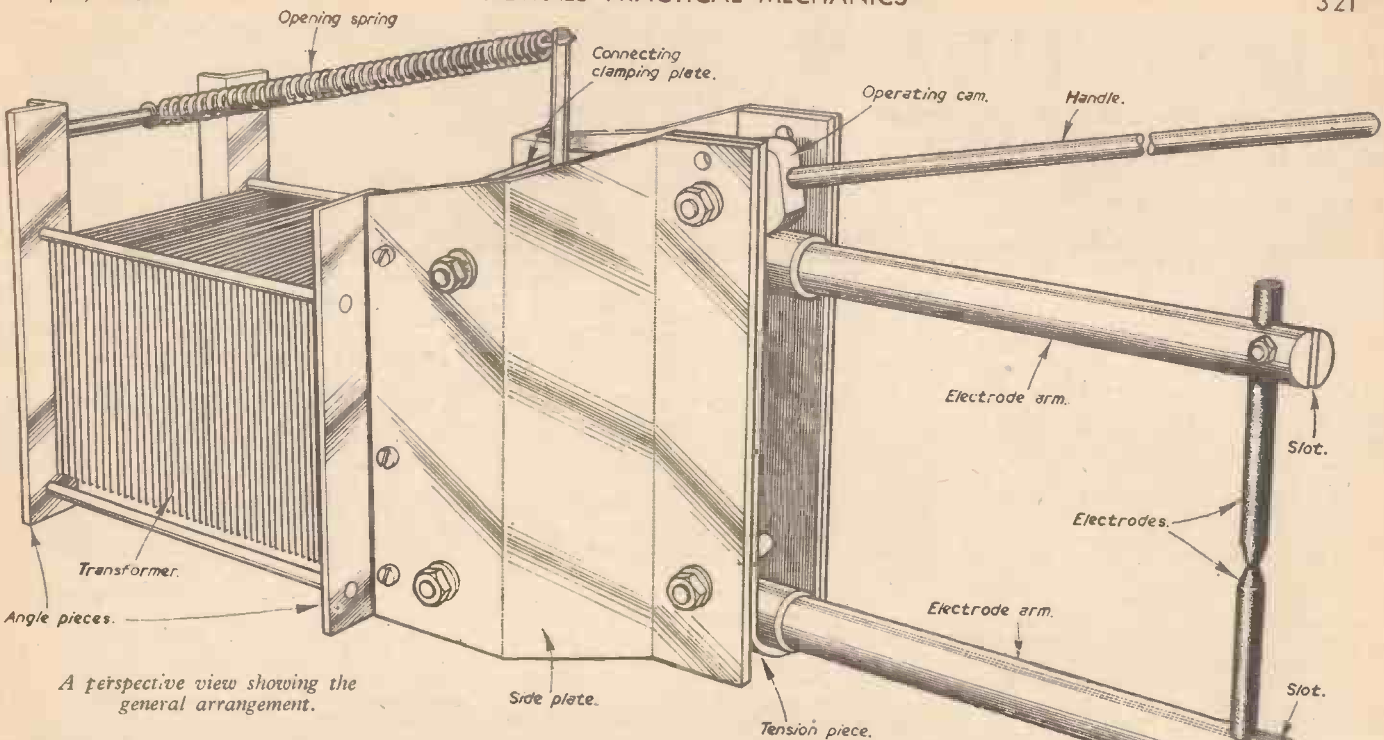
After July 1st, 1959, calculations for science and technology will be made in terms of the international units defined above. They will not, however, be used for trade purposes, for which the imperial units laid down in the Weights and Measures Act, 1878, will be used.

Train Performance Calculator

GIVEN data of locomotive characteristics, train resistance and gradients, a new train performance calculator can in two minutes provide figures which would take half an hour by normal methods. The calculator, which is of a type developed by Manchester College of Science and Technology affords facilities for the whole range of investigations involved in traction projects and has predicted speeds within 1 m.p.h. of the actual figure when plotting performance curves before the trial runs of a diesel-electric locomotive. The calculator has been developed by G.E.C.

Molybdenum Casting

MOLYBDENUM melts at 4,748 deg. F. and because the crucible melted before the molybdenum, it has hitherto been impossible to make castings from it. American metallurgists solved the problem by use of a high-density electric arc under remote control conditions in an inert atmosphere. In a copper-lined water cooled crucible 30lb. of molybdenum were melted, which were then poured into a rotating graphite cylinder via a series of troughs. This forced the metal into the walls of the rotating mould where it set. The first molybdenum casting is a hollow cylinder 4½in. wide and 8in. long.



A perspective view showing the general arrangement.

Making A Spot Welder

Transformer Details Appeared Last Month

Having Made the Transformer You Can Now Complete the Apparatus by Following the Instructions Below

The Welding Mechanism

THE design of the mechanical parts of the spot welder has been simplified as much as possible, the general arrangement being clear from a study of the perspective view above and Fig. 9. The main frame consists of two 3/16in. mild steel plates E as detailed in Fig. 10. Reference to the plan in Fig. 9 will show that these plates are to be bent after drilling. This will slightly reduce the horizontal distance between some of the holes, but this is of no consequence. The tension piece D may next be made, as in Fig. 11, one piece being required. It is important that the holes P, Q and R in this piece line up with the corresponding holes in the plates E (Fig. 10). The holes in the tension piece D should certainly be drilled after this piece has been bent. In fact, it is perhaps an advantage to drill them whilst clamped between the pieces E after the latter have been screwed to the angle pieces B and B_1 by means of the ¼in. screws M shown in Fig. 9.

The Operating Cam

This, lettered C, may be made to the dimensions given in Fig. 12. It is of mild steel 1in. thick, and it is most important that the cam be made perfectly smooth. The ⅞in. deep hole is to be drilled a tight fit for the ⅝in. dia. handle, but the other hole is to be ⅝in. clearance. A mild steel spacing tube 1 13/32in. long, having an inside diameter of ½in. and an outside diameter of ⅝in. is to be slipped through the hole in the cam, with ⅝in. washers P (Fig. 9) used to hold the cam central in the tension piece D. The tension piece D and the side plates E are then clamped together with the ½in. bolt Q, which is 3in. long. The ½in. bolt R may be fitted later. The ⅝in. dia. mild steel handle N may be about 24in. long.

Electrode Arms

Fig. 13 shows suitable dimensions for the two 1¼in. dia. electrode arms J of hard copper. The ⅝in. dia. holes are for the electrodes. It will be noted that the ends of the electrode arms are slotted, so that the electrodes can be clamped by means of the ¼in. bolts, washers and nuts indicated at T in Fig. 9. The wide slot at one end of the ¼in. dia. clearance hole should be made exactly equal to the distance across the flats of the head of the ¼in. clamping bolt, so that the nut can readily be tightened by means of a spanner.

Bottom Electrode Support

Fig. 14 shows the dimensions of the

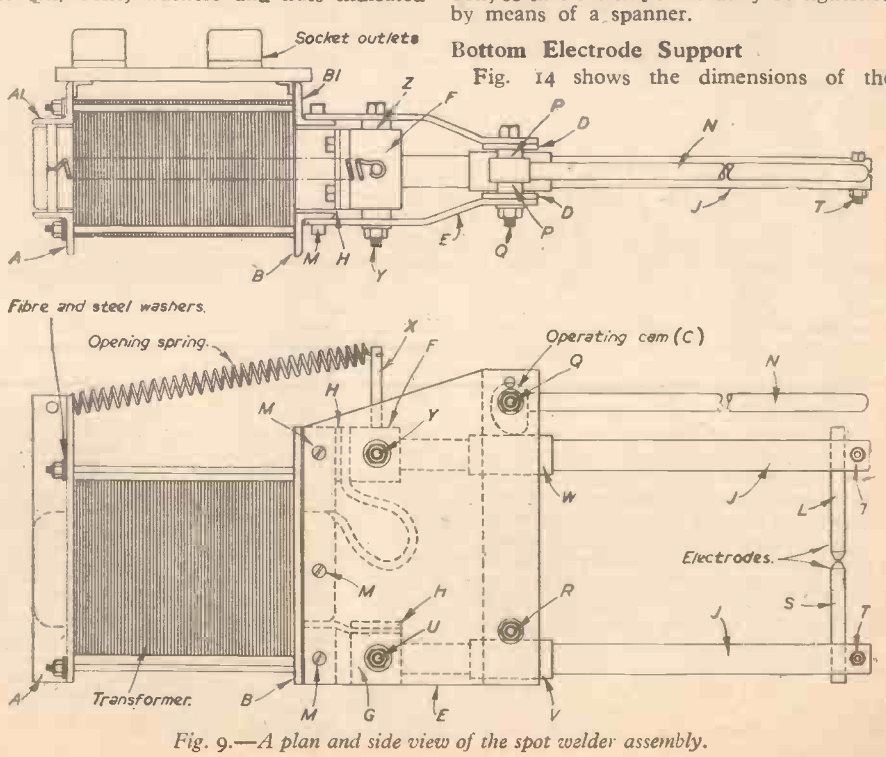


Fig. 9.—A plan and side view of the spot welder assembly.

bottom electrode support, shown at G in Fig. 9. The best materials for this part are brass or copper, although aluminium may serve as a less suitable substitute. An important point is that the 1¼in. dia. hole must be a tight fit for the copper electrode arm. The ⅜in. dia. hole may be drilled after the bottom electrode arm has been pressed into the 1¼in. hole, thus serving to

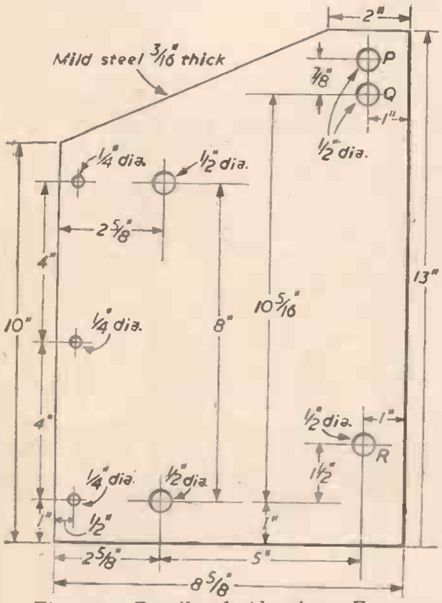


Fig. 10.—Details of side plates E.

