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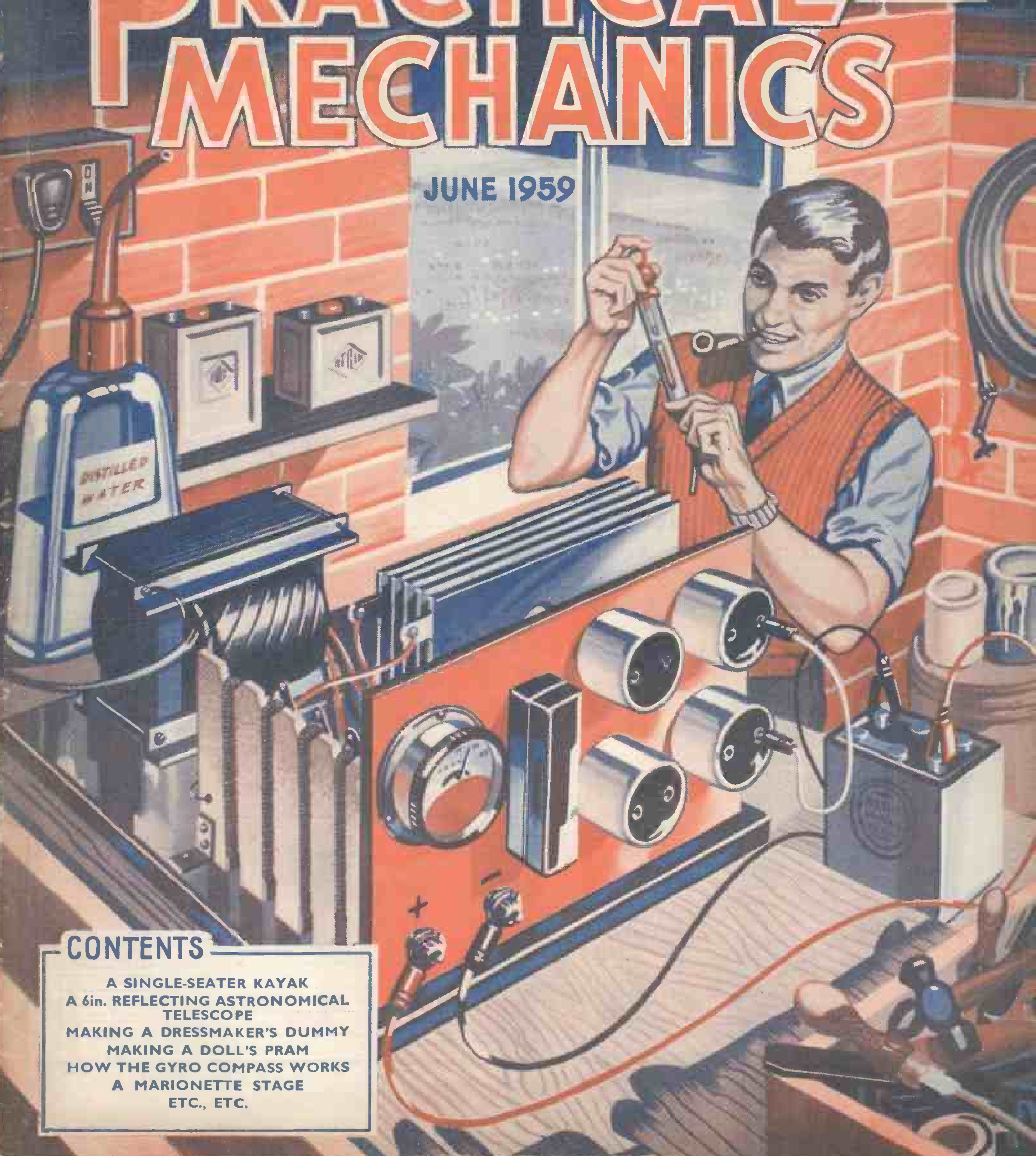

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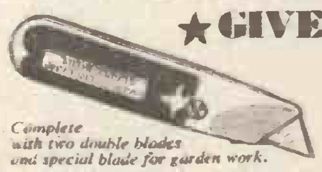

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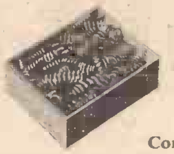

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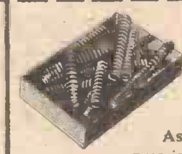

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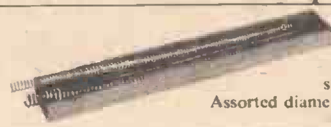

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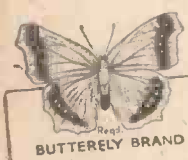

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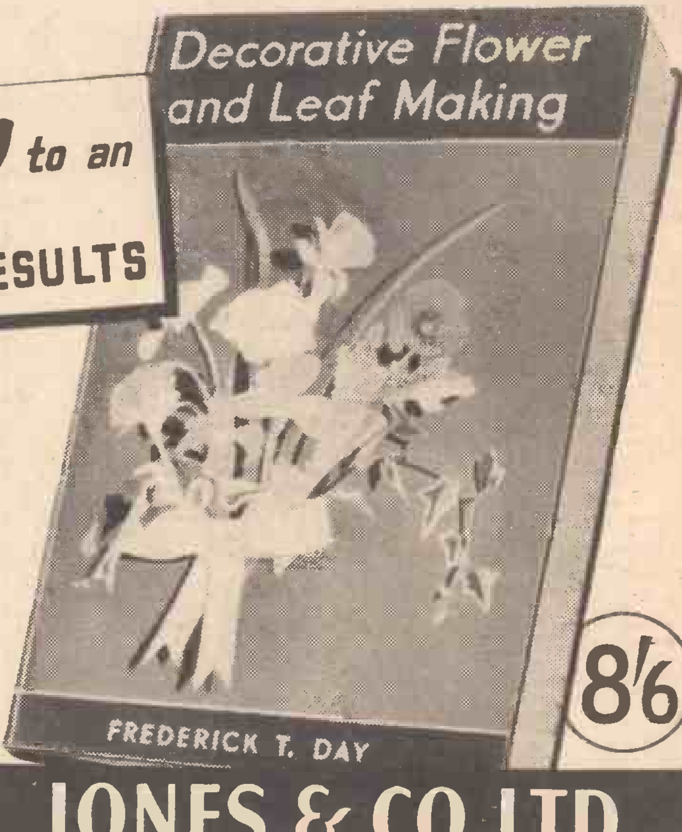

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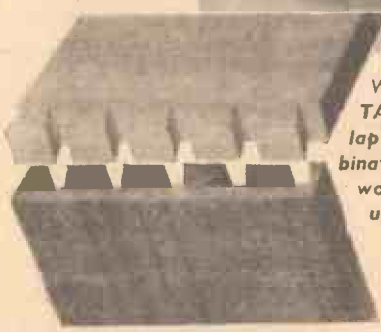

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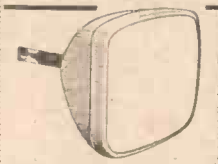

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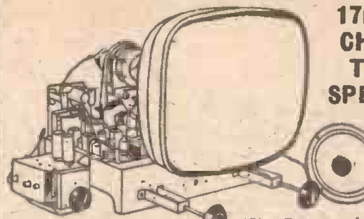

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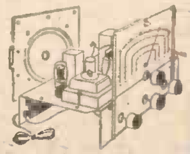

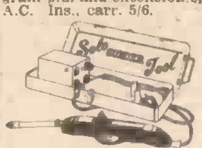

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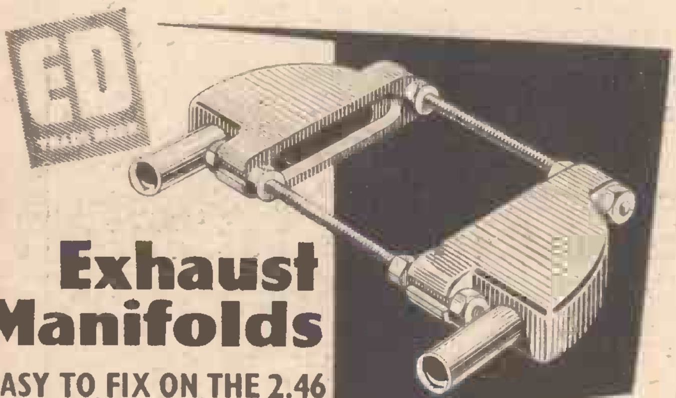

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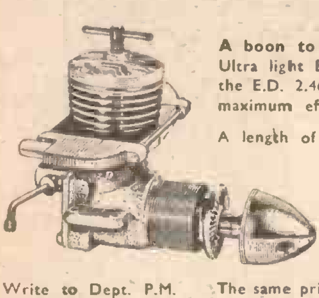

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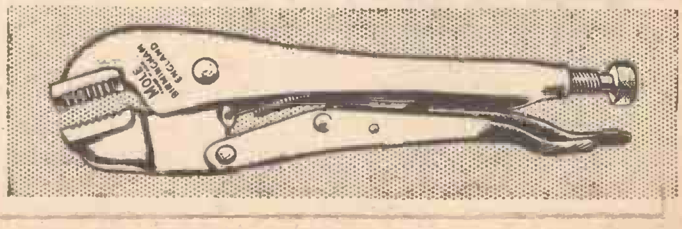

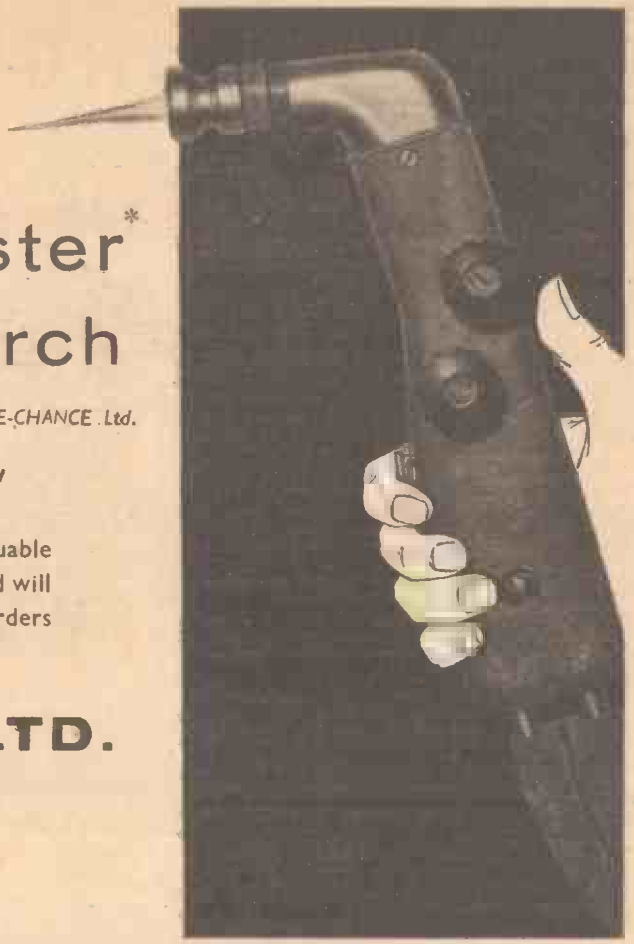

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FAIR COMMENT

LIFE ON MARS?

MUCH of the space fiction of the past has been written about travel to the planet Mars and about imaginary beings who might live there—the "Martians." But it would seem, however, that, in a very limited way, the top scientists of America are tending to agree with the space fiction authors inasmuch as they now think that there is life on Mars.

That there is probably life on Mars was the conclusion reached at a recent meeting of the National Academy of Sciences in Washington. This followed the presentation of details of observation of the infra-red spectrum of the dark areas of Mars obtained at Mount Wilson. A band of spectral lines was obtained at a wavelength of 6.7 microns and this closely compares with spectra of algae found on Earth.

The dark areas of Mars on which the observations were carried out are those popularly assumed to be vegetable life of some form, a conclusion reached after observing seasonal changes of colour from season to season. These changes of colour, it is thought, are attributable to plants showing green vegetation in summer and turning brown in winter; it is also thought that there may be some form of evergreen. This latter assumption is also a result of observation of the location of bands of colour. Dust storms occur frequently on Mars and periodically cover up areas of the surface, but the green always reappears, indicating that the vegetation is either strong and vigorous enough to break through the dust or that it can grow again on top. Water, if it exists at all, can only be present in small quantities and oxygen, similarly, is likely to exist only in minute amounts, so that plant life on Mars must, by Earth's standards, have overcome almost insurmountable difficulty in its fight for survival.