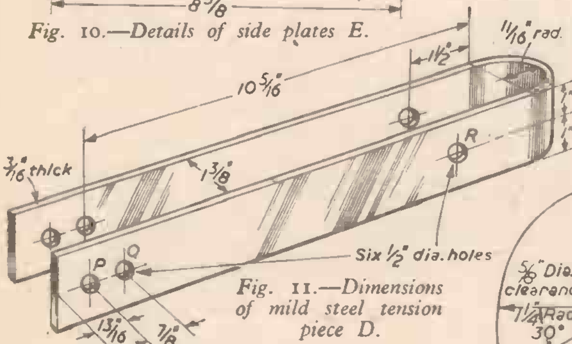


Fig. 11.—Dimensions of mild steel tension piece D.

lock the arm. However, this must only be done after it has been confirmed that the distance between the centre of the ⅜in. hole in the piece G is exactly 17in. from the centre of the ⅜in. hole in the electrode arm, and that these holes are exactly at right-angles as shown in Fig. 9. To avoid error it is best to prepare the drilled end of the electrode arm after the other end has been fitted in the bottom electrode support G.

Pivot and Connecting Piece

Fig. 15 shows the dimensions of the pivot F and connecting piece for the top electrode arm. Again the 1¼in. hole is to be a tight fit for the electrode arm. The ½in. clearance hole should be drilled through the pivot and electrode arm after the latter has been fitted into the pivot, taking the same precautions *re* lining up the end of the electrode arm as in the case of the bottom support G.

Fig. 16 shows the dimensions of a mild steel connection clamping plate, two of which are required. As will be seen from Fig. 9, these are used to clamp the laminated secondary leads to the electrode pivot and bottom electrode support by means of six ¼in. Whit. 1in. long screws or bolts with washers.

Insulating and Connecting the Bottom Electrode

In the spot welder it is necessary to insulate the low-voltage secondary winding and leads on one side only; in this case the bottom lead is to be insulated. This is done by pushing through the ⅜in. dia. hole in the bottom electrode support G a fibre bush 3⅜in. long, having an outside diameter of ⅜in. and a bore of ½in. On either side of the bottom electrode support G is fitted a fibre washer between the part G and the side plate E. The washers should be about 5/16in. thick and have an internal diameter of ⅜in. preferably with an outside diameter of about 2in. The bottom electrode support G with the bottom electrode arm may now be fitted.

First it is necessary to insulate the bottom electrode arm from the tension piece D, by means of the bush shown at V in Fig. 9. This bush is best made of fibre 3in. long and 1⅞in. o.d., with a bore of 1¼in.: although the bush could be built up on the electrode arm by means of empire tape as a less satisfactory alternative. The ½in. bolt U in Fig. 9 is pushed through the fibre bush in the bottom electrode support G and tightened up. The ½in. clamping bolt R may then be fitted and tightened up. The short laminated lead 3in. wide from the bottom of the secondary winding is then carefully pressed down on to the bottom electrode support G, and the connection clamping plate H laid on the top and lined up, so that the secondary lead can be marked out for drilling for the six ¼in. screws, or bolts, used to clamp this connection. After drilling the laminated lead, each lamination should be carefully cleaned and the connection clamping plate screwed down. Any surplus lead may then be cut off.

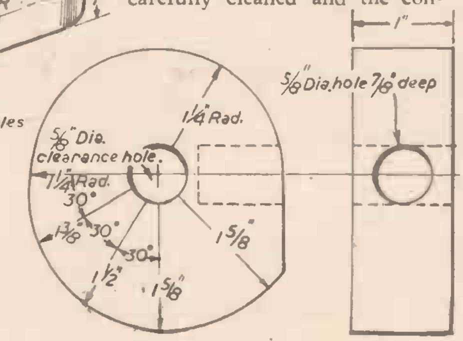


Fig. 12.—Details of mild steel operating cam C.

Connecting the Top Electrode Arm

The long laminated flexible lead from the top of the transformer secondary winding should be suitably bent as indicated in Fig. 9 to form a flexible connection between the secondary winding and the top electrode pivot F. A smooth steel bush 3in. long × 1⅞in. o.d. and 1¼in. bore is to be fitted on the top electrode arm as shown at W in Fig. 9. The bush may be pinned to the arm if required. It is very important that this bush be quite smooth externally. The ⅜in. mild steel rod X may then be driven into the electrode pivot F. There is no objection to this being fitted right into the electrode arm itself.

The ½in. steel bolt Y may be slipped through the electrode pivot F after positioning the pivot in the centre of the side plates E by means of ½in. washers Z. After making sure that the top laminated secondary lead is correctly shaped for maximum flexibility and is correctly positioned, the connection clamping plate H may be placed in position so that the flexible lead can be marked for drilling to take the six ¼in. clamping bolts or screws. When the lead has been drilled, the laminations should be cleaned and the lead clamped up. A ½in. dia. rod between the angle pieces A and A_1 carries the opening spring, the function of which is to separate the electrodes when the handle is raised. Fig. 18 shows suitable electrodes for general purposes.

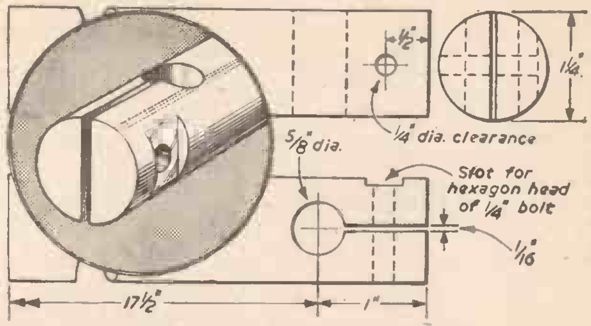


Fig. 13.—Dimensions of hard copper electrode arms J.

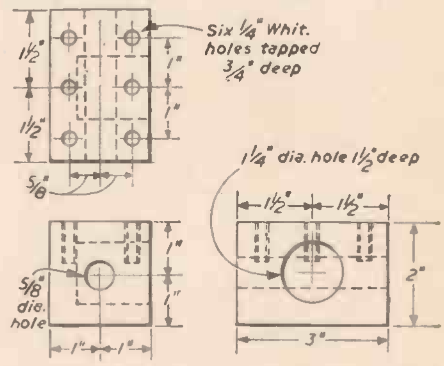


Fig. 14.—Dimensions of brass bottom electrode support G.

Connections

The equipment can now be connected up as in Fig. 17. A wooden panel may be fitted at the side of the welder, on which are to be mounted four 15-amp. two pin socket outlets, together with a 15-amp. three-way porcelain-encased connection block. The start of the primary winding is to be connected to one terminal of the connecting block, the other four leads from the primary winding being connected to the socket outlets as indicated. The other side of each of the socket outlets may be connected to the second terminal by means of 13 s.w.g. wire passed through a systoflex sleeve. 15 amp. (70/0.0076) flexible cables are used to connect the terminals to the 15 amp. three-pin supply plug, and to the foot-operated switch, as shown.

The foot-operated switch is one item which should be purchased. It should be rated for at least 15 amps. at 250 volts. Only a single-pole switch is required, but it

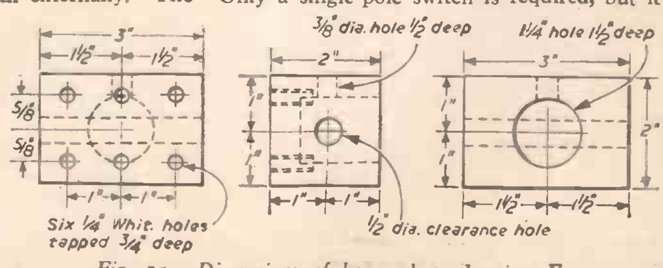


Fig. 15.—Dimensions of brass electrode pivot F.

must be of robust construction. It must be arranged so that the contacts are normally kept open by means of a spring, and can be closed momentarily by pressure. This switch should be mounted on a heavy wooden base and, if required, a lever can be mounted over the switch to enable good control to be obtained by means of the foot. The operating cam C and the mild steel bush W on the top electrode arm should be well greased.

Varying Secondary Voltage

The operation of the welder is as follows. The terminals of a 15-amp. two-pin plug are short-circuited together by means of a piece of 13 s.w.g. copper and this plug is then inserted into one of the 15-amp. socket-outlets. When inserted in socket A in Fig. 17 all the primary turns are in use to give minimum secondary voltage. When the plug is fitted in socket-outlet B to use 150 primary turns a slightly higher secondary voltage is obtained. With the plug in socket-outlet C 120 primary turns are used to give a still higher secondary voltage, whilst the maximum secondary voltage is obtained when the plug is placed in the socket-outlet D, so that only 90 primary turns are used.

Welding Operation

After lowering the handle of the welder

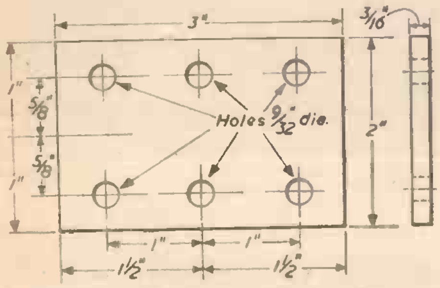


Fig. 16.—Mild steel connection clamping plates H.

the electrodes should be clamped in the electrode arms so that they just meet. When the handle is raised through 90 degrees the opening spring allows the steel bush W on the top electrode arm to rise by ⅜in so that the electrodes are separated about 1¼in. The two pieces to be welded are then placed between the electrodes and the handle brought down so that pressure is applied to the work pieces through the electrodes. The foot switch is then pressed down momentarily, for about 1/10th sec., during which a current in the region of a thousand amps or so passes through the work pieces between the electrodes heating the points. Pressure is maintained on the work and, after release of the foot switch to cut off the current,

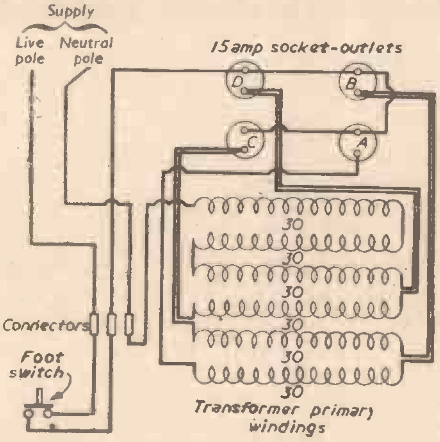


Fig. 17.—Diagram of connections.

further pressure is applied to the handle to forge the points together.

Practice Required

Some little practice will be required in order to obtain the best results and it is best to experiment with odd pieces of the metal requiring to be welded. In general the higher welding voltages will be required when welding metals of fairly high electrical resistance. It will be noted that the following adjustments are possible. The welding voltage can be adjusted by means of the socket-outlets, a higher voltage increasing the welding current to given work pieces. The duration of the welding current is foot controlled, some little practice may be necessary to get this correct. If it is necessary to do so, owing to the shape of the articles to be welded, the distance between the electrode arms can be increased by about 3in. by placing the cam pivot bolt in the holes P in the side plates E (Fig. 10) instead

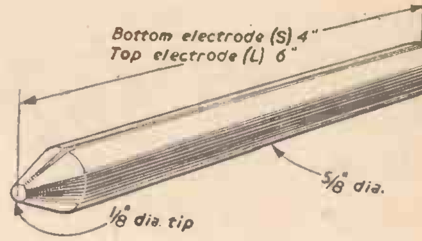


Fig. 18.—One type of copper electrode L.

of in the holes Q, although longer electrodes may then be needed. The height of the electrodes above the bottom arm can be raised by placing the shorter electrode in the top arm and the longer electrode in the bottom arm, or by using special electrodes. The electrode pressure, of course, depends on the pressure applied to the operating handle.

Spot Welding Notes

The size of the electrode tip should not exceed ⅛in. dia. and the tip should be touched up with a fine file when necessary to keep the surface flat and at right-angles to the axis of the electrode. Swan neck electrodes may be required for some purposes, such as welding a tube of certain size. If it is required to spot weld iron wires at right-angles to each other the electrodes must be grooved to accommodate the wire. The depth of the groove in each electrode should be slightly less than half the diameter of the wire. For rightangled welding of wires the groove in the top electrode should be at right-angles to that in the bottom electrode.

It will be appreciated that, since a spot welder joins the metals in a series of spots, it is not suitable for making a watertight joint; this requires a seam welder. Once a spot welding connection has been established between two plates or strips it will act as a shunt to the electrodes if applied near the first spot. Thus, with a given plug setting, the welding current applied to a second spot nearby may be reduced. It is advisable that the spacing between the centres of two adjacent spots should be about ½in. for minimum loss of welding heat due to this cause. For efficient welding the surfaces of the metal to be joined should be clean.

BOOKS Received

Photographic processing. By John Blaxland. 164 pages. Price 18s. net. Published by George Newnes Ltd.

OF the many aspects of darkroom technique, the most important is probably that of maintaining the spotless cleanliness of sensitive materials. Too often the amateur finds, due to careless handling, negatives and prints are spoilt by dust and dirt causing blemishes. This book is written as a complete darkroom guide for the amateur with particular emphasis on scrupulous cleanliness. The beginner following the clear step-by-step instructions in this volume will be able to produce technically excellent negatives and prints and the experienced photographer will almost certainly be enabled to improve his technique. To those who process miniature negative materials, this book will be of particular use. Every step of the process is covered from loading the camera to mounting the finished print. Both drawings and photographs are extensively used.

"Basketry Step By Step," edited by O. R. Scott. 92 pages. 105 illustrations. Price 15s. Published by Sir Isaac Pitman & Sons, Ltd.

THE reader of this book is led by easy stages from the simplest beginnings of basketry to complicated designs. Each step is clearly illustrated by a diagram and there is a photograph of each completed article. Choice of materials and the correct tools to use are also covered. The book contains over thirty attractive and useful designs, which range from a vase-shaped linen basket and canework cradle to a fruit basket and cycle carrier.

Commerical and Industrial Photography, by David Charles. 402 pages. Price 52s. 6d. net. Published by Chapman & Hall, Ltd.

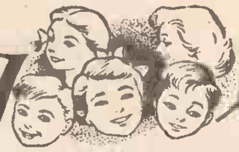
THIS book is intended as a text book for all who use or apply photography in commerce, industry or science, but will almost certainly interest the amateur as well. The author has had a lifetime of experience as a commercial photographer which he has used here to present information on the many problems which may be encountered in the commercial studio, the industrial workshop or the laboratory. The aspects of photography covered are too many to list, but some of those included are; camera types, lens types, sensitive materials, exposure, darkroom installation and equipment, lighting, colour, illustrating handicrafts, microphotography and macrophotography, copying, lantern slides and film strips and many others.

The book is written in simple language, but assumes that the reader knows to to take a photograph of an ordinary subject. The final chapters deal with photographic words and their meaning and the book is concluded with an index. Many photographs and line drawings are used to amplify the text.

Solid Propellent and Exothermic Compositions, by James Taylor, M.B.E., D.S.C., etc. 153 pages, 12 plates, 27 tables and 21 diagrams. 25s. Published by George Newnes, Ltd., Tower Hhouse, Southampton Street, London, W.C.2.

CHEMICALS have been and are being used in various compositions to provide energy for a number of differing purposes. This book surveys the chemical compositions used as energy sources and describes their applications. The aspects covered include self-sustained exothermic chemical reactions and explosives of various kinds. There are several chapters on the various types of propellents. The final chapters deal with power cartridges and gasless reactions and an index is included. This book is a Newnes Technical Survey.

Photographing Children



A. E. BENSUSAN GIVES SOME USEFUL HINTS AND TIPS

IN general, it may be said that children are photographed by natural lighting in out-of-doors settings, just as much as under studio conditions and by artificial light. We will deal first with the studio aspect of child portraiture.

The equipment required for this branch of photography was dealt with in the article "How to Take Portraits" (April, 1958, issue), but when the photography of children is to be undertaken, the remarks made with regard to easy viewing and equipment adjusting are even more strongly applicable. Sudden noise, quick movement, lengthy manipulation of apparatus and other similar distractions can cause a rapid loss of patience by the child, and tears may even be forthcoming where there is an underlying nervous disposition. The entire photographic session should be conducted as smoothly as possible, and in a pleasant atmosphere.

Reassuring the Child

Since children usually feel more comfortable and secure in their own homes, the photographer who takes his equipment to the sitter will often have an initial advantage. Provided that it is old enough, the child should be allowed to join in the fun of erecting the camera and lighting gear. A peep through the camera viewfinder or at the focusing screen helps to dispel any fear of the equipment. When a focusing screen is fitted, and the image is reversed top to bottom—for instance, in a studio camera—considerable play can be made of the image showing people apparently standing on their heads or the ceiling being downwards and not up.

Fig. 1.—An older child can be posed over the back of a chair with window lighting at the rear.

In this way, by the time the working session starts, the child will have lost its fear of the array of apparatus and may even have some primitive idea of the procedure to be followed. The major difficulty—that is the sitter's fear of the unknown—will have been surmounted without any fuss or trouble.

Light Tone

Since the most popular and sensible treatment of a child portrait is to keep the whole tone of the picture quite light and fresh, it is often advisable to add the effect of daylight to that of the floodlights. On a cloudy but bright day the window may be used as a background, so providing considerable back illumination and a certain amount of top lighting. This aids the feeling of lightness and youth in the picture, in addition to adding to the three-dimensional effect by apparently lifting the image of the sitter away from its background.

Children hate being stiffly posed for a photograph to be taken, and this dislike can all too easily be reflected in the finished portrait. For this reason the most natural studies are taken when the pose is completely informal. A young child can safely be left to play with one or two toys in an area covered by the camera lens, and the exposures made when suitable opportunities present themselves. Do not have too many toys within reach for, apart from the cluttered effect on the photograph, the child may seem bewildered by a large array.

If a portrait of the child is required in which the eyes are looking towards the camera, a momentary sound made by clicking two coins together, or any similar method, will instantly attract the sitter's attention. However, with most young children the novelty soon wears off and the dodge should not be repeated too often. A soft toy, balanced precariously on the photographer's head, generally produces a laugh, but again the action soon loses its appeal.