Observations over several years of the ice caps at the poles of Mars have shown that they decrease in size during the Martian summer, which could indicate melting of ice and snow similar to that on Earth. The canals, too, have been reported to become more clearly defined in summer (although they are seldom visible at all). This could perhaps be interpreted to mean that water flows down them when the ice cap melts with a corresponding increase in the vegetation along their banks, which is probably what can be seen through the telescope. Or could it be, as so many scientists have emphatically stated in the past, that the "canals" are not canals at all, but some other phenomena? This is a fascinating field for speculation and perhaps our readers would like to send their views for inclusion in "Letters to the Editor."

BRITAIN'S SPACE PROJECT

ALTHOUGH at the time of going to press, there seems to be no details settled of what role Britain will play in the exploration of space, it is a very welcome decision indeed that Britain is to take some part, albeit a small one. This country's contribution will be concerned mainly with collecting scientific data rather than with space exploration and the first step is to be the building of scientific instruments, for which space will be rented in an American satellite. Design studies are also to be put in hand for a British rocket for launching satellites. This would probably be a three-stage rocket, comprising a solid-fuel rocket to carry the satellite, a middle stage "Black Knight" and a "Blue Streak" missile as a booster.

The chief brake on the British programme would seem to be political, in that it is not wished to spend too much money before the General Election. Some two months ago we said it was a pity that there was to be no British space programme, but now it seems almost as great a pity that although the decision has been made to go ahead, the whole project is likely to be handicapped by lack of money. We have at Woomera the ideal launching site; we have scientists and technicians second to none, but apparently our scientists—the potential discoverers of new worlds—will have to face exactly the same difficulties as did Christopher Columbus when he wanted to sail westwards—no one will finance them!

The July, 1959, issue will be published on June 30th. Order it now!

Making the most of Your CIRCULAR SAW

How to Make Some Useful Attachments

By Jameson Erroll

EVEN the smallest of circular saws is capable of fulfilling functions other than just straightforward ripping or cross-cutting. The purpose of this article is to enumerate a few of the more simply made gadgets which enable grooves, tapers, tenons, etc., to be cut accurately and quickly with the circular saw.

Tapering

Fig. 1 gives details for the construction of a tapering jig the length of which may vary from 2ft. upwards according to the size of the saw table and the class of work likely to be undertaken. In practice, it consists of two pieces of wood hinged at one end (the hinge must be recessed) and fitted with an adjustable lid-stay at the other. The outer edge of this jig, i.e., that farthest from the saw, is run along the saw fence while the work rests against the inner edge and is prevented from sliding along it by the stop.

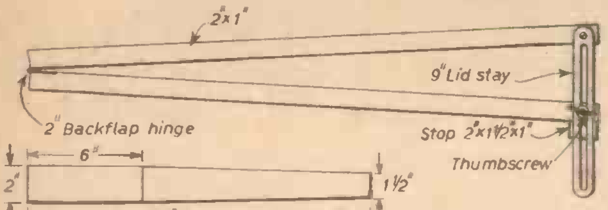


Fig. 1.—Taper jig details.

Assuming it is required to cut a tapered leg as shown: clearly the taper is ¼in. in 12in., and the jig is set for this by holding a ruler at a distance of 12in. from the hinged end and setting the arms so that their inside edges are ¼in. apart at this point. When two sides of the legs have been cut and, consequently, a tapered side must rest against the jig, reset the jig to double the amount of taper, i.e., ½in.

Flute (or Cove) Cutting

To cut coves with a circular saw make up a temporary jig as shown in Fig. 2 so that the side battens—which must be parallel—are the same distance apart as the width of the cove required. Adjust the jig on the saw table so that the inner edges of these battens just touch the teeth of the saw; this gives the correct angle at which to fix the fence which can consist of a length of wood clamped to the saw table. Its exact position is ascertained by arranging it so that the centre line of the proposed cove passes across the centre line of the saw. This is made clear in Fig. 2.

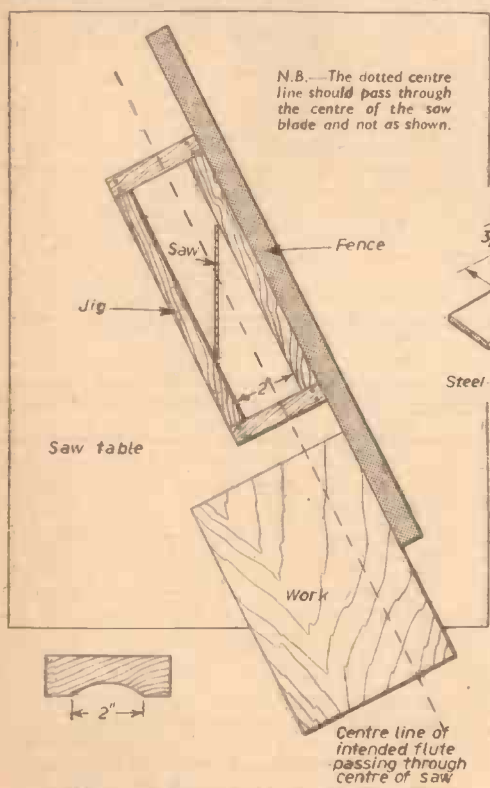


Fig. 2.—Flute or cove cutting jig.

When correctly set up, lower the saw to project about ⅛in. and make the first cut, feeding quite slowly; continue to lower the table gradually, making cuts at each adjustment, until the flute is completed.

Tenon Jig

This piece of apparatus enables tenons of any width to be cut speedily and accurately; their depth is limited only by the depth of saw cut possible with the saw being used. Size is largely a matter of convenience and is naturally related to the work most likely to be undertaken within the limits of the capability of the saw. Those given are used by the author with a 7in. saw and have covered practically all requirements.

The base "A" rests on the saw table along which it is guided by the length of steel which runs in the groove in the table. The face-plate "B" is fixed to the base at right-angles and is made perfectly rigid by an L bracket at the back—not visible in Fig. 3 which is a perspective drawing of the jig. By easing the wingnuts on the ¼in. bolts which pass through grooves in the base and are fixed to the guide bar, the face-plate can be moved to and from the saw in order to accommodate varying widths of tenons. The work to be cut is placed in front of the fixed upright "C" and fastened to the face-plate with a "G" cramp. The jig is then pushed forward past the revolving saw, the work released and turned round, and the second cut made. The depth is, of course, regulated by the rise-

(*Concluded on page 414.*)

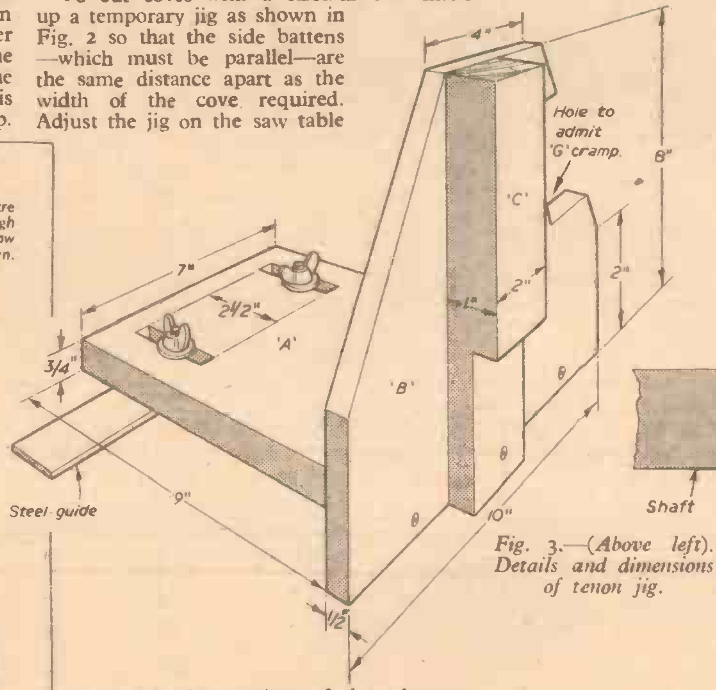


Fig. 3.—(Above left). Details and dimensions of tenon jig.

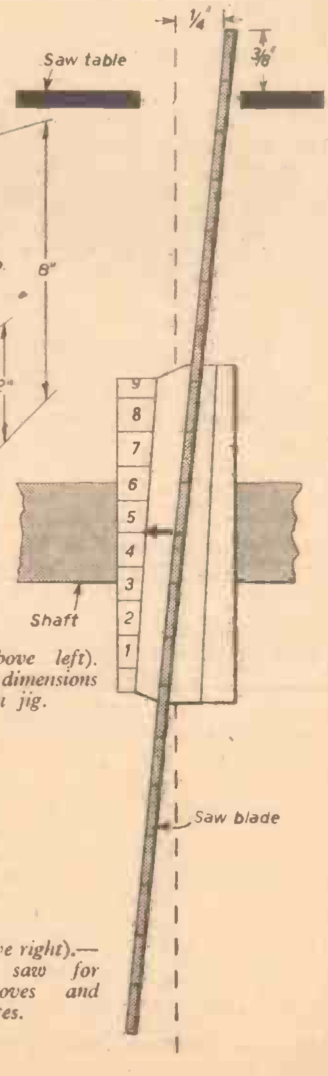


Fig. 4 (Above right).—A wobble saw for cutting grooves and rebates.

A Marionette Stage

C. C. Somerville Also Deals With Lighting Arrangements and Scenery

MARIONETTES, if handled by a good manipulator, can play their parts successfully without the aid of elaborate and gorgeous settings. Nevertheless, a well-fitted theatre with good lighting can definitely improve the performance.

This stage has been designed on the lines of a professional one for use with puppets 18in. to 24 in. high. It is small enough to be used in a large room and yet, if placed on an existing stage or platform, is adequate for the church or village hall. Although the stage has been made portable, the use of pin-hinges, telescoping and jointing could do much to make it even more so; but this is a matter for the individual craftsman.

Construction

Fig. 1 shows the general construction and overall measurements. The marionette stage consists of three main parts: the proscenium or stage front which screens the puppeteers from the audience, the stage on which the puppets perform, and the bridge on which the manipulators work. Whatever the system of construction of a marionette theatre, it must embody the three features described.

The whole stage is built upon the two shallow boxes, each measuring 7ft. 6in. × 3ft. 6in. × 6in. high. They consist simply of a framework of planks 6in. × 1in., and are topped by a sheet of ½in. plywood. The bridge box must be battened across the middle, but this is unnecessary with the stage which has to support only the weight of puppets and scenery. These boxes, when stored, can serve to hold flat scenery, curtain rods and drapery. When in use they are bolted together, one in front of the other.

The four corner uprights made of 4in. × ½in. planks and are 9ft. high. At the bottom they are bolted to the stage boxes, and at the top to 4in. × ½in. battens. The two side battens are 7ft. long and the rear batten 7ft. 6in.

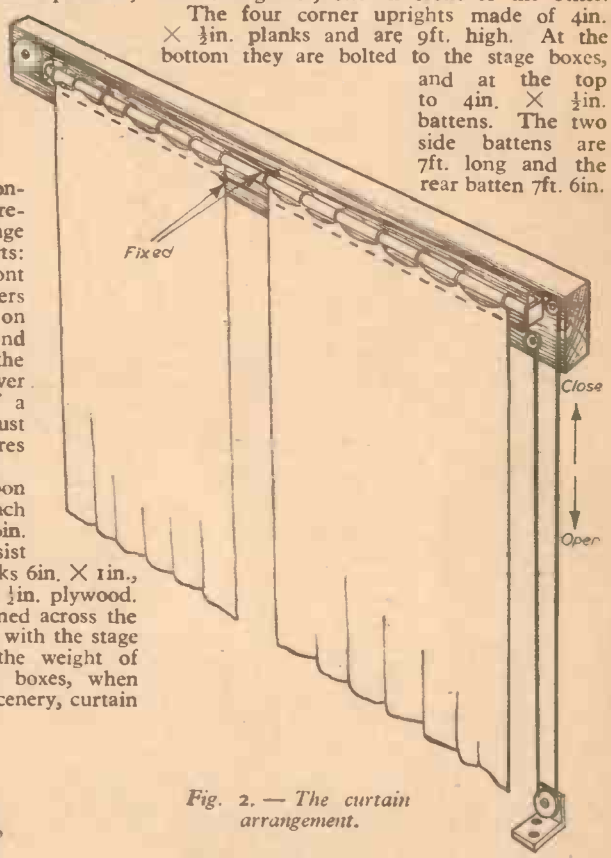


Fig. 2. — The curtain arrangement.