Older children can be arranged so that they kneel on the seat of a chair and look over its back towards the camera (Fig. 1). This position confines them within the camera's angle of view, but at the same time, permits them considerable latitude in the matters of pose, expression, etc. In fact, a whole series of shots may be taken during a short "peeping" game played over the back of the chair.

Flat Lighting

The lighting should be arranged so that it falls rather more flatly upon the child's features, than would be desirable for an adult. Dramatic child studies, using wide variations in lighting between one part of the picture and another, or relatively harsh modelling of the facial features, are almost invariably undesirable. The object is to maintain the youthful effect, and this will certainly have the greatest appeal to the child's parents. Two floodlights are sufficient where the sitter is confined to a small area, the camera lens is operated at a wide aperture and a fast panchromatic film or plate is used. Cameras having small aperture lenses will demand a higher light intensity to enable shutter speeds of at least 1/25th of a second to be used.

Natural Pictures

Children photographed out-of-doors are normally more at ease, and the resulting pictures reflect this freedom. Apart from this, the scope of settings and poses is greatly increased. Under these conditions the intensity of the light is invariable, and the only concern is that it should fall on the subject in the manner most suitable in both the pictorial and technical senses. When the sun is high, near midday, the choice of subject position is not so critical, as all aspects will have similar illumination. However, lighting of this nature is inclined

Fig. 2.—A group of children photographed in a swing-boat.

to be rather hard, and softer effects are obtained both earlier and later in the day. Light clouds, obscuring the sun, provide ideal conditions for child studies at any time.

It is very difficult to group a number of children so that they look happy and unselfconscious without the aid of some centre of interest. Where they can all be crowded into a swing or a boat, or some similar item, the problem is solved (Fig. 2). Otherwise a sundial or an unusual sea-shell may serve as a focal point for their attention.

Letters to the Editor

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

P.M. Guitar

SIR,—Re your note in the January, 1959, PRACTICAL MECHANICS, "Made Anything from P.M. Lately?" you may be interested to know that I have made two guitars from the instructions in the September, 1958, PRACTICAL MECHANICS. (See photograph.)

I made these for my twin daughters for Christmas. I am not a musician and have never made a musical instrument before, but I am extremely pleased with the result, tone, etc.—A. R. BRADLEY (Newport).

Mr. Bradley's guitars.

Rubberising Diving Suits

SIR,—Our attention has been drawn to an article in the February edition of your magazine concerning the rubberising of garments intended for use as under-water swimming suits. The article, written by Mr. R. J. Garvey, refers to "Revultex" our pre-vulcanised latex and gives our address as suppliers of the material. We feel that we should bring to your notice the fact that, although Mr. Garvey has found our material suitable for this particular application, it was not upon our recommendation and we cannot therefore accept any responsibility regarding its suitability for this purpose or upon its wearing qualities. Revultex is used for the proofing of materials, but we could not give any definite time as to the effective life of the proofing.

As we are not in a position to cope with such small quantities as were recommended in Mr. Garvey's article, we have arranged with P. K. Dutt & Co. Ltd., of 1, Alfred Place, London, W.C.1, to make this material available to people wishing to make their own diving suits.—REVERTEX LIMITED (London, W.C.2).

[*The price mentioned in the article for this material has now been increased to 3s. 7d. per lb.*—ED.]

Wood Wind Lubricant

SIR,—As a reader of PRACTICAL MECHANICS for around eight years or more, I wish to compliment you on your January issue for the varied and valuable contents—even though you have done away with the glossy cover.

On reading through it my attention was drawn to the answer to a query re wood wind instrument lubricant.

As one who plays, teaches, repairs and manufactures accessories for these (over 45 years' experience) I do not quite agree with the answer to this query.

The first formula you gave is on the right track, but in my opinion medicinal paraffin

is not the best to use, and the consistency should be much stiffer than petroleum jelly, for in this climate it must not run at 110 deg. or be so hard at 32 deg. that it cannot be applied.

Of course, in my own formula (which I cannot divulge, as you can understand) there are more components than those you have mentioned, and also it is scented and preservative added, so it does not grow mouldy—I have some samples over 20 years old.

The second formula I do not agree with at all, although it is exported to this country it is not popular though it is easier to manufacture (and cheaper, also).

With this compound the joints become so slippery that instruments, if at all loose in the joints—as they are in this part of the world in the summer heat—tend to fall apart. Also the mineral jelly is not the best for cork. Animal and vegetable grease are better, especially if the joint is not virgin cork—in fact it will disentegrate granulated cork.—WM. MOORE (Australia).

Is the Earth Flat?

Mr. W. Mills Defends His Planeist Theory

SIR,—I note that several readers are interested in my theory that the earth is a plane and not a globe, and have presented some queries for me to answer. Mr. W. A. Patience says Alfred Russell Wallace proved the Bedford Canal showed a curved surface. I reply, he did not. Here is the answer.

A white sheet was hung on Witney Bridge and six miles distant from it a "globite" with a telescopic camera placed 18in. above the water's surface took a photograph of the sheet and its reflection in the water. Now the "dip," 8in. to the mile—equals 24ft. in 6 miles if the earth is a globe. How then was it possible to obtain such a photograph unless the surface of the canal was horizontal? I possess one of the photographs but it is very faded. The canal, however, is still there to be tested. He also asks, "Does a straight line exist only in our imagination?" My answer is, yes, if a curved line does the same.

Mr. D. S. Spence refers me to the Engineers of the Manchester Ship Canal re curvature. That was done on February 19th, 1892, and the answer to the enquiry was, "It is not the practice in laying out public works to make allowance for the curvature of the earth." From the *Earth Review*, October, 1893, re eclipses. These were known to occur at stated intervals thousands of years ago when people believed the earth was flat. A team of 70 eclipses of the sun and moon occurs every 18 years 11 days. If No. 1 occurred tonight, it would occur again after that period elapsed, which is 6,585½ days and so on throughout the series, after which the cycle would begin again.

Mr. V. D. Butler asks about my contention that a 45 deg. angle to the sun is unobtainable from a globe. Here is how he may see it. Draw two circles, one to represent the "globe" and the other the sun and the latter above the former. Then add a vertical line from the earth to the sun's centre. It can be any length so long as it exceeds the earth's diameter. Then add a base line of equal length to the vertical and it will project into space. Now draw a diagonal line from that to the sun's centre. This is the 45 deg. angle that you cannot get out into space to obtain.

But you can get the 45 deg. from your own garden. Spirit level a piece of board wide enough to take a pyramid made of a piece of card, say, 4in. square. Cut diagonally, thus making two double triangles. Intersect these by making slots halfway down from the apex of the one piece and halfway up from the base of the other and you have a perfect pyramid, if done exactly.

Now place it on the board with one point facing the centre of the sun. Correctly pointed to it there will be no shadow on either side. Then when the sun is exactly 45 deg. above the horizon the double triangle face of the pyramid will throw a shadow at the back exactly equal to its size. That proves the earth to be a plane.

The confused shadows on the sundial must happen if the base (the earth) upon which it is placed has two movements, orbital and axial. Then there is the sun's movements which makes confusion worse confounded. But the steady single shadow thrown on the sundial proves that it is the sun that moves not the earth. That is stationary. Also the sundial. Here is additional proof. A shadow goes at equal speed to the object that throws it, whether it be a person or a railway train. If the "globe" revolves at 1,000 miles an hour at its equator, the shadows thrown by objects on its surface should prove it. Also the speed at higher and lower latitudes being less, the shadows should move proportionately slower. Do they? It would be at nearly double the speed at the equator of shadows thrown in London, which is supposedly at 600 m.p.h.

Finally, may I inform Mr. F. O. Brownson that sextants are used to obtain the height of the sun, etc., by plane trigonometry for navigation, not spherical trigonometry. Also that 32in. of an arc on the sextant represents 32 deg. miles on the earth, and to get the centre of the sun sixteen miles are added, or deducted, for that purpose. It depends upon whether the upper or lower limb is taken. That proves the sun to be 32 nautical miles in diameter, not 864,000 miles. These points need serious consideration.—W. MILLS (London, N.4).

(*Continued on page 329.*)

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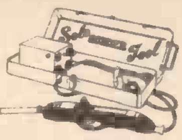

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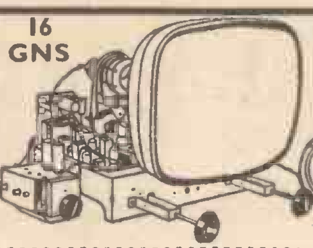

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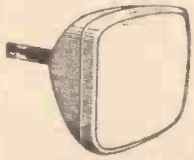

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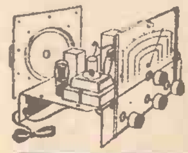

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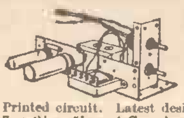

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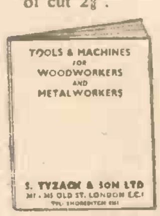

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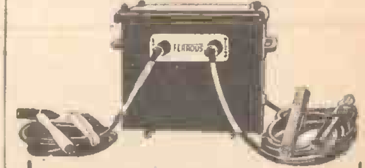

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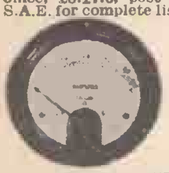

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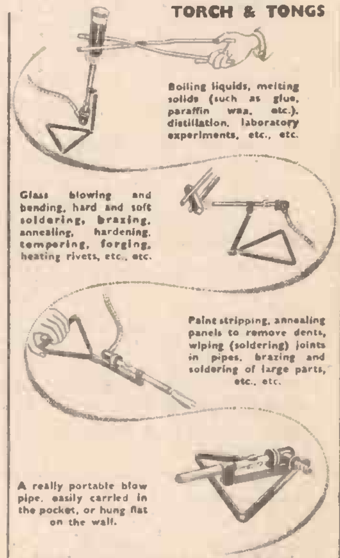

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Bell Transformers.—These guaranteed transformers work from any A.C. mains giving 3, 5 or 8 volts output at 1 amp., operate bulb, buzzer or bell. Will supply light in bedroom or larder, etc., 9/-, post 1/-. Similar Transformer but output of 4, 8 or 12 volts, 13/6, post 1/6. BUZZERS for use with either the above or batteries, 4/3, post 5d. **G.P.O. Telephone Hand Comb. Sets,** 12/6, post 1/6. **Telephone Hand Generator,** 8/6, post 2/-. **Telephone Bell,** 3/6, post 9d. **S.B.C. Neon Indicator Lamps,** for use on mains to show "live" side of switches, etc., 2/6, post 4d. **Neon Indiator,** complete with condenser, pencil type, with vest-pocket clip, 7/6, post 5d.

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Another Satisfied Customer!

SIR,—Below is a picture of my very first model, which you will recognise as the twin solenoid electric motor for which plans were given in PRACTICAL MECHANICS in October, 1958.

I started buying PRACTICAL MECHANICS to relieve the tedium of bus and train journeys and I became intrigued by this little engine. Heavens! how these things eat up time—the "idiots' lantern" is hardly a starter in the "time consumption stakes" compared with a model—particularly in obtaining (by fair means) the raw material (I was only a beginner at this remember). That flywheel gave me a real headache until some bright scrapyard attendant suggested the top of an alloy piston.

Mr. Hearfield's model.

One complaint about the model. For some time after its completion I was afflicted with a strange restlessness; an urge to wander into the shed and twiddle the vice handle or aimlessly measure up scraps of metal. The restlessness has now passed—I have started on the other model in the same issue—steam this time! Oh! I feel this could become a dreadful habit—perhaps I shall be using a query coupon to ask for a cure—if I can find the time.—E. F. HEARFIELD (Halifax).

THEORY OF THE UNIVERSE

SIR,—How can mortals, even the very brilliant ones, ever explain as to where the boundaries of space lie when it is impossible even for the immortals, or the gods, to do this? The latter would certainly grow very old in trying to reach the borders of infinity.

In answer to Mr. W. A. Patience's query in the February issue, "Is the human mind capable of defining 'Nothing?'" I would say, certainly.

By "Nothing," is meant nothing to the power absolute. Under this condition of nothing we would have (a) Vacuum to the power absolute; (b) Low temperature to the power absolute. Both these two powers can never be obtained by man.

Creation cannot be explained away as having originated from primeval gas clouds or that it existed to the period of infinity.

To explain creation, first consider a very high vacuum. Under this condition solids are known to vaporise. It is obvious, however, that the degree of man-made vacuum is limited owing to the nature of the shell surrounding it. What then would limit vacuum to the power absolute in outer space, where no "shell" exists. Obviously, with the condition of "Nothing Absolute" a new factor arises.

Several years ago, experiments were carried out by the late Professor Evenshaft which brought him to believe that in a vacuum an unknown force existed. Owing, however, to the nature of his experiments and apparatus, his theories were not generally believed or accepted.

If the process, however, had been repeated under conditions of the extremes of nothing and temperature absolute, a different result may have been achieved. The small forces obtained in his experiments might have magnified into considerably larger ones.

It was at this point that creation commenced.—K. E. LANGNER (Ramsgate).

SIR,—I really thought that the "Flat Earthists" had passed away with that staunch supporter of the theory the late President Kruger of the Boer Republic.

Upon reflection I wonder what percentage of the adult population *can* give any mathematical proof of the earth's shape? I appreciate Mr. Brownson's glorious rhyming, but I am startled to realise that I cannot supply myself with mathematical proof of the value of π.

What justifies the extensions of the value of π to umpteen decimal places, when neither diameter or circumference can be so accurately measured?

Mr. Mills (February issue) may at least be congratulated on not taking everything on trust as so many do to-day.

May I suggest a series of articles on Euclidean geometry as applied to similar problems?

As C. G. Jung, the eminent psychologist, has now published a book on U.F.O. (Saucers) we can watch for sparks in the near future. Congratulations on the continued interest value of PRACTICAL MECHANICS.—K. S. EDWARDS (Leeds 6).

Extracting Hydrogen Gas from Water—Correction

SIR,—In my letter to you on hydrogen production I mentioned 96.470 amp. secs. to produce 1 gram of hydrogen. This should have been 96,470 not 96.470. At N.T.P. 1 ampere minute would produce 10.35 c.c. of mixed hydrogen and oxygen which is vastly different to 11 litres of hydrogen alone. Please accept my apologies.—S. SEAGER (Staffs).

A Tenor Side Drum

(*Concluded from page 302*)

At this stage the various parts of the drum may be decorated to suit the constructor's taste.

Mark out circles of parchment for the heads of the drum, making allowances equal to 2½ times the width of the flesh hoop as shown in Fig. 4. Thoroughly moisten the parchment, lay it flat on the table and place the hoop centrally on top. Commence tucking the parchment over and

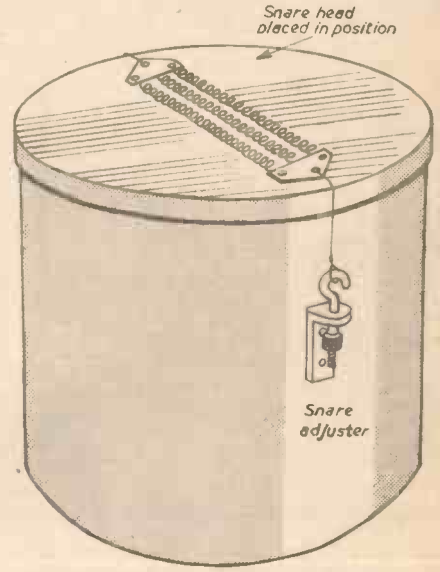


Fig. 10.—Snares in place on snare head.

around the hoop. The curved end of a teaspoon is useful for this tucking process.

When the hoops are covered with parchment they are fitted over the ends of the shell of the drum and left in place to dry.

If the heads have dried out, the snares may next be fitted in place (Fig. 10). Short lengths of gut string fasten the snare plates to the tensioning hooks.

Place the two straining hoops in position and pass the straining rods through the clips and fit on the washers and wing nuts. Remember to cut out two little segments in the snare head hoop so that the snare straining wires may pass through easily. (See photograph of finished drum in heading.)

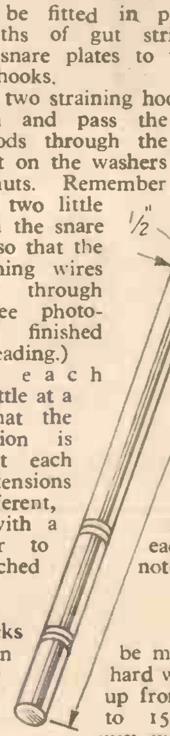


Fig. 11.—Dimensions of drumsticks.

Tighten each strainer a little at a time so that the same tension is obtained at each rod. If the tensions are different, when the head is struck with a flick of the finger near to each rod, a slightly different pitched note will be detected.

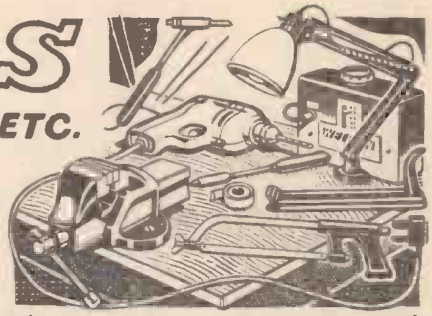
Drum Sticks

These can be made from beech or other hard wood. They may be planed up from some ½in. × ½in. timber to 15in. in length. Another way would be to use some ½in. birch dowel rods and work up the ends as shown in Fig. 11.

For instructions in drum playing there are standard tutors on the market such as the "Simplicity Tutor for Drums" published by Boosey and Hawkes, price 2s. 6d.

Trade Notes

A REVIEW OF NEW TOOLS, EQUIPMENT ETC.



AMERICAN B & D TOOLS

THE lifting of the embargo on dollar imports has provided an opportunity for the introduction in this country of selected tools manufactured by the American Black and Decker Mfg. Co. Fully backed by service branches in the U.K., the tools introduced are the U.10 jig saw. the 3in. heavy duty Dustless belt sander and the 1 h.p. router.

The jig saw retails at £18 17s. 6d. and its appearance can be seen from the photograph. It can cut straight, curved or irregular lines, circles, and "pocket" cuts in panels, skirtings. etc., without a lead hole. Blades for cutting different materials are available.

The Black & Decker jig saw and 1 h.p. router.

The 3in. heavy duty belt sander has a close-coupled vacuum unit (worked by the sander motor) which sucks up 80 per cent. of the dust into a detachable bag. Its large range of uses is increased by the extended front roller which allows concave surfaces to be tackled and the flush side which enables it to be used against vertical surfaces. The price is £52 17s.