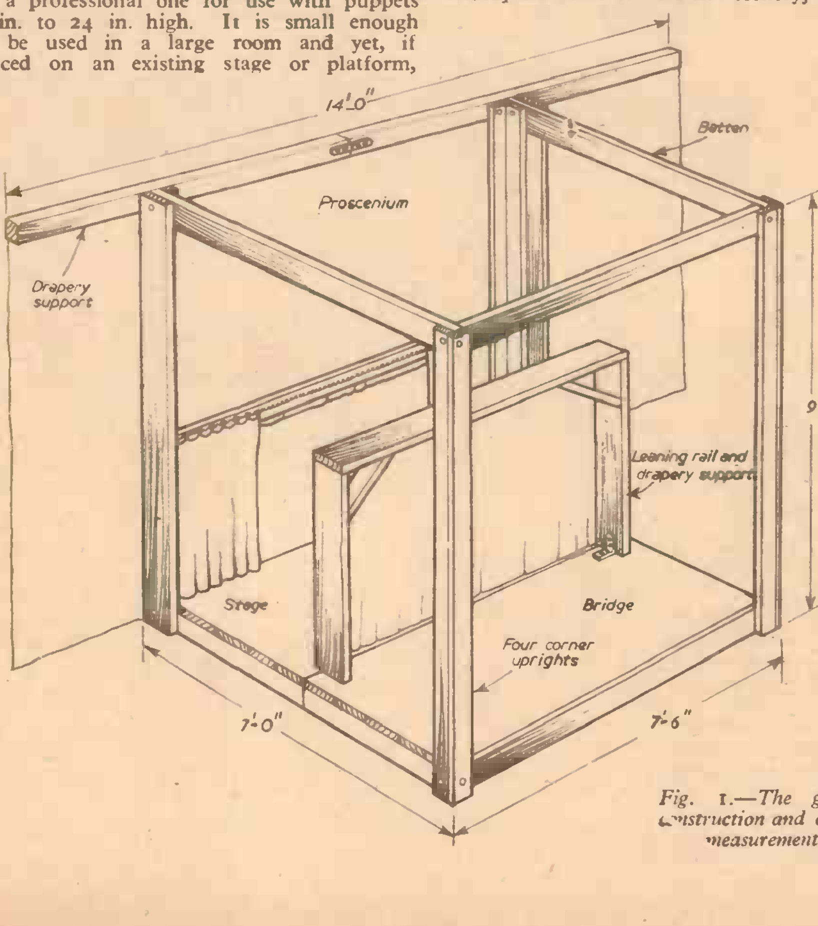


Fig. 1.—The general construction and overall measurements.

The two drapery supports are each 7ft. 1½in. × 1½in. and are joined at the centre by a flat metal strip bolted to each. An alternative system would be to fit a square metal tube over the centre joint.

A lightweight batten runs along the front of the proscenium at a height of 3ft. above stage level. This serves to fix the position of the top of the proscenium opening and acts as a support for the draw curtains.

The leaning rail and scenery support is constructed from 6in. × ½in. battens and is 4ft. high. The top is 6ft. long, and from this is hung the backcloth. The whole leaning rail is bolted to the floor by means of two sturdy angle brackets.

Drapes

The entire front of the theatre is hung with lightweight drapes, blackout cloth being excellent. These drapes can be simply drawing-pinned to the top battens. The draw curtains should be in some rich, contrasting colour, and are hung from either brass curtain rod or spring curtain wire. The method of operating these is illustrated in Fig. 2.

Lighting

Once this basic framework has been constructed you are free to experiment with scenery and lighting positions. The usual puppet theatre lighting is based upon the

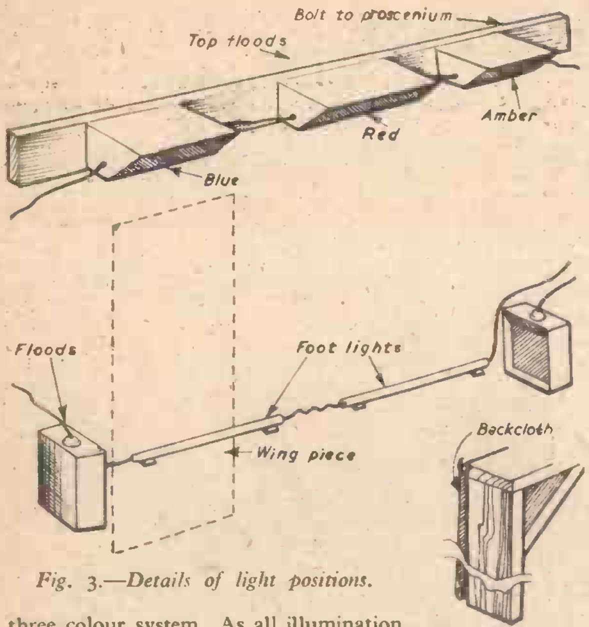


Fig. 3.—Details of light positions.

three colour system. As all illumination will be done by electricity, it is obvious that the work of equipping the theatre with wires and light points should be done, from start to finish, by an expert on the subject, in order to ensure a system both shock-proof and reliable.

For this reason this article will not give any detailed description of the wiring of an electrical circuit for the theatre. The matter here will be confined to the position of the lamps and the general arrangement of the lights.

The system shown in Fig. 3 is adequate for any but the largest theatres, and is, in fact, based upon the system used in Britain's only permanent puppet theatre. The general layout shows strip footlights, two floods in the wings and a batten of three top floods.

The Flood Boxes

These can either be constructed by a tinsmith, or can be improvised from biscuit tins. The boxes are slotted to take coloured gelatine slides, available from any theatrical supplier. In normal use the three top lights will have blue, red and yellow gelatines and the two floods rose-pink and amber. The footlights are left white. These gelatines are available in a wide variety of tints and it would be worth while having a selection of these for special effects. The use of a stronger gelatine called "cinemoid," which though more expensive, is well worth while, since it is non-inflammable and is tougher and does not wrinkle with the heat of the lamps. On a stage of this size the lamps will be 60 watt, and should ideally be connected to a dimmer, a variable resistance supplied by the makers of theatrical lighting equipment.

Scenery

The scenery consists of backcloths and wings with perhaps occasional set-pieces. The backcloths, which hang from the top batten, are painted on linen or scenic canvas, with poster colours, distemper or "flat" oil colours. Rings along the top edge will allow the scene to be fitted to corresponding hooks on the scenery support. The bottom edge of the scene can be weighted by a dowel rod through a wide hem (Fig. 4). This serves a dual purpose, it makes the scene hang well and facilitates rolling for storage. The wing pieces can be painted on cardboard, plywood or hardboard and are strengthened by a thin wood strip behind. The positioning of these can be seen in Fig. 3.

Operating

When the theatre is made, the lights fitted, scenes painted and the puppets ready for action, the play, opera or variety show, or what you will, has to be produced. This means that every action, every stage position and movement, every effect of lighting, sound accompaniment, and the various dialogue will have to be rehearsed and synchronised to ensure a smooth-running show.

For hanging the puppets when they are not "on-stage" cup hooks are screwed at regular intervals along the whole length of the top battens.

The selection of a play or an act of any kind is entirely a matter of personal taste. Remember, however, that the puppet can do many things impossible to the human actor, he can fly, be a dragon or a witch, lose his head or perform a host of other "impossibilities." This would indicate that the puppet's best field is that of fantasy and imagination, which suggests a wealth of possibilities.

On completion of the marionette theatre you might also like to make the accompanying puppets from the design given in

Fig. 4.—Weighting the backcloth by using a dowel rod.

the February, 1959, issue of PRACTICAL MECHANICS. The design was for a 24in. wooden puppet. In our September, 1956, issue we also described the making of a fully articulated skeleton marionette, which readers may find of interest.

A DESK PENCIL SHARPENER

An Effective Idea Described By W. J. Stannage

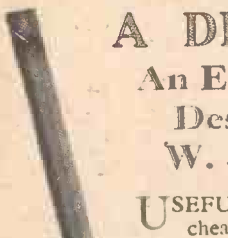


Fig. 1.—Completed sharpener.

USEFUL as the ordinary cheap pencil sharpener is, it has one disadvantage. As there is no container for the waste material this can quickly dirty the hands and clothes, and if scattered will quickly be trodden into the carpet. To overcome these snags the writer fixed the sharpener to the inside of the metal screw-on top of a glass jar (see Fig. 1).

Sharpener Holder

To hold the sharpener in position a metal holder was made up, and Fig. 2 shows the various stages in its construction. However, the first requirement is a hardwood block about 6in. long and the same width and thickness as the actual sharpener. This block is necessary to fold the metal around. The metal required can be a piece of light tinplate, but aluminium was used by the author. A strip of the chosen metal is required, and this should be the same length as the block and about ⅜in. wider. The metal and block are clamped together in the vice, the metal overhanging the block by an equal amount on each side. The metal is then formed over the block to give the channel section shown at "A" in Fig. 2. The centre section is then cut away. The size of this section will depend on the size of the particular sharpener being used by the reader.

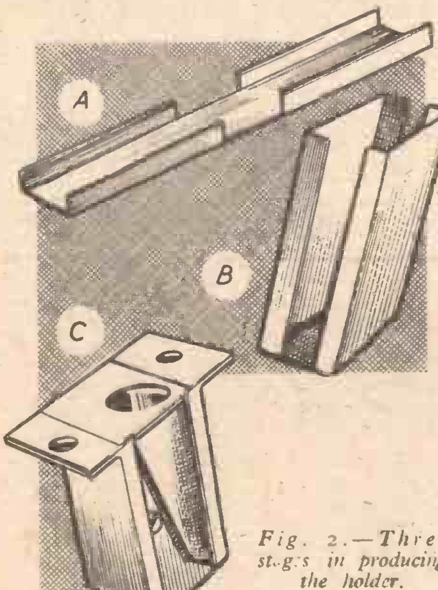


Fig. 2.—Three stages in producing the holder.

The channel is now bent up around the block to give the shape illustrated at "B."

Following this operation the sharpener is slipped into the formed holder and its height marked off. The actual channel sides above this mark are filed away and the metal turned back to form lugs. These are now trimmed to fit inside the lid, and two small holes are drilled. This is stage "C."

Fixing

A hole is now drilled in the jar lid, equal in size to the pencil hole in the sharpener. The two holes are lined up and the position of each fixing hole marked off.

Two small, round-head machine screws about ⅛in. dia. with nuts are required to fix the sharpener holder to the lid. The jar top is now painted an attractive colour and set aside to dry.

If the screw which holds the blade in place fouls the edge of the channel, file a small section of the channel away to clear it.

It is advisable when folding back the fixing lugs to have the sharpener projecting about 1/16in. above these so that the sharpener will be pulled up tight against the lid.

A Single-seater Kayak

By F. Hook

No. 3.—Full Details for Completing the Boat

BEFORE fixing the top side panels, pieces of wood have to be glued and screwed to the bow and stern pieces between the chine and sheer strips.

These are to provide additional surfaces for glue and nails other than the chamfer on the bow and stern pieces. They can be made from pieces of $\frac{3}{4}$in. × $\frac{3}{4}$in. and are planed to the correct slope when in place.

Glue and nail the top side panels as in the case of the bottom side panels. Get a good butt joint of the panels at the centre frame. When the glue is dry trim off the slight overlap at the chine.

It is at this stage that the canoe may be removed from the building form Fig. 21 and then the overlap of the top sides at the sheer may be removed.

Fig. 23. — Deck beams in position.

The Cockpit

Two deck beams are required to form the fore and aft ends of the cockpit. The top curve of these pieces should blend in with that of the smaller frames as shown in Fig. 22.

Mark out the positions of the two side members of the cockpit on the deck beams and with a straight-edge joining them mark the position on the centre frame.

Saw out the unwanted piece of the main deck member, screw the deck beam to it and screw the two ends of the beam to the sheer strips (see Fig. 23).

Now saw out the unwanted part of the centre frame and screw in place the two strips for the sides of the cockpit.

Fitting the Decks

Before fitting the decks, the fore and aft buoyancy compartments must be given two or three coats of aluminium priming paint.

The decks are made from the pieces of plywood remaining from the sheets used for the top and bottom sides. Prepare paper patterns as before. It may be necessary to fair off the main deck beam and the sheer strips so that the decks will fit smoothly on these members.

Glue and nail the deck pieces in place and remember to get a good watertight joint across the top of the fore and aft frames.

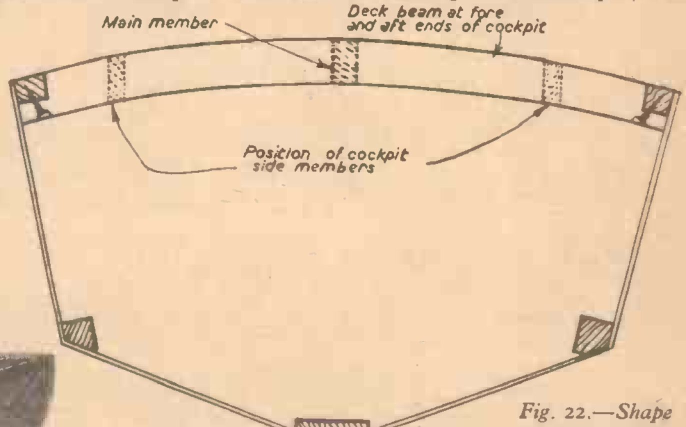


Fig. 22.—Shape of the deck beams.

Fitting the Rubbing Strips and Keel

Invert the kayak and plane along the joint of the two bottom side panels to accommodate the $\frac{5}{8}$in. half-round keel strip (Fig. 19, May issue). This strip runs the whole length of the boat but it is easier to apply in two pieces with a joint in the middle. To bend this moulding round the stem and stern it is necessary to place the ends of the moulding in boiling water for a short time and then temporarily hold in place with one or two screws until the wood is dry.

When the strips have dried out they may be removed and will keep the curve. Under the strips should be placed a thin layer of Seelastic or other similar type jointing compound. The keel strip is then screwed back into place. Clean off any Seelastic which may be exuded. By using this method of fixing the keel strip it will be an easy matter to replace it from time to time as it wears.

The strips at the chine and sheer will be unlikely to get a great deal of wear and so may be glued and nailed into place. Be particularly careful when fixing the chine strip, that, whilst covering the joint

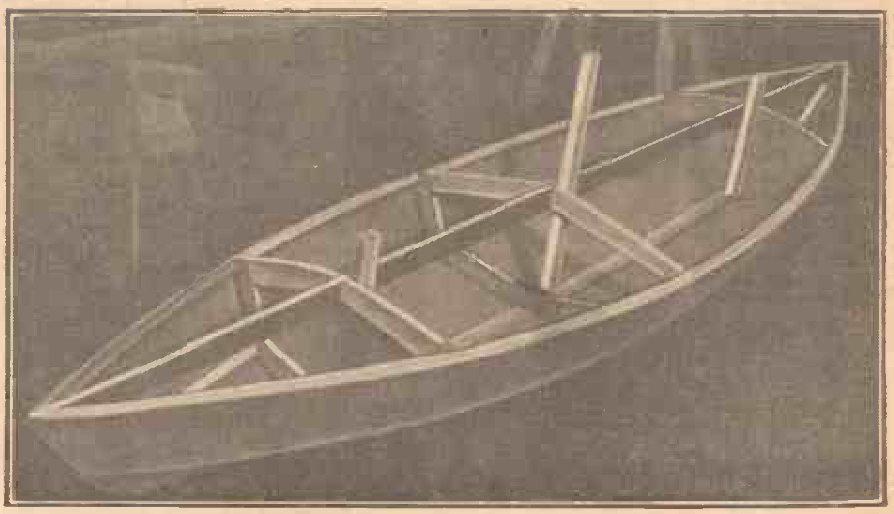


Fig. 21.—The kayak removed from the building form.

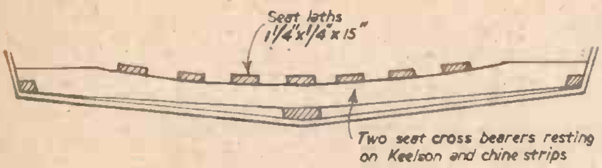


Fig. 24.—Dimensions of the seat.

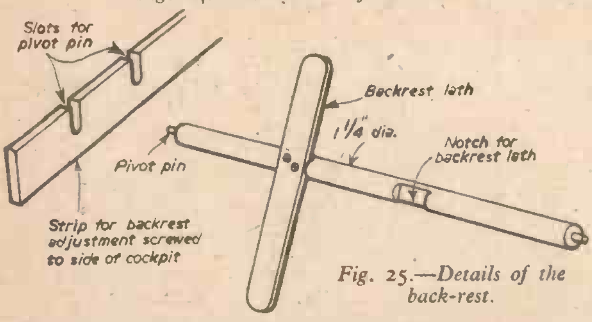


Fig. 25.—Details of the back-rest.

of the pieces of plywood an even smooth curve up towards the bow and stern is obtained. Chamfer off the ends of these strips where they reach the keel strip at bow and stern.

If required, a coaming may now be fitted to the kayak. Such a fitment is not shown in Fig. 1 (last month's issue). However, if the canoe is to be used on the sea, the addition of a coaming would be most desirable.

Finishing

The kayak is now ready for painting. First of all the surfaces should be well prepared with various grades of glasspaper. Any slightly protruding heads of nails must be hammered home flush. All holes should be filled with plastic wood.

First of all apply a primer. Two thin coats of priming are better than one thick one. Next apply the undercoat. Finally, apply the finishing coat. Between each coat of paint the surfaces should be lightly rubbed down with No. 1 glasspaper. Yacht enamels are, of course, the ideal finish but good results can be obtained with any of the enamels advertised as being resistant to heat and water.

When painting is completed four grab handles may be fitted at the sheer, each being screwed astride the fore and aft frames. These handles are useful for portages and for roping the canoe to the car top.

Seat and Back-rest

A seat is made of strips secured to two cross-pieces which rest on the chine strips and the keelson. Fig. 24. These cross-pieces are slightly curved to give more comfort. A suitably sized sorbo-type cushion would be a great aid to comfort and should be fixed in place by gluing or other means to prevent movement during use.

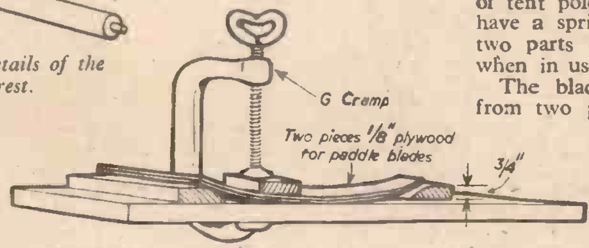
The backrest is made from two pieces of plywood secured to a cross-piece 1in. in dia. (see Fig. 25). This has two metal pegs on the ends which rest in slots on two short members screwed to the side of the cockpit. The movement thus provided will accomodate the backrest to the back of the crew. The two vertical pieces may be padded so as to give greater comfort.

The Paddles

The paddles should be strong yet as light as possible. As the overall length is 8ft. it is convenient to make the handle in two parts with a centre joint like that of tent poles. Professionally made paddles have a spring pin at this joint so that the two parts of the handle will not separate when in use.

The blades of the paddle are built up from two pieces of ⅛in. resin-bonded plywood glued and cramped up as shown in Fig. 26.

The finished paddle can be painted or varnished. Two drip rings are required half way up the handles of the paddle so that water will not run up the arms of the user. These rings may be made from some pieces of rubber sheeting such as is used for soling shoes. The rings should be about 2½in. outside diameter and should be a tight fit on the handles.



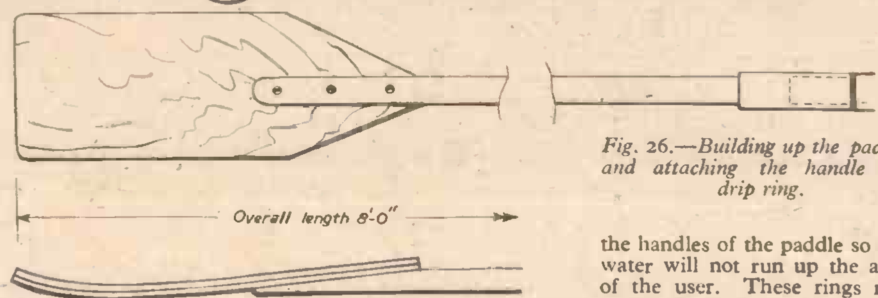


Fig. 26.—Building up the paddles and attaching the handle and drip ring.

Metallised Paper

AN American firm has developed a new metallised paper for bottle labels and carton overwraps. The paper is processed in vacuum chambers where pure aluminium is deposited on it. The finished product looks like aluminium foil, and is easily printed on.

Underground Listening Equipment

THIS equipment has been developed specially for use in searching for trapped miners. No special equipment needs to be carried by the men. They merely strike the walls, roof or floor of the space in which they are trapped and the rescue teams will pick up the sound by means of sensitive electronic detectors. These use a geophone (a special form of transducer) spaced some distance from an amplifier using modern low-noise valves and a special switched input circuit. Clear signals have been obtained over a distance of more than a quarter of a mile, in spite of earth noise from machinery.

Rubber Air Bags For Bunkers

A GERMAN firm has recently discovered a new way for emptying bunkers. In the past manually or mechanically operated pokers were used to detach the mass from the walls. Unsatisfactory results and even serious accidents often occurred. Now rubber air bags are mounted on the internal walls of the bunker or are countersunk into the structure. The air bag consists of an iron base and a soft rubber diaphragm. When inflated the force exerted by a bunker air bag of the standard size is about 32 tons and is sufficient to detach the charge from the sides of the bunker, even in cases where the mass is relatively sticky and adheres strongly to the walls. The number of air bags required depends on the size and type of bunker. It is impossible to burst a bunker air bag because a safety valve opens automatically as soon as the permissible volume of air has entered the bag.

Weather Rocket

TO enable more accurate weather forecasts it may be possible sometime in the future to use an inexpensive rocket made of plastic to be fired daily by meteorologists. The successful firing of the American ARCAS rocket—All-purpose Rocket for Collecting Atmospheric Soundings—has paved the way for these future weather rockets. The rocket would only need a two-man crew to launch it and would run on solid fuel.

Image Converter

A SIMPLE device that photographs stars electronically has recently been used successfully on telescopes in America. The Carnegie Institution in Washington is testing an improved version of this device which will be used soon on an expermental basis for making stellar and planetary photographs. Called an image converter the device is also being tested for photographing the path of high energy nuclear particles passing through a scintillation counter. The device is a 6in. long tube, attached to the eyepiece of the telescope, that receives the starlight at one end. Internally the light is intensified by electronic means and then shown at the other end where it is photographed. The image converter has been used on a 40in. reflector and 24in. refractor. An exposure time of only two minutes permitted photography of stars of the 18th magnitude on the 40in. reflector. The same region photographed directly showed stars of only 16.5 magnitudes.

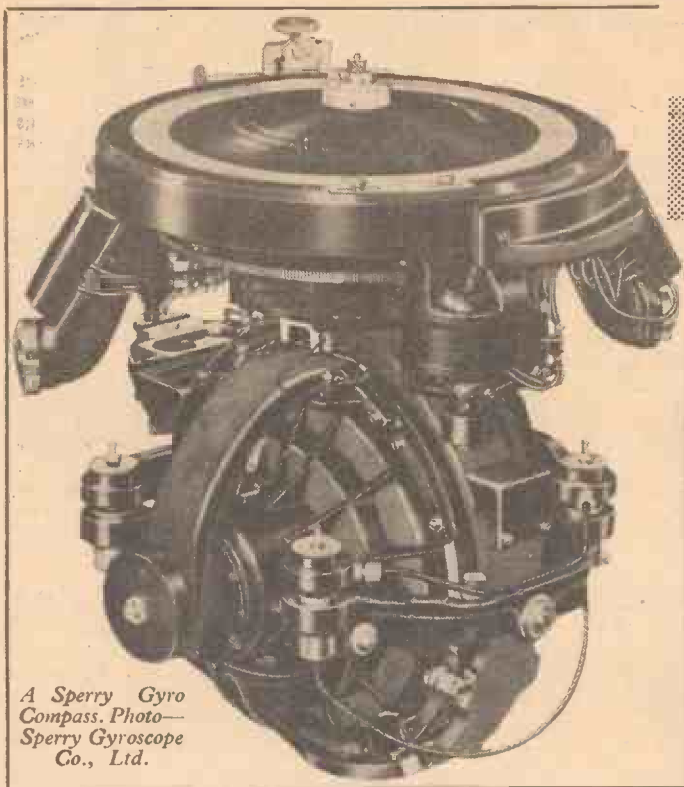
Thames Navigation Service

A NEW service consisting of a comprehensive radio-telephone system extending from London Bridge to the outer limits of the port beyond the Nore, is being opened by the Port of London Authority. Called the Thames Navigation Service, its purpose is to provide ships with information on berthing and all necessary complementary navigational data such as state of tide, position of wrecks and weather conditions, etc., thus assisting ships. Pye V.H.F. frequency-modulated radio-telephones are used throughout the entire scheme. Ships entering the Port of London and requiring information from the Navigation Service will call initially on Channel 16 (156.8 Mc/s). The operations room will then switch to the relevant two-way information channel on which ship and shore can converse.

How the Gyro Compass works

Our Largest Ships Depend on the Accuracy of This Instru.nent

By R. N. HADDEN



A Sperry Gyro Compass. Photo—Sperry Gyroscope Co., Ltd.

THE gyro compass is an instrument that will point to the true north pole, its operation is mechanical and so it does not depend at all on the earth's magnetic field. It depends solely on the properties of the gyroscope to give it its "North seeking" properties, and as a result it is very accurate.

The Gyroscope

To understand the operation of a gyro compass, the working of a toy gyroscope must be studied (see Fig. 1).