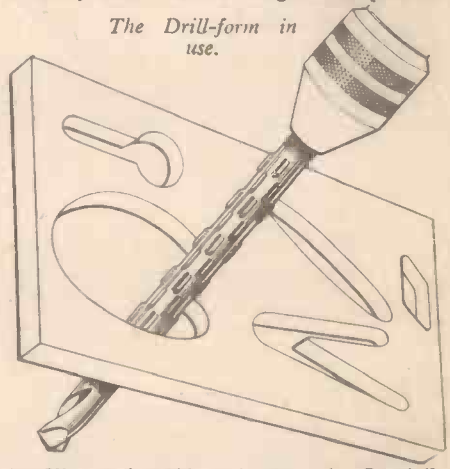
The 1 h.p. router is operated by direct drive at 21,000 r.p.m. and features include micrometer type depth adjustment and a collet type chuck with $\frac{1}{4}$in. and $\frac{3}{8}$in. collets. Router bits are available for beading, grooving, fluting, cove-cutting, dovetailing, veining, chamfering, rabbeting, mortising, etc. Numerous attachments are available and the price of the router is £34 15s. The English address of Black and Decker is Harmondsworth, Middlesex.

"The Engineer" Buyers' Guide 1959

THIS 958-page book includes a valuable and up-to-date list of suppliers of a wide variety of engineering products and services. It gives a list of trade names and also details of forthcoming engineering and industrial exhibitions. Copies are obtainable from The Manager, "The Engineer" Buyers' Guide, 28, Essex Street. London, W.C.2, price 9s. 3d. including postage.

A New Shaping Drill

DESIGNED by Selecta Power Tools Ltd., Hampton Road West, Hanworth, Feltham, Middlesex, to suit any of the popular power drills, the "Drillform" can be used for the production of slots, recesses, holes and all irregular shapes and for filing and rapid stock removal. Specially set teeth ensure an even depth of cut and rapid working. In addition to wood the "Drillform" may be used on hardboard, plastics, asbestos, rubber, ebonite and linoleum. The price is 4s. 3d.



The Drill-form in use.

A New Blowlamp

A NEW blowlamp, the No. 3. has been added to the well-known Valtock range. It has been specially designed for the home decorator, yachtsman and handyman. It is manufactured from solid brass and finished in nickel-plate. Safe to use in the home, clean, simple and efficient in operation, it is self-pressurising. completely automatic and needs no pumping. Methylated spirit is burnt with a clean non-toxic flame. The flame temperature is in excess of 2,000 deg. F. It is ideal for burning off old paint, and is suitable for all plumbing jobs about the house, soft soldering, silver soldering, tinning and sweating. The price is 63s. and it is manufactured by Valtock Ltd., Regency House, Warwick Street, London, W.1.

The new Valtock blowlamp.

Catalogue and Book on Telescope Construction

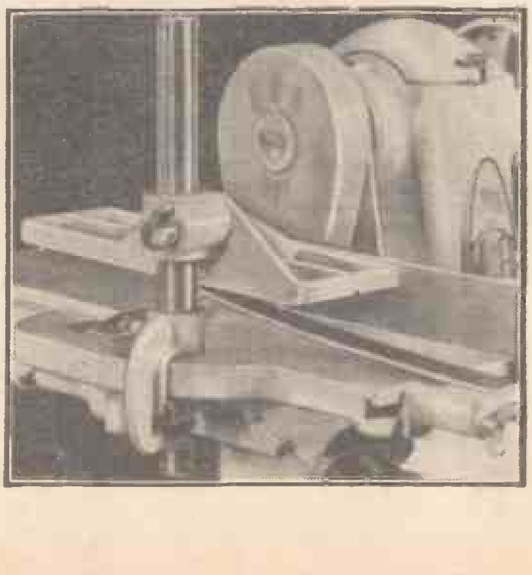
FROM Charles Frank, 67-75, Saltmarket, Glasgow. C.1. we have received a catalogue listing the photographic, optical and scientific instruments which they supply. These include binoculars, compasses, navigational instruments, stop watches, surveying apparatus, lenses, drawing instruments, rangefinders, monoculars and telescopes. Much of the equipment is ex-Government and consequently low priced.

Also received was Frank's "Book of the Telescope," illustrated with line drawings and halftones, and costing 5s. 6d. The book is intended as a practical introduction to the various types of ex-Government telescopes available and the potentialities of these instruments are examined with a view to their use on astronomical subjects.

THICKNESSING ATTACHMENT

TWO versions of this latest piece of Myford equipment are available, one to suit the PR.11 bench planer and the other to suit the 1549 Planing attachment for the ML.8. The thicknesser permits the use of the full 4½in. width without restriction and a jointing capacity of 5½in. It can be instantly attached without alteration to the existing equipment. The graduated pillar enables immediate setting to thickness of timber being worked. When planing thin wood, the safety factor is increased, the work being firmly held and prevented from springing or bouncing.

The makers are Myford Engineering Co. Ltd., Neville Works, Beeston, Nottingham.



(Left) The Myford thicknesser.

READERS' SALES AND WANTS

The pre-paid charge for small advertisements is 6d. per word, with box number 1/6 extra (minimum order 6/-). Advertisements, together with remittance, should be sent to the Advertisement Director, PRACTICAL MECHANICS, Tower House, Southampton Street, London, W.C.2, for insertion in the next available issue.

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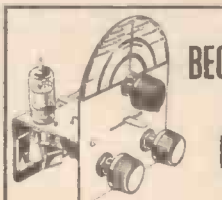
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Your Queries Answered

Fireproofing Wood Shavings

WOULD wood shavings laid to a depth of 3in. to 4in. make an effective heat-insulating medium, when laid above bedroom ceilings, between the joists, in a house? If so, can you suggest a cheap and effective method of rendering the shavings fireproof?—G. P. Francis (Kenilworth).

WE can only offer a formula which Rural Industries advise is suitable for fireproofing *straw*. As you are aware, the term "fireproof" is relative, and we advise you to test your treated wood shavings yourself. Of course, they are excellent insulating material.

28lb. ammonium sulphate.
14lb. ammonium carbonate lump.
7lb. borax lump.
7lb. boracic acid.
14lb. alum lump.

Dissolve this (or relative proportions) in water (50 gallons for above stated quantities) and soak the shavings in this solution and allow to dry on slats.

Models in Aluminium

CAN you tell me what I would need to make small models in aluminium?—G. D. Reeks (S.W.6).

WE feel sure that you will never make a success of casting small models in aluminium. The dies would have to be carved and finished in either steel or hard brass and the metal for casting is so light that it would not flow into all the parts of the mould; it would not have the necessary weight to carry it there. Small objects in aluminium, that you may have seen, are always made by pressure casting in machines. The metal is forced into the dies.

Your best plan will be to use Wood's metal which melts at about 212° (i.e., it will melt in boiling water). Your dies can then be made by either carving in wood or by taking moulds off a master model in plaster of Paris or Portland cement. Wood's metal has sufficient weight to drive it to all parts of the mould. It behaves, in fact, like type metal, but at a much more convenient, lower temperature.

Embossing in Gold Leaf

HAVING bound several books, I wish to emboss the titles in gold leaf. I have some suitable printer's type and a book of gold leaf and also blocking powder. After applying the blocking powder to the spine I heat the type in a holder, pick up a portion of gold leaf and apply the leaf to the spine. One or two letters will adhere, but on the whole the job is unsatisfactory. Can you advise me if I am going the right way about the job?—D. C. Powis (Essex).

IT is possible that your surface may not be quite clean, i.e., free from grease, or possibly you may be working at too low a temperature. Your type should be at "sizzling" heat—about boiling point of water.

We think that your best plan would be to use an albumin wash, and this material together with instructions as to how to use it with gold leaf can be obtained from Messrs. E. Ploton (Sundries) Ltd., 20, Marchmont Street, London, W.C.1.

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.

Stencilling on Glazed Tiles

I WISH to make black stencil imprints on ordinary white builder's glazed tiles. Can you advise me of a method of "fixing," so as to prevent the imprint from chipping or rubbing off. Is it possible to bake it on?—E. F. Chambers (Kent).

YOU can use a black enamel which can be obtained from Messrs. Wengers Ltd., Stoke-on-Trent.

This is a dry powder and needs mixing with turpentine and fat oil. (Fat oil is the residue from evaporated turpentine.) Both these materials can be obtained from Wengers. The tiles may then be fired in an electric oven up to 700°C. and should be matt but durable.

Electric Bell Design

I AM interested in making a very small electric bell for a toy telephone, one that will work from a very low voltage. Could you please let me know what controls the voltage of a small bell coil?—W. N. Whitmarsh (Glam).

THE resistance of the coil is determined by the voltage and current to be used. The current may depend on the capacity of the source of supply and also on the volume of sound required from the bell. The latter will also depend on the size of the bell. The ohmic resistance of the coil may be taken as approximately equal to the voltage divided by the current, whilst the gauge of wire used must be sufficient to carry the required current without overheating. For an intermittent load such as a bell a current density of about 4,000 amps. per sq. in. might be adopted.

Having ascertained the resistance required and decided upon the size of wire, the length required can be calculated from tables giving the resistance of the wire per yard. For instance if the bell is to work on 0.2 amp. at 1.5 volts the coil would require to have a resistance of 7.5 ohms. Using 34 s.w.g. wire which has a resistance of 0.36 ohm per yard you could then use 21 yards of this wire.

Drying a Damp Patch

IN my bungalow, during very wet weather, a damp patch appears on one wall of a bedroom. It is an outside wall that is affected and I have noticed that all other parts of the room are damp free. The patch appears over the same area each time. Where do you think the fault lies and how can it be remedied?—Michael Martin (Co. Cork).