Suppose the toy gyroscope to be spinning. It remains pointing in the same direction, even though the baseplate be moved in all directions. It does not matter if the baseplate is twisted or turned or indeed the gyroscope moved sideways, as long as the flywheel continues to spin, the axle will still point in the same direction. Thus it is learnt that *—unless the direction of a gyroscope is forcibly changed it will continue to point in the same direction.*

Effect of a Weight

Assume that the gyroscope is spinning again, but this time a small weight has been hung on it as shown in Fig. 2. A surprising thing now happens; instead of the gyroscope tilting, as might well be expected, it starts to turn about its vertical axis in the direction shown. This turning is known as "precession" and is the second important property of the gyroscope. It can therefore be stated that — *a gyroscope is caused to precess if an upsetting force acts on its axis*, the direction of precession depending on the direction of rotation of the flywheel.

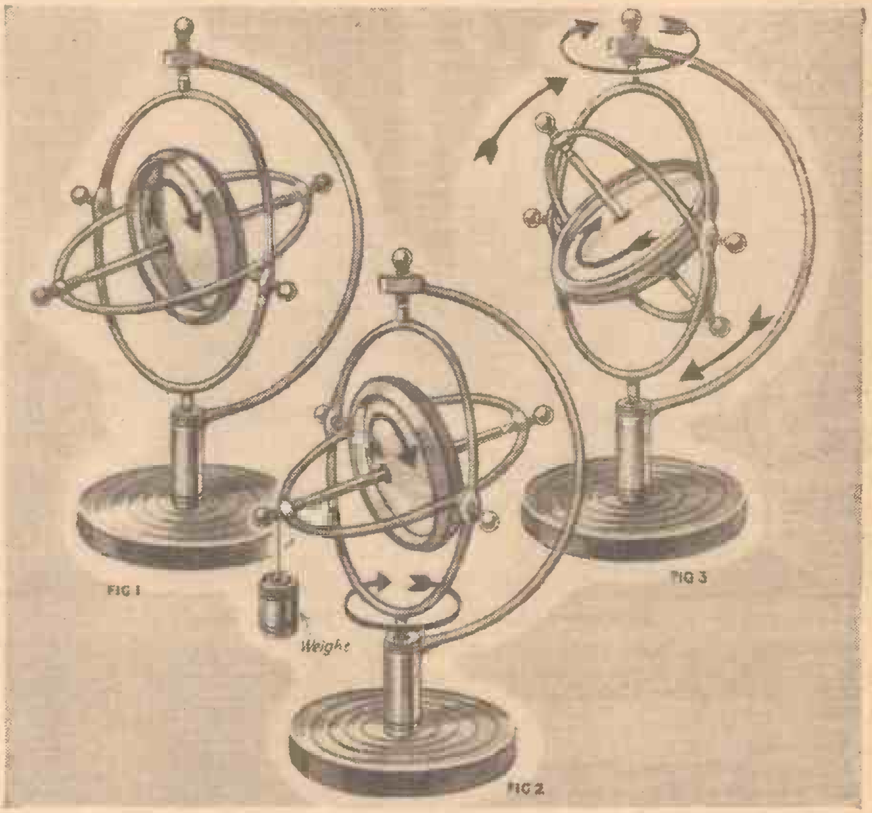
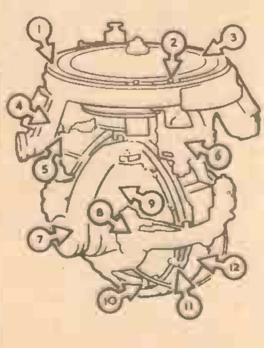


Fig. 1.—The gyroscope. Fig. 2.—A weight attached. Fig. 3.—The gyroscope turning bodily in a vertical plane.



Sperry Gyro Compass (top of page)
KEY
1. Lubber ring.
2. Lubber line adjusting plate.
3. Compass card.
4. Outer member.
5. Follow-up transformer and armature.
6. Azimuth motor.
7. Compensator weights and frame.
8. Control element.
9. Rotor assembly.
10. Rotor case lock.
11. Vertical ring lock.
12. Phantom element.

One Other Property

There is one other property of the gyroscope which ought to be known and which can easily be found from the model. This property is that if the gyroscope is turned forcibly about the vertical axis, the flywheel and axle will rotate bodily within their housing, as shown in Fig. 3. Thus—a *gyroscope will turn bodily on a horizontal axis if it is forcibly caused to rotate about a vertical axis.*

The Gyro Compass

So it is now known how a gyroscope will react in any given circumstance, and this gives the background to understand the working of the gyro compass. The first person to think of using a gyroscope instead of a compass tried to set a motor-driven gyroscope pointing north and south. As has been seen, this should have retained its direction always, thus enabling it to be used as a compass. Unfortunately, although this idea is sound in theory it did not work in practice. This was because it was impossible to have the gyroscope so perfectly balanced that precession did not occur. Even an extra d.op of oil on one bearing caused the gyroscope to precess considerably during one day. For this reason the idea was discarded as useless.

It was obvious that if a gyroscope was to be used at all for a compass something had to be done to make it "north seeking." This was, in fact, done by a very ingenious means, and the principles shown with the toy gyroscope can be applied.

Suppose that an ideal frictionless, perfectly balanced gyroscope is at the equator,

Fig. 4.—Gyroscope at the equator directed east and west and the earth rotating.

and that it is set pointing east and west, as shown in Fig. 4. As the earth revolves the gyroscope continues to point in the same direction. To a man standing on the earth, the gyroscope seems to rotate slowly once every day, so that 24 hours after it was started it is again in the same position from which it started.

So far not much has been done to make the gyroscope north seeking, but now hang a weight under the gyroscope, as shown in Fig. 5. As the earth rotates the gyroscope axle wants to continue to point in the same direction, but it cannot do this as the weight causes an upsetting force to act in it. The more the earth rotates, the greater is the upsetting force; this is shown in Fig. 6. It can be seen from the second experiment that this upsetting force must cause the gyroscope to precess. In fact, the gyroscope continues to precess until its axis is pointing north and south, in which position it is again stable. The sequence of events is shown at (a), (b), (c) and (d) in Fig. 6. Thus, by hanging a weight under a gyroscope it has been made north seeking, and the only place it can come to rest is when its axis is pointing north and south.

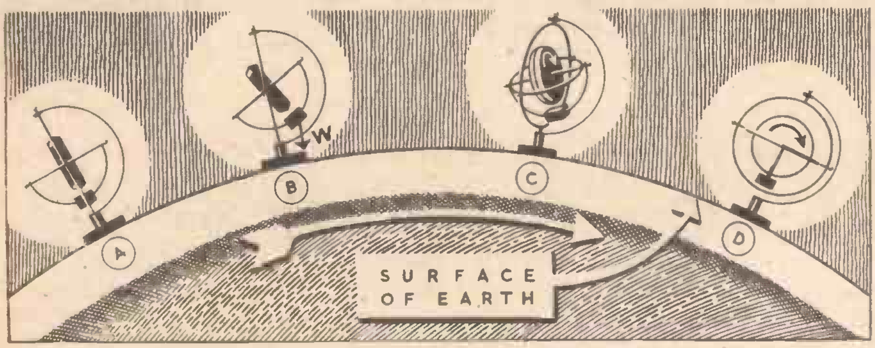


Fig. 6.—The gyroscope is made north seeking.

A Difficulty

Although in the case described the gyroscope is at the equator, it will work equally well when it is at any other point of the earth's surface. However, there is a slight difficulty when using a gyro compass on a ship that is steaming either north or south. Fig. 7 shows the position. The gyroscope wants to keep its axle pointing in the same direction as before, but due to the fact that it is going, say, north, the weight will soon start to cause an unbalanced force. This causes a slight amount of precession, and thus a slight deviation from the true north-south line. This deviation depends on the speed of the ship and on the latitude, but is not affected by the make of the compass. It is known as the speed and course error, and amounts to about 2 deg. in a ship steaming at 20 knots in British latitudes. To overcome this difficulty many modern gyro compasses have their "lubber" mark, which is the mark from which the bearing is read, moved by a servo motor to correspond with the ship's course and speed.

An Actual Instrument

So far only a theoretical compass has been considered, but how are they made in practice? Look at a typical compass, the Brown compass, sketched in Fig. 8. The gyroscope itself and driving motor are contained in the casing (c) which is held in gimbals. On either side of the case there are respectively the working bottles (B) and the damping bottles (b). The tops of both sets of bottles are connected to air chests (k) and (k'), both of which are directly over vertical air jets (j).

Fig. 5.—Adding a weight.

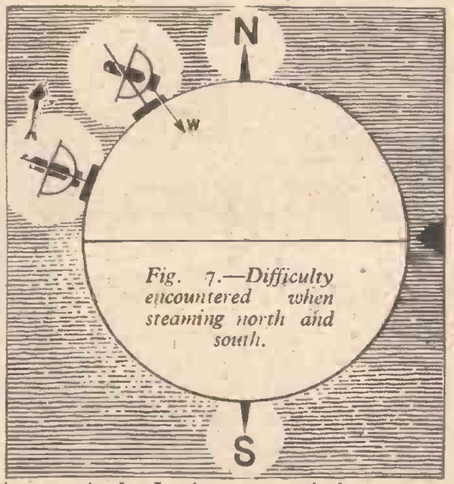


Fig. 7.—Difficulty encountered when steaming north and south.

Suppose now that the compass is not pointing north and south; to a man standing on the earth the gyro casing must start to tip. As the casing tips it causes the air chests (k) and (k') to move relative to the air jets. This causes air to be blown into the lower bottle, in the case of the working bottles, and into the upper bottle in the case of the damping bottles. The air forces the liquid, which is usually kerosene, out of the bottle in question and into the other bottle. These two movements of kerosene on opposite sides of the gyro casing would cancel each other out, were it not for the restriction fitted in the damping bottles. The effect of this is to make the movement of kerosene much slower in the damping bottles, and so it does not cancel out the movement in the working bottles. The result is a gradually reducing unbalanced force is applied to the gyroscope.

Due to the unbalanced force the gyroscope starts to precess. However, as a result of the damping bottles applying a force in the opposite direction, which is gradually cancelling the unbalanced force, the gyroscope does not swing past the north-south line as it would do otherwise. As a result it comes to rest in the north-south line about one hour after starting. The rate of damping can be adjusted by altering the restriction in the damping bottles.

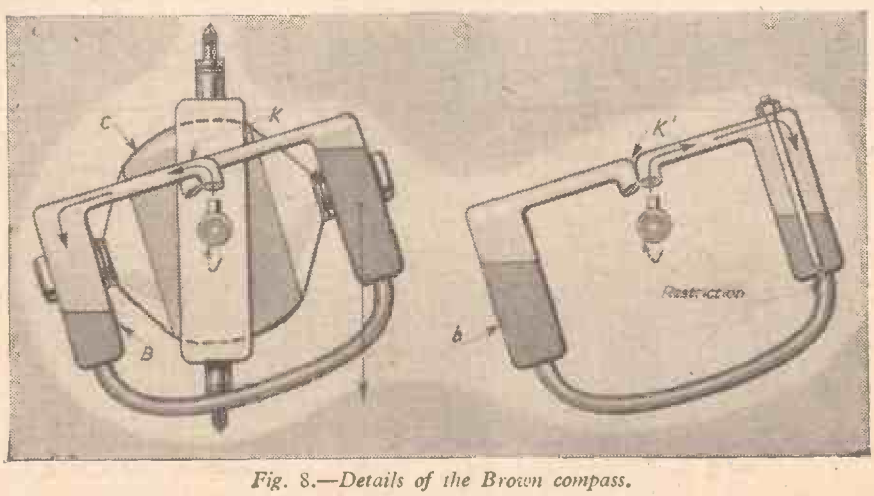


Fig. 8.—Details of the Brown compass.

A 6" Reflecting Astronomical Telescope

Part 2.—Concluding Details of Construction

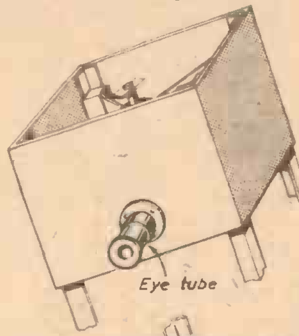
By F. W. COUSINS

CONSTRUCTION of the simple tube is shown in Fig. 10. In the case of the circular tube the writer favours a square end. In Fig. 12 the most simple fixing for the mirror cell is shown. In Figs 10 and 11, there is set out a refined fixing, which allows the mirror to be "squared on" when the operator's eye is at the eye tube. Both these arrangements once set and locked will give absolute satisfaction.

Consider the simple fixing of Fig. 12 first. Four simple bolts of not less than ¼in. B.S.F. are fixed to the tube end. These bolts co-operate with the straps which carry the mirror cell. By adjusting the nuts and the locknuts the mirror and the mirror cell can readily be tilted to bring the optical axis into the correct position.

The refined fixing in Figs. 10 and 11 allows the observer to adjust the mirror while he has his eye at the eye tube of the main tube. When the optical setting instructions are read it will be seen that this refinement is indeed worth while.