IT is possible that the damp patch is due to an area of salts contained in the plaster and we would suggest the following treatment. Since the salts are highly sensitive to atmospheric moisture, the application of a poultice composed of whiting and water mixed to a thick paste and applied ¼in. thick over the affected area, allowed to dry thoroughly and then scraped off, may result in dissolving the salts which are absorbed into the whiting and subsequently removed.

We would also suggest that a thorough inspection of the surface on the outside of the wall is made and any defects noted (such as cracking of rendering if any, loss of pointing or structural cracking) made good. An application of liquid waterproofing solution of the silicone or Grangersol type may do much to overcome moisture penetration. A decorative treatment which has much waterproofing merit is Snowcem. We would suggest that an external inspection combined with the whiting poultice may lead to a cure.

Two- Three-view Pictures

I AM interested in making or mounting pictures for framing that would view two ways similar to the principle used in advertising signs. One way it would read, say, "So and So's soap" and in the opposite direction say "Washes whitest."

I recall seeing an article on the making of "Triad" pictures.—G. Ross (Edinburgh).

THE two-view pictures and advertisements to which you refer are produced photographically and are, or appear to be, printed upon tinfoil or some white metallic surface. We have never seen a three-view picture but the principle must be the same as for two-view.

Above is shown roughly the principle of the two-view and three-view pictures. Often the ribs or folds are very fine and the printing of the views has to be very accurately placed. The folds must come exactly upon the lines of the joins in each view. Obviously the smaller the pictures the more perfect it appears because of the smallness of the angle of vision. The two-view scheme would be the most successful because of the lighting, in the other, view No. 2 has to be seen by light shaded at the sides by views Nos. 1 and 3. Might we suggest that your best plan will be to make a hardwood tool for folding the paper first, making the folds $\frac{1}{4}$in. wide. Then with a photographic print trimmer cut up two pictures into $\frac{1}{2}$in. strips. Stick one picture upon all the faces to the left and the other on faces to the right. This will serve as an experiment and upon it you can determine your future plans.

Moulding Material

I WISH to make some collecting boxes for a church building fund in the form of small bricks. They must be strong enough to have a life of several years if possible. I have made a metal mould which will produce half a box and I intend to glue or cement the two halves together. Could you suggest a suitable material for this purpose, preferably one which will take the impression of some lettering engraved in the surface of the mould, and also one which has a fairly short hardening time?—Robert Hedley (Kent).

THE only materials likely to meet your criteria of strength, durability, etc., are the cold-setting plastic resins. These can be poured as a viscous fluid into a metal mould and harden in a period of hours. You can obtain details of cold-setting casting resins from I.C.I Ltd. (Plastics Division), Black Fan Road, Welwyn, Herts.

De-scaling a Heating System

KINDLY advise me of the method of scouring the rust-sludge from a central heating system by the use of acid, I believe its Hydrochloric.—G. J. Ladyman (Bucks).

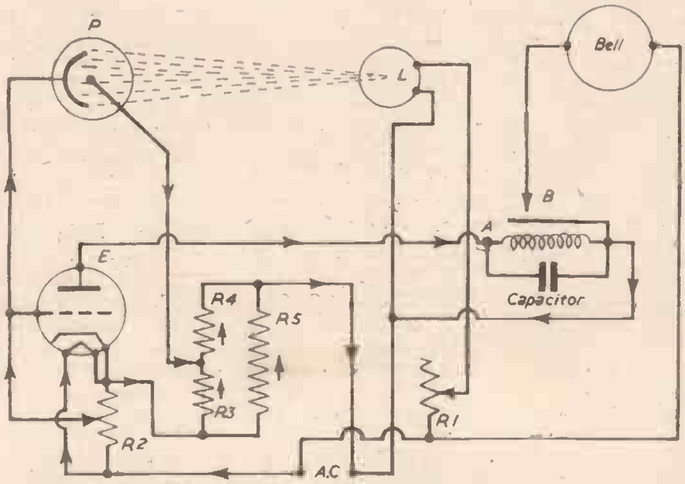
ACIDS used for the removal of lime deposits in a heating system are what are known as "inhibited acids" and unless you are fully conversant with the use of these materials in obtaining the correct proportions, we would not advise treating acids in order to use them to remove lime deposits. There is, however, a material on the market which is prepared for the work of de-scaling and is marketed by Messrs. Boilerine Ltd., 897, Old Kent Road, London, S.E.15. The quantity required would depend upon the capacity of your system but if full details of this and the type of material of your system, i.e., copper or galvanised are supplied, the firm would, no doubt, inform you of your requirements.

Smoke Detector

CAN you please tell me how a smoke detector works?—R. E. Kruse (Chatham).

THE diagram shows a simple circuit. Light from a lamp (L) is directed across the space, where smoke detection is required, on to a phototube (P). With no smoke, or minimum smoke, a considerable amount of light reaches the phototube which conducts an appreciable current so that a low voltage is applied to the grid of the amplifying valve (E) and the latter valve conducts. The current through the relay coil (A) then holds open the contacts (B).

If the smoke reaches a certain density the light is cut off the phototube so that it stops conducting. This increases the negative bias on the grid of (E) and reduces the plate current so that the relay coil (A) releases its contacts and the bell is sounded.



Smoke detector circuit.

Treating a Doorstep

I HAVE a front doorstep made from bricks laid on edge and I wish to paint it a deep red to produce a permanent surface which will be washable. Rising dampness has so far caused peeling. Can you help?—Gordon Entwisle (Middlesex).

IT is not rising damp that is likely to be the cause of the paint breaking down on your step so much as traffic and the character of the surface. The most lasting colour is obtained by using one of the concrete dyes. Both Sealocrete and Cementone dyes can be obtained, and we advise you to ask your nearest builders' merchant to get you a small quantity. You would, however, have to get down to the brick surface, which may need a stripper such as Nitromors, then a good washing off with white spirit and a thorough wire brushing.

Information Sought

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

Automatic Garage Doors

COULD you advise me on how to construct a mechanism whereby the garage doors will be opened by the action of the car passing over, say, a push switch in the drive in?

As the garage is not wired for electricity power-operated doors are out of the question. The passing of the car wheel over a switch would operate a battery-operated electro-magnet which would attract a lever of the door catch thus releasing the spring-loaded doors. The doors would then have to be closed by hand. A mechanism would have to be constructed so that the electro-magnet would only operate every alternate "on" push of the switch (every fourth time the switch is pressed, assuming the front wheels switch "on" and the back wheels switch "off."—R. WATSON (Prestwick).

Bubble Tube Lamps

I WISH to make a variation of the bubble tube lamps described in your February, 1959, issue. This is a corked (not evacuated) jar containing two liquids. When heat is applied the lower liquid rises lazily, writhes about and then breaks up and falls slowly. The difference in specific gravity is probably less than between the two liquids described in the article. Can you help please?—F. W. HICKMAN (Essex).

Dry-mounting Press

I WISH to make a dry-mounting press for wholeplate prints. Can you supply details of construction?—D. T. ROBERTS (Sunderland).

Polishing Chemically

PLEASE let me know the chemical way of polishing polystyrene.—J. B. STOTT (Bury).

Removing Static Electricity

HOW may I remove static electricity from polystyrene mouldings? The special cloths for this purpose do not appear to be economical. Could you please describe apparatus called a "destatisiser"?—A. S. RELF (Swindon).

Morse Recorder

I HAVE constructed a recorder for taking morse signals down from a radio receiver, using a "Creed" ink stylus. I would like to record electrically. Can you tell me how to treat the paper tape, so that when it passes between two elecrodes with a small current (milliamps) passing through them it will leave a trace?—J. DAVEY (Peterborough).

Finish for Plaster

PLEASE tell me how the "black and old ivory" finish is obtained on plaster figures and ornaments. It appears to be a wax finish which sinks well below the surface.—P. G. HURDLE (N.10).

Bronzing Children's Shoes

COULD anyone tell me a method of bronzing or metallising children's shoes?—W. J. MULLINS (Lancs).

THE Cyclist

VOL. XXVII APRIL, 1959 No. 441

All letters should be addressed to the Editor, "THE CYCLIST," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

Phone: Temple Bar 4363
Telegrams: Newnes, Rand, London

COMMENTS OF THE MONTH

Decline of Club Life

ALL those club officials who have to organise any club activity that is not concerned with racing are finding that the social side of club life—and this includes the club run—is not getting the support it merits, as the basis of club life. Too many cyclists are now joining clubs solely for the opportunities they provide for racing and are neglecting completely those other facets of the game which make cycling a pastime as well as a sport.

The modern clubman's day seems to start with an event—probably short distance—followed by an immediate return home for breakfast. This precedes a long training ride either alone or in company with a few other hardriders, returning home again in time to go to the pictures or spend the evening watching television. The old tradition of always attending the club run, even if only for tea, seems to be dying out. At one time non-racing club members would be out early to support the competitors in an event after which everyone would have breakfast at some previously decided rendezvous. This would be followed by the organised club run—not necessarily a short leisurely ride—to lunch. In the afternoon the ride would take the club to tea where perhaps another section of the club would be met; either the "potterers" or the hardriders, but in any case a properly organised club run. These teas were the highlight of the day's run and would be extended often to a couple of hours, before the leisurely run home as a club began.

Now the organisers of Sunday runs know in advance that the number of riders turning out will only be enough for one section and that this is quite likely to split up long before "elevenses" as breakaway groups try to race their fellow riders and other clubs. New and inexperienced riders find themselves alone after riding hard trying to hold the rapidly disappearing back wheels of their so-called clubmates. Older members—the ones who always are elected to positions on the committee at the A.G.M. and who organise the marshalls for club events—try to remonstrate, are labelled "old women" and eventually leave the club in disgust.