The straps of the mirror cell are seen to be carried by screwed rods which screw into the flat screwed members firmly fixed to the tube end. The screwed rods, with their knurled heads, are long enough to reach easily to the operator's hand when his eye is at the eye tube. Once the mirror is satisfactorily aligned the locknuts are tightened.



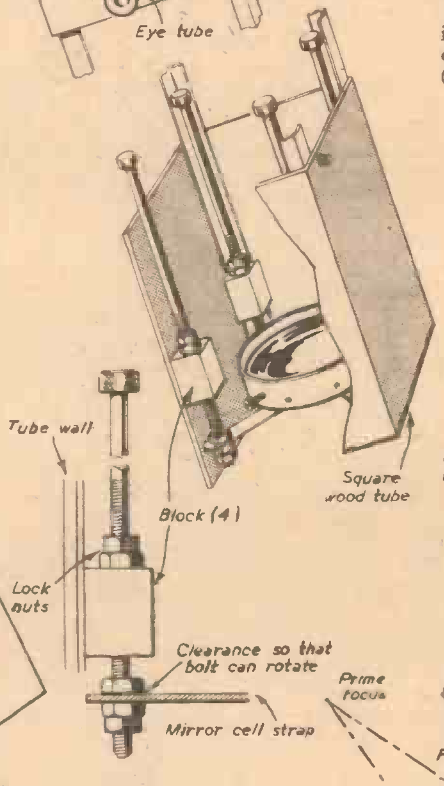


Fig. 11 (Above).—A refined mirror adjustment system.

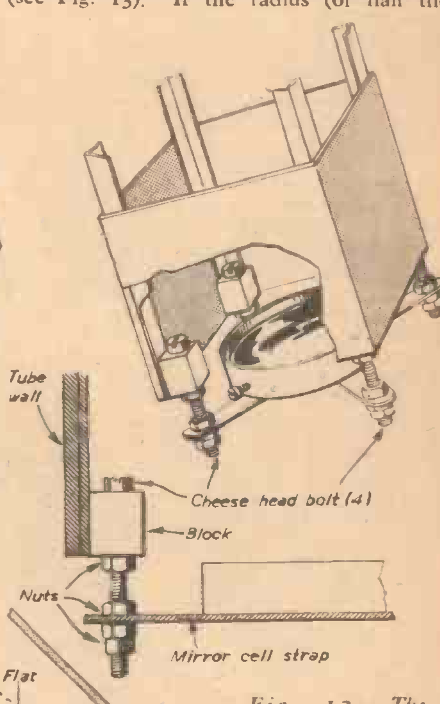


Fig. 12.—The simplest type of mirror adjustment system.

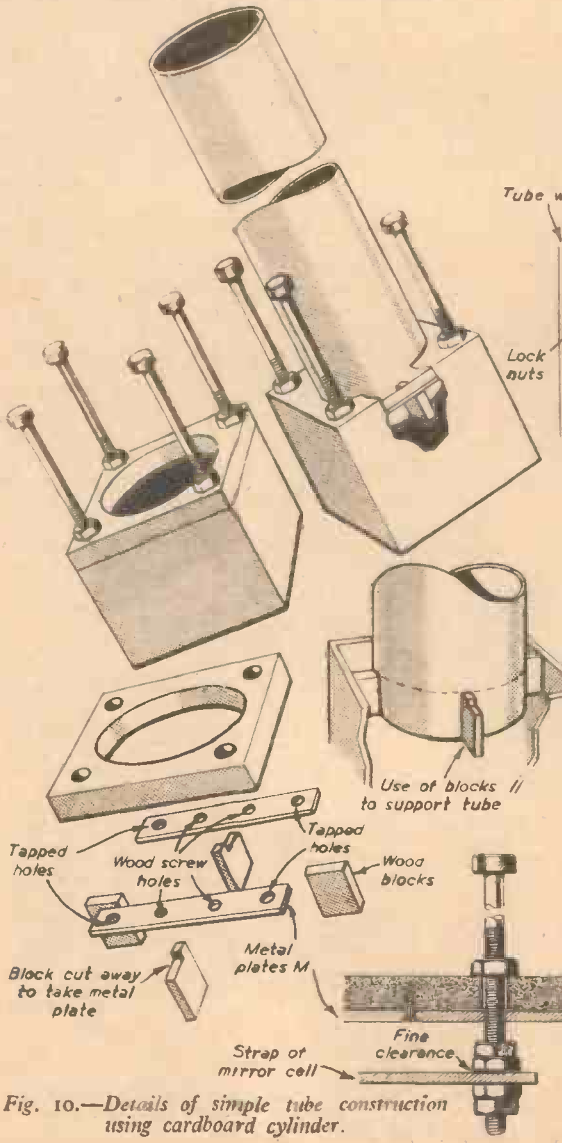


Fig. 10.—Details of simple tube construction using cardboard cylinder.

Position of Eye Tube on Main Tube

When the mirror cell is located it is possible to consider the cutting of the eye tube aperture. This must be done with some care. First examine the back of the mirror; it will be marked with a diamond giving the signature of the maker and its focal length. It is not always possible to have a mirror figured at exactly $f8$, so check the exact focal length of the mirror to be used.

In the writer's view (some will disagree) it is sufficient to bring the focal point 1¾in. *outside* the *outer* wall of the telescope tube (see Fig. 13). If the radius (or half the

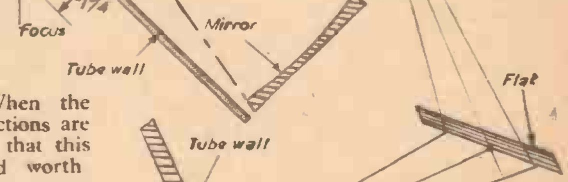


Fig. 13 (Right).—Geometry of mirrors of Newtonian focus.

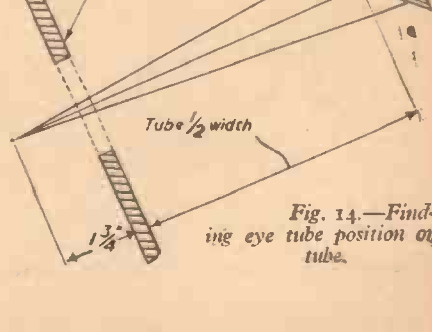


Fig. 14.—Finding eye tube position on tube.

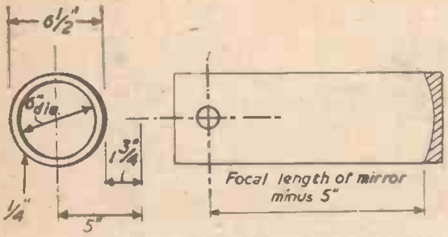


Fig. 15.—Position of eye tube for round tube.

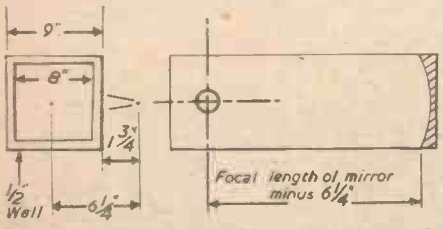


Fig. 16.—Position of eye tube for square tube.

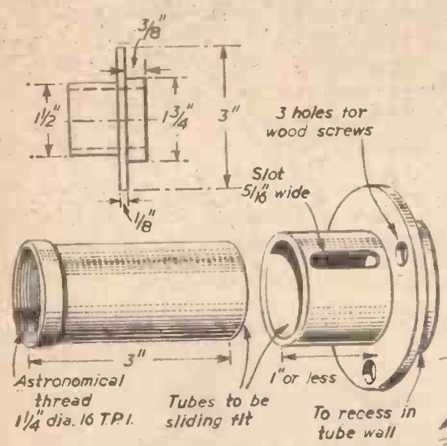


Fig. 17.—Eyepiece draw tube assembly.

side of the square for a square tube) is added to this 1¾in. dimension it will give the amount by which the cone of rays is to be truncated and the point at which the flat or prism is to be placed to intercept the rays (see Fig. 14). Deduct this distance from the focal length of the mirror to obtain the dimension of the centre of the eye aperture from the top surface of the mirror.

For those who are interested in the field of view available the calculations are set out separately on page 397. Those using either a square section tube or circular tube having a half width (radius) lying between the limits of 4½in. and 3¼in. with the 1.3in. flat recommended will obtain satisfactory conditions.

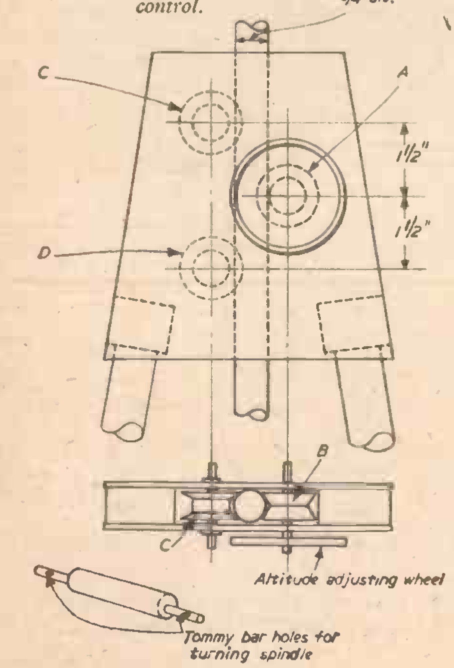
Two examples—one for a 6½in. (outside) diameter tube (Fig. 15) and 9in. (outside) square section tube, Fig. 16, are given below.

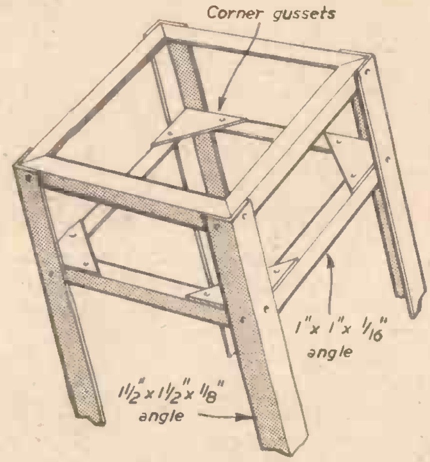
Assume the focal length of the mirror to be 48in.

For the circular tube the eyepiece mount will be (48in.-5in.) from the top of the mirror surface.

For the square tube the eyepiece mount will be (48in.-6¼in.) from the top of the mirror surface.

Fig. 19.—The Appleton altitude control.





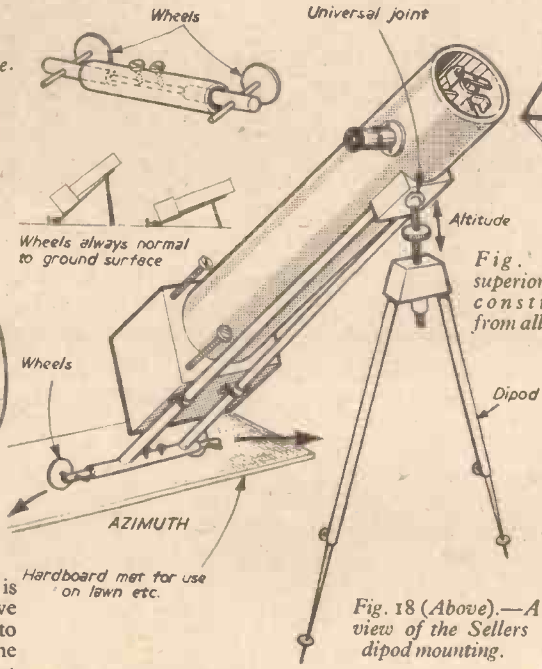


Fig. 18 (Above).—A perspective view of the Sellers dipod mounting.

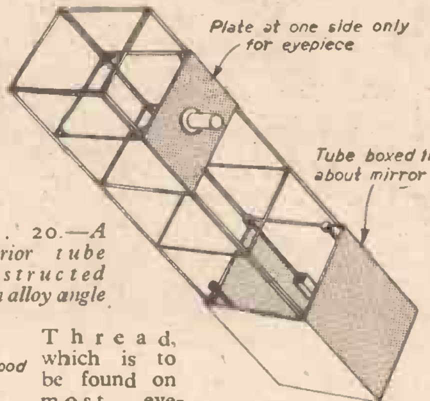


Fig. 20.—A superior tube constructed from alloy angle.

It will be readily seen that the mirror cell should be fixed and satisfactorily placed to allow for some adjustment before the eyepiece aperture is cut in the tube wall.

The Eyepiece Tube Assembly

From Fig. 1 (May issue) it can be readily seen that the eyepiece fits into an adaptor tube which in turn slides in a flanged member screwed to the wall of the main tube.

With the image brought to a focus only 1¾in. outside the tube wall the flanged member must be kept very short. The details of a suitable eyepiece assembly are shown in Fig. 17. The entire fitting is much restricted by the dimensions of the standard Royal Astronomical Thread, which is to be found on most eyepieces. The sizes are given in Fig. 17.

6.—The Sellers Altazimuth Mounting

This mounting is one of the few which is simple yet rigid. The mounting is portable and comprises a dipod

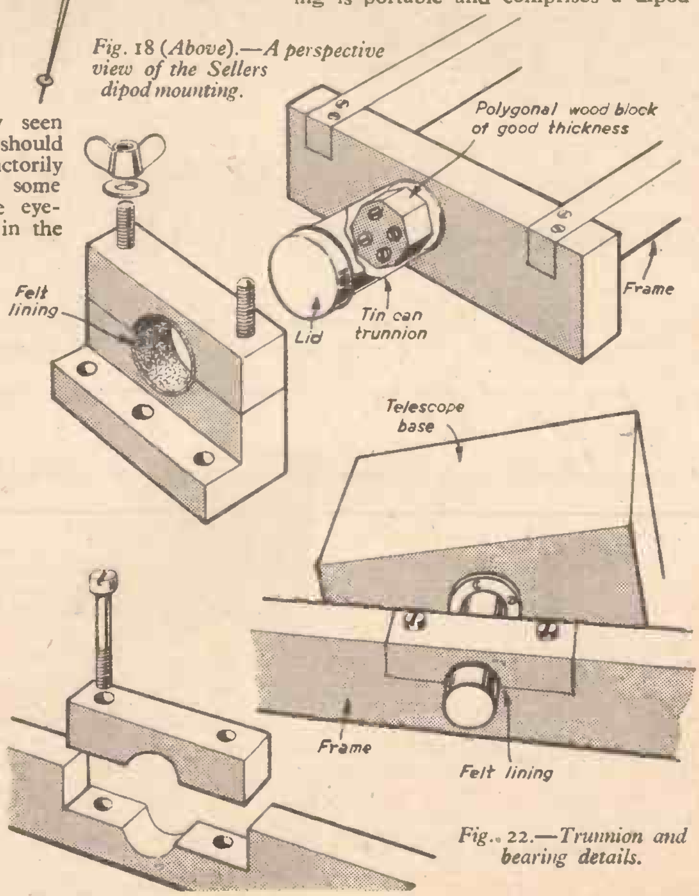


Fig. 22.—Trunnion and bearing details.

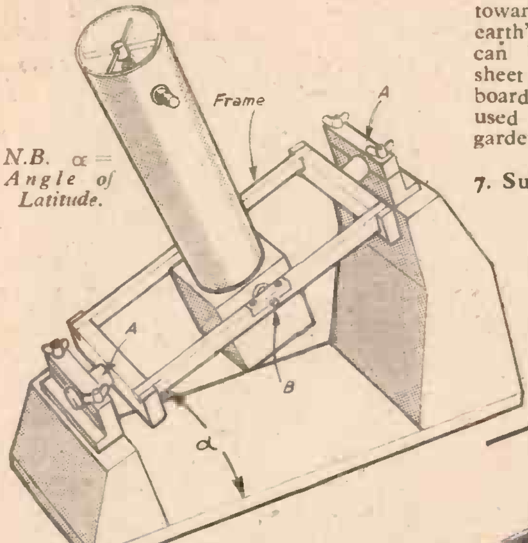


Fig. 21.—General arrangement of a superior equatorial cradle mounting.

having extendible legs fitted near to the eye end of the tube; a long pitched adjusting screw for slow motion in altitude and supports for the tube terminating at the mirror end with wheels for motion in azimuth. The general construction is shown in Fig. 18.

An improvement to the Sellers Mounting was proposed by A. K. Appleton. He provides an altitude control of a novel construction in which a straight tube is moved by the friction-wheel principle. The main tube A (Fig. 19) of ¾in. dia. is arranged to co-operate with an opposed-cone-wheel B, and two running wheels, C and D. The running wheels are on eccentric spindles so that the centres of wheels C and D can be moved towards or away from the centre of the opposed-cone-wheel B. The Appleton altitude control is shown with the most important sizes in Fig. 19.

Adjustable wheels are an advantage for the azimuth movement and this refinement is set out in Fig. 18.

The eyepiece of the tube should be placed as shown in Fig. 18. It is easier to *push* the mirror end from you than pull the eye end toward you to counteract the earth's rotation. The wheels can be placed on a simple sheet of rough surfaced hardboard if the mounting is to be used on a damp lawn or garden.

7. Superior Tube from Angle

This can be made from hard-rolled light alloy of 1½in. × 1½in. × ⅛in. section and other lighter sections such 1in. × 1in. × 1/16in. as braces. The parts can conveniently be held together by Parker-Kalon self-tapping screws. The basic construction shown in Fig. 20 may be followed.

(*Concluded on page 417.*)

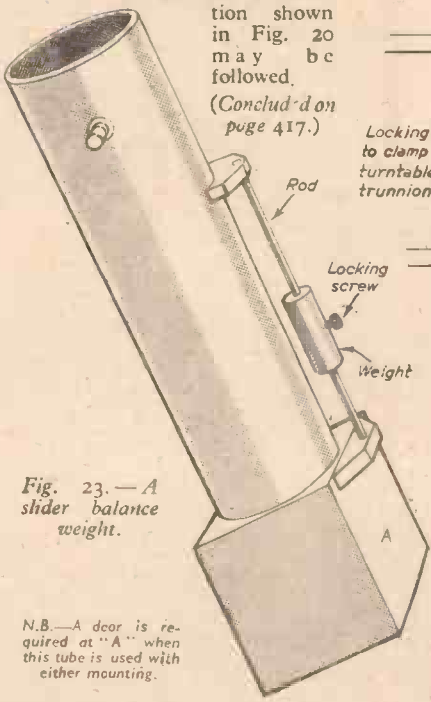


Fig. 23.—A slider balance weight.

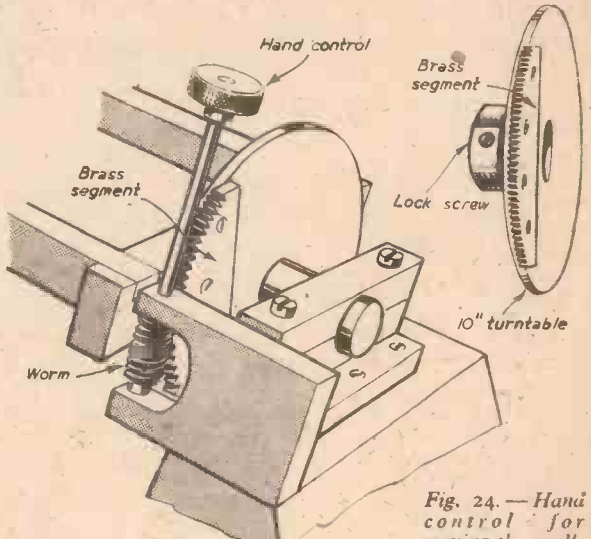


Fig. 24.—Hand control for moving the cradle in a direction counter to the earth's rotation.

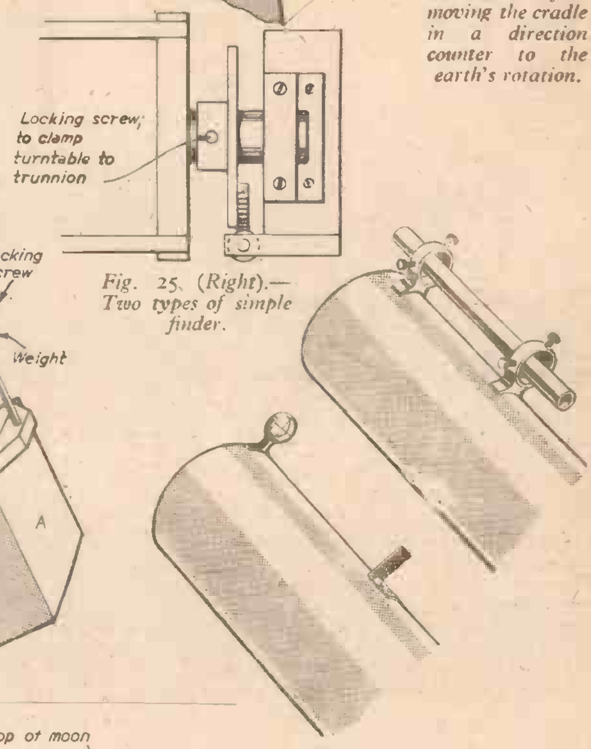
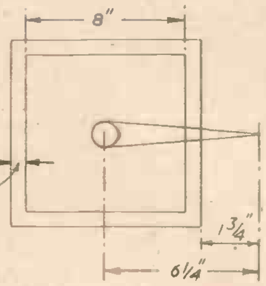


Fig. 25. (Right).—Two types of simple finder.

Appendix :
Available Field of Full Illumination

9in. square tube of ½in. wall.
Focal length of mirror 48in.



The proportion which y bears to x gives the proportion of the diameter of the mirror which the minor axis of the flat mirror must be in order to contain the rays from a point. But for anything wider than this one has in effect to deal with two cones more or less divergent. It is the outside of these cones which must be included in the minor axis

of the flat mirror if full illumination is to be secured.

In this case, let y = 48in.

x = 6.25in.

$$\frac{6.25}{48} = \frac{1}{7.68}.$$

To contain the rays from a point the minor axis of the flat mirror must be the diameter of the main mirror divided by 7.68.

$$\frac{6\text{in.}}{7.68} = 0.781\text{in.}$$

With the flat mirror's minor axis decided at 1.3in. we have (1.3 − 0.781) for illumination of the field, viz., 0.519in.

Now this 0.519in. is (48in. − 6.25in.) from the main mirror, that is 41.75in.

We know from radian measure that 1in. at 57.3in. gives 60 minutes of arc (1°).

0.519in. at 57.3 gives 60 × 0.519 minutes of arc.

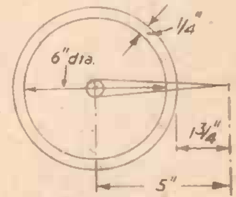
0.519in. at 41.75in. gives

$$\left(60 \times 0.519 \times \frac{57.3}{41.75}\right)$$

minutes of arc.

This works out to 42.7 minutes of arc. A very reasonable though not excessive field taking in the whole moon (½° or 30′) with a good bit to spare.

Six inch circular tube with ¼in. wall (Focal length mirror 48in.).



y = 48in.

x = 5in.

$$\frac{5}{48} = \frac{1}{9.6}$$

To contain the rays from a point minor axis of flat mirror must be diameter of main mirror divided by 9.6

$$\frac{6\text{in.}}{9.6} = 0.625\text{in.}$$

Flat chosen at 1.3 illumination of field is (1.3 − 0.625) = 0.675in.

This 0.675in. is (48in. − 5in.) from main mirror, that is 43in.

1in. at 57.3in. gives 60 minutes of arc.

0.675in. at 57.3in. gives 60 × .675 minutes of arc.

0.675in. at 43in. gives $60 \times 0.675 \times \frac{57.3}{43}$ minutes of arc.

This works out to approximately 54 minutes of arc—a very good field.

Home Made Musical Instruments

How to Make Recorders

Part 5 Deals with Descant, Treble and Tenor Versions of the Instrument

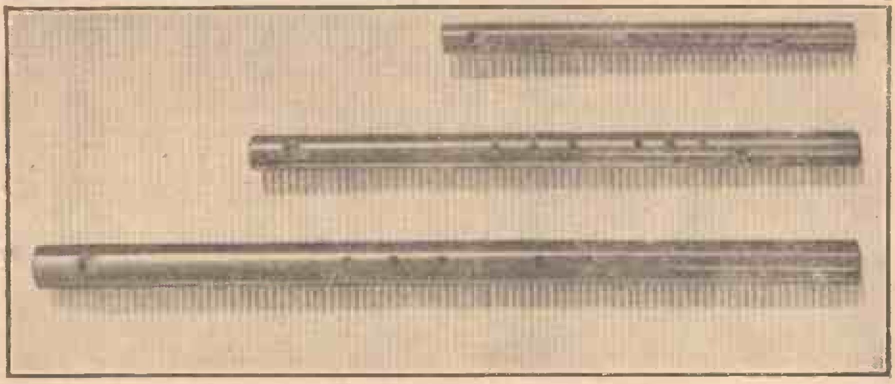


Fig. 1.—Descant, treble and tenor recorders.

THE simple type of pipe made from bamboo tubing which has already been described in our January issue has certain limitations in range. Nevertheless there is an extensive range of musical publications for these instruments. The reader may now like to make an instrument of the recorder type which has a greater range and with which an even greater field of musical arrangements is opened up.

In the days of Shakespeare the recorder was a very popular instrument and many families had consorts of recorders used for community playing in the home.

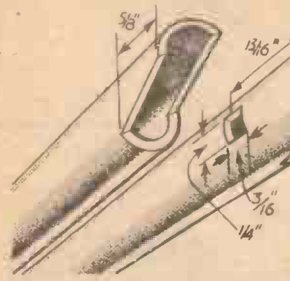


Fig. 2.—Making the recorder mouthpiece.

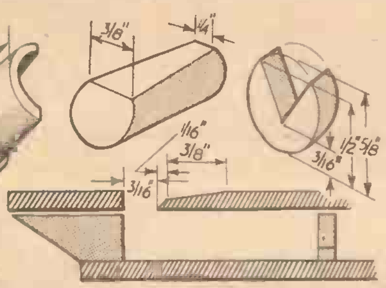


Fig. 3.—Details and fitting of the mouthpiece plug and adjuster.

The note of the recorder is produced in the same way as the bamboo pipe, but the extended range of the instrument is produced by the use of a tapered bore. Without the use of a lathe it will be difficult to make an exact replica of the original recorder. Therefore a design is given for making these instruments in a simplified way by using parallel bore tubes of ebonite and inserting certain restrictions in the bore which will give the extended range and fingering of the original recorder. Thus, only the simple tools already described will still be necessary.

The fundamental notes of the three recorders to be described are different from those of the bamboo pipes. The descant recorder is tuned to C, a tone below the fundamental of the treble bamboo pipe. The treble recorder has the fundamental of F, in interval of a fifth below the descant instrument. The tenor recorder is an octave below the descant instrument. These are all shown in Fig. 1.

The Descant Recorder

The material needed for this instrument is a 12in. length of ebonite tubing with a bore of ⅜in. and wall thickness of ⅛in. Although ebonite is specified there is no doubt a number of more modern types of plastic tube which would do quite as well provided they have the dimensions stated. A piece of ⅝in. diameter rod is necessary to form the plug at the end of the mouthpiece.

The mouthpiece is made in a similar way to that described for the bamboo treble pipe. Dimensions only are different. The piece removed from the end of the tube extends ⅝in. down from the end of the tube (Fig. 2). The opening for the windway is centred 13/16in. from the end of the tube, and is drilled and filed to be rectangular in shape—¼in. across the width of the tube and 3/16in. down the tube (Fig. 2). A shallow windway is filed on the inside of the tube leading to this opening. Trim up the corners of the windway with a sharp ¼in. chisel.

The slope below the rectangular opening is ⅜in. in length and in two stages. Work the complete slope at first leaving a blunt top about half the thickness of the bore. Then for a distance down of 1/16in. bring the top edge to a sharp edge (Fig. 3).

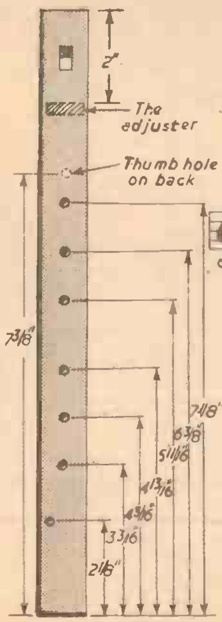


Fig. 4 (Left).—Finger hole distances for the descant recorder.

The end of the instrument is plugged with a piece of ebonite rod. Some care is needed in fitting this plug to prevent cracking the tubing. Gradually reduce the diameter with a fine file and emery cloth so that the plug will go into place with light pressure only. It should reach to the top of the rectangular opening.

On the plug file a "flat," ⅜in. wide at the end leading to ¼in. wide at the inside end. Trim off the surplus material so that the instrument is comfortable between the lips (Fig. 3).

In order to produce a wider range of notes on this instrument a small adjuster is placed inside the bore at a distance of 2in. from the extreme top end of the recorder. This is made from a piece of the ebonite rod and is ⅛in. in thickness. A V-piece is sawn from the adjuster as shown in Fig. 3, which gives the measurements of the segment required. This segment is pushed into the bore of the instrument with the V towards the windway. For the time being the adjuster is 2in. from the end of the instrument but it may subsequently have to be slightly moved up or down the tube from this position. Replace the plug and the instrument is ready for tuning.

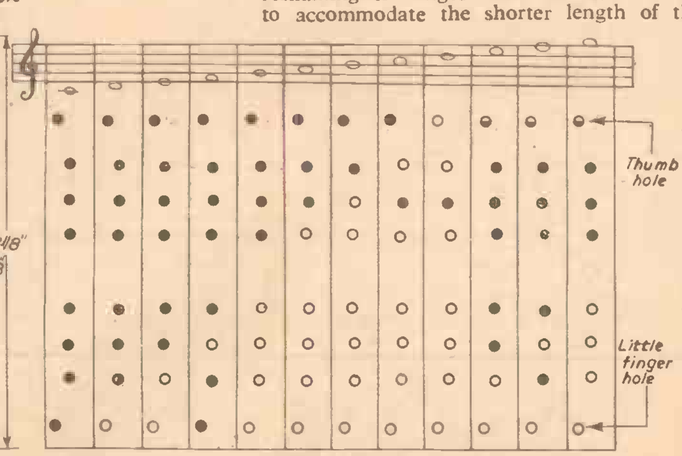
Tuning the Instrument

Test the note produced by the recorder and by removing small pieces from the lower end of the tube raise the pitch so that the fundamental note is C.

Positions of the holes are shown in Fig. 4.

The first hole, covered by the little finger of the right hand when playing the instrument, is placed ¼in. off centre of the remaining six finger holes above. This is to accommodate the shorter length of the little finger. The hole is centred 2⅛in. from the bottom of the tube. Drill it 3/16in. in diameter and gradually enlarge it to produce the note D. It will be found that the sharp pocket knife will cut the ebonite quite well. Alternatively a suitably tapered reamer or tang of a file could be used.

The second hole, now in line with the



● Closed hole ○ Open hole ◐ Half closed hole

Fig. 5.—Fingering of the descant recorder scale.

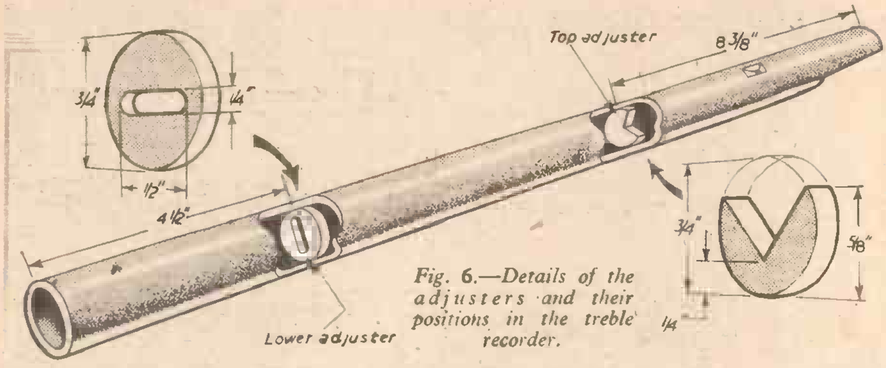


Fig. 6.—Details of the adjusters and their positions in the treble recorder.

windway opening, is centred 3 3/16in. from the base of the instrument. Drill it 3/16in. dia. and open out gradually to produce the note E.

The next hole is that to produce F and is centred 4 3/16in. from the end of the tube. This hole is tuned to F natural with the first two holes covered. With these uncovered the note will be F sharp.

The G hole is drilled 4 13/16in. from the bottom end of the tube. Proceed carefully with the tuning of this hole as it will be a little smaller than the preceding holes. This completes the holes covered by the right hand and attention should now be given to the holes for the left hand.

The next hole is 5 11/16in. from the base and tuned to A. It is followed by the B hole which is 6⅜in. from the end. Drill all these holes with a 3/16in. drill and open carefully so as not to make them sharp.

The front top hole is 7⅛in. up from the base and is tuned to C sharp—with the next hole below covered it will be C natural. Test for both notes carefully.

Finally, at the back of the instrument is the thumb hole, 7⅞in. from the base of the recorder. This is tuned to D with the second from the top front hole covered. Refer to the chart in Fig. 5, which shows the fingering for the various notes of the scale with recorder fingering.

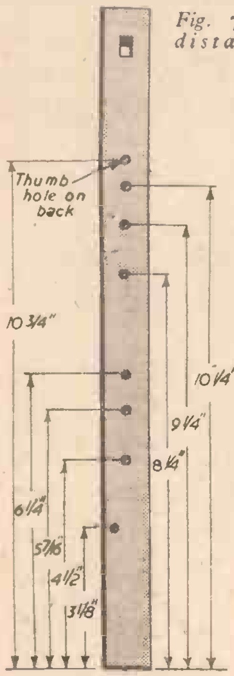


Fig. 7 (Left).—Finger hole distances for the treble recorder.

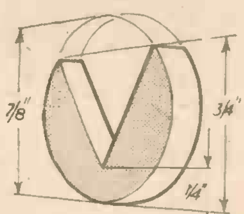


Fig. 8.—Upper adjuster for tenor recorder.

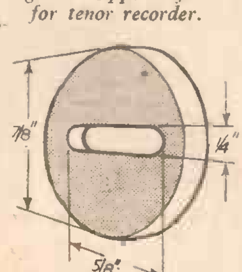


Fig. 9.—Lower adjuster for tenor recorder.

Now comes the final positioning of the small adjuster placed inside the instrument so that notes in the upper octave of the instrument are produced accurately.

Close all finger holes so that the lower C note is produced. Blow a little harder and C an octave above will be produced. Blow still harder when the note will spring up to upper G. It is these two upper octave holes that must be listened to with care to see if they are in fact true octaves. This can be done by ear or compared with the piano or other tuning instrument.

Should these upper holes be a little sharp then the adjuster must be pushed very slightly down the inside of the bore. Move but a fraction of an inch at a time and test again and again until the true octaves are produced.

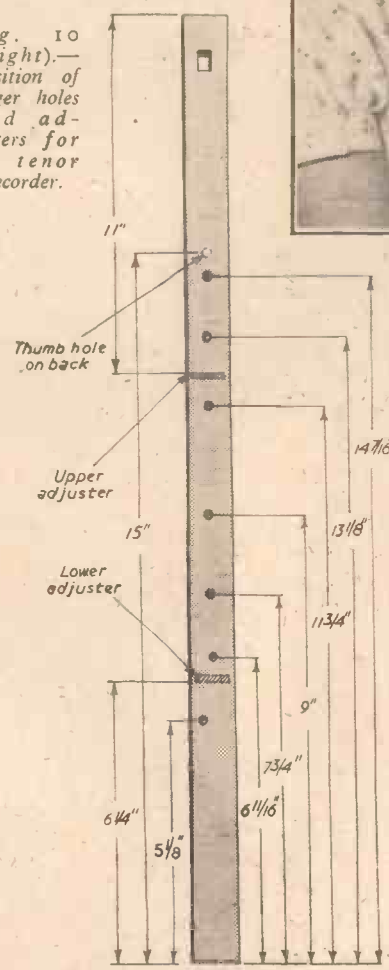


Fig. 10 (Right).—Position of finger holes and adjusters for the tenor recorder.

On the other hand if the octave notes are flat then the adjuster must be moved nearer towards the mouthpiece.

It should, of course, be noted that the upper G referred to as the second harmonic of the fundamental note is not generally produced by this method when playing the instrument but is played by uncovering the lower four holes and thumbing or nailing the thumb hole and blowing slightly harder. It is perhaps outside the scope of these articles to give full details of playing the instrument and the reader is asked to refer to one of the many tutors available from music publishers concerned with the playing of recorders. It is sufficient to say here that notes in the upper octave are produced by sliding the left thumb at about right angles to the instrument so that the edge of the nail is across the diameter of the hole, thus partially uncovering the hole. Then by using the fingering for the lower notes and slightly blowing harder the note will spring up the octave.

Fig. 11.—A player with the treble recorder.

The Treble Recorder

The treble instrument is the next to be made in the consort of recorders. The ebonite tube for this is of ¾in. bore and ⅛in. walls. A piece 18in. in length is required and a piece of rod ¾in. dia. to fit the mouthpiece end.

Saw out the segment from the end of the tube in the usual way ⅝in. down from the end of the tube.

The wind opening is 1 1/16in. from the end and is drilled and opened out to 5/16in. width and 3/16in. depth. The shallow wind way is filed and chiselled out on the inside of the bore, about 1/32in. deep. The slope to the lower edge of the opening is made in two stages as before—⅛in. long with a blunt edge at the top. Then sharpen the top edge extending down the primary slope 1/16in. Fit the mouthpiece plug carefully so as not to split the tube.

For this instrument two small adjusters are required (refer to Fig. 6). The one pushed in 8⅜in. from the top end takes the same shape as that used for the descant instrument (Fig. 6). The lower one which is pushed up 4½in. from the base is a complete circular piece ⅛in. thick