Finally, at club events, the last bulwark of club life, the start sheet becomes shorter and shorter until the events become uneconomical to run. Where are the riders? They are all competing in open events which are being run on faster courses, in the hope that they may be able to knock a few seconds off their record time.

This is a dismal picture and if matters are allowed to go on, the result would be the end of the club.

Many reasons are given for this state of affairs, but it is probably a natural result of the modern attitude to all kinds of sport, where the object is not the game but the winning of it. Training is not the haphazard business it was in the past, when the Sunday club run plus the ride to work and a couple of mid-week evening spins were sufficient. Now diet, weight-training, massage, regular spins at certain speeds have all become matters for serious discussion and the

"The Old Shovel" Inn, Cowley, Middlesex.

schedule is rigidly adhered to. Where the old-time cyclist enjoyed his club, his friends, his cycling and his racing, probably in that order, the first and last thought of the modern clubman, winter or summer, is the next race.

The solution to this problem is not easy. It has been suggested that the answer lies in limiting the amount of racing available to club members. This would have the effect of weeding out the racing "addicts," but eventually the club's character would change and there would be only tourists and second-class racing men left. The club's prestige would be lost and many clubs with famous names value this.

Another solution is to introduce more discipline but compulsory club runs, etc., do not fit in with the ease and freedom of club life.

Perhaps the answer is to increase discipline just enough to stop riders breaking away during the actual club run and to combine this with a more flexible, more interesting and more varied runs programme. At least two runs should be arranged, one for the tourists and newcomers to the club, with the route selected for its scenic properties and sights of interest en route, and on which a slow pace can be maintained; and another run to satisfy the more energetic members and to allow the racing man to have his training within the structure of the organised club run. All these riders can meet, at least for tea and during this meal and the run home an opportunity is provided for the two groups of riders with conflicting interests to meet. Their interests may differ, but it should be remembered that they are both aspects of the same great game of cycling.

The Tour of Britain

THE newly formed British Cycling Federation's Racing Committee at its first meeting selected teams for this year's Tour of Britain. The Milk Marketing Board will sponsor the event again this year. It will start on Tuesday, May 26th, from Alexandra Palace, London, and will finish on Saturday, June 6th at Eastbourne, Sussex. The British team will be R. Coe, H. T. Reynolds, A. S. Brittain, D. Bedwell, W. Bradley. Reserves are to be O. Blower, T. Oldfield, J. J. Perks, R. Beck, G. O'Brien. The team will be managed by previous tour winner Gordon Thomas. In addition to the British National team there will be an Army team and 13 regional teams. Austria and Belgium may send all-amateur teams. Independents in this country can enter, but they will be representing regions and not trade teams. They can carry advertising matter on their jerseys, in return for which the riders' sponsors will pay a fifth of the rider's costs. £15 covers food and accommodation throughout the race.

The following is a list of the stages:

1. London to Skegness—137 miles.
2. Skegness to Scarborough—129 miles.
3. Scarborough to Whitley Bay—113 miles.
4. Whitley Bay to Morecambe—123 miles.
5. Morecambe to Blackpool—70 miles.
6. Blackpool to Rhyl—113 miles.
7. Rhyl to Aberystwyth—115 miles.
8. Aberystwyth to Porthcawl—108 miles.
9. Porthcawl to Bath—130 miles.
10. A 27-mile time-trial based on Bath and Bath to Weston-super-Mare 57 miles.
11. Weston-super-Mare to Southsea—112 miles.
12. Southsea to Eastbourne—93 miles.

The race carries £1,000 in prizes.

Cycle Frame Alignment

How to Check it and Remedy Minor Defects

Fig. 1.—Lining up the rear forks.

ANY major distortion in the frame will be a job for the cycle repairer, but you can check it up yourself and remedy some of the smaller defects.

Down and Seat Tubes

First you will need a 3ft. straightedge made from $1\frac{1}{2}$in. × $\frac{1}{4}$in. steel. Drill this at one end $\frac{3}{8}$in. clearance for a $\frac{3}{8}$in. bolt. Fit both the bottom bracket cups into place, pass the $\frac{3}{8}$in. bolt through the straightedge and the bottom bracket and lock on the other side by means of a nut. Using this bolt as a pivot, swing the straightedge until it is parallel with the down tube and with a pair of callipers measure the distance between this tube and the straightedge. Check again at the other end of the tube and the measurement should be the same. Now swing the straightedge until it runs parallel with the seat tube and repeat the measuring procedure with the callipers (Fig. 2). When these have been found to be correct remove the straightedge and bolt.

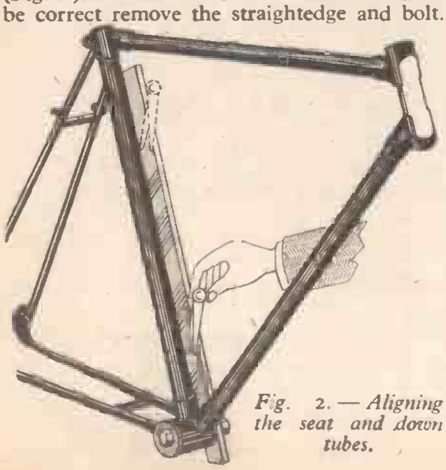


Fig. 2. — Aligning the seat and down tubes.

Head and Seat Tubes

Two straight 1in. wooden dowels are required now. These are passed through the head tube (the forks have already been removed) and the seat tube. By standing away from the frame it should be possible to see that these two dowels are in line (Fig. 3). If they are not the frame is twisted and should be dealt with by a competent cycle engineer.

Truing the Read Ends

Misalignment of the rear ends can take several forms. A common type of distortion is loss of parallelism between the ends both as regards length and height and another is when either end or both become off centre. Sometimes, too, the lower half of the spindle slot becomes twisted to one side.

Fig. 3.—Checking head and seat tube alignment.

Local distortion can be remedied by pulling and twisting the ends in a pair of Stilsons or a large adjustable spanner. Parallelism should be checked with a pair of callipers after every application of the straightening tool. The vice can be useful in flattening the ends (one end at a time).

When the ends have been trued up approximately, they can be checked to see if they are parallel with the seat and head tubes and whether they are central with them. For this the set-up in Fig. 1 is used. Fit a wheel spindle in the rear ends right at the back of the slots and then lay a long and accurate straightedge across the head or down tube and the seat tube touching the spindle in the rear ends. Measure the distance from the straightedge to the rear end on that side. Transfer the straightedge to the other side of the head and seat tubes and then measure distance from it along the spindle to the adjacent fork end. The two measurements should coincide.

If the measurements do not coincide, lay the frame on its side with the bottom bracket resting on a block of wood. Place a foot on the bottom bracket and pull up gently on the fork end which requires attention. At the same time the distance between the fork ends can be adjusted to suit the wheel hubs in use. After every adjustment repeat the test with the straightedge and re-measure the distance between the fork ends until both are correct.

When these corrections have been made re-check the parallelism of the rear ends with the callipers and make any final minor adjustments which may be necessary.

The Front Forks

These must first be checked for "twisting," i.e.. one fork blade being forced in front of the other. The easiest method is to put a front spindle in or on the drop-outs, after laying the forks on their back on the bench; then laying another spindle or piece of bar across the blades just below the crown as shown in Fig. 4. Sight down the forks to check that these two bars are parallel.

The next point to check is that the two drop-outs are spaced equidistant from the centre line of the forks. The simple way to do this is to mark out the centre line on the bench with a line crossing it accurately at right angles at one end. Lay the fork column along the centre line so that the projected line can be seen between the blades and move the forks so that the wheel spindle lays along the right-angled bisecting line. It should be possible now to measure between the line and each fork end.

The method of correcting inaccuracies if they are small is to clamp the crown in the vice and pull the blades into position.

When this has been done, the method of checking parallelism between the two ends is the same as for the rear ends.

It must be stressed once more that when correcting inaccuracies of alignment, only minor adjustments can be attempted in the cold state. Major work of this kind can only be done in conjunction with heat, and the cycle engineer or frame maker should be consulted.

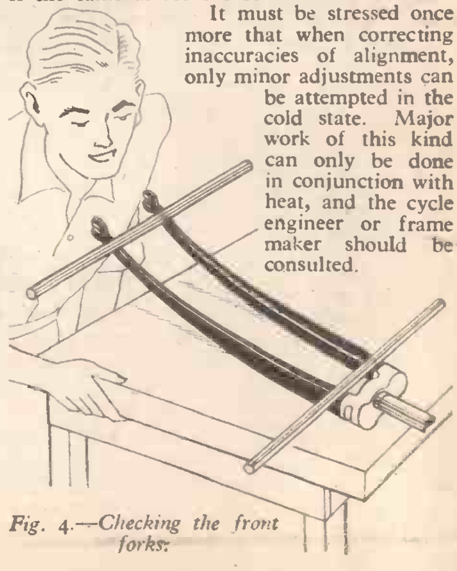


Fig. 4.—Checking the front forks.

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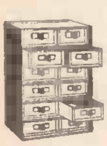

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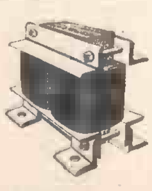

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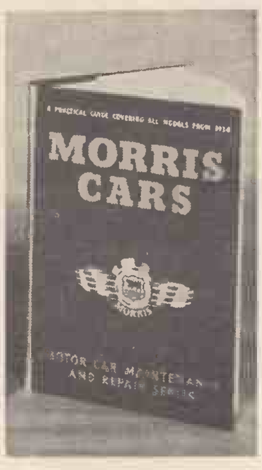

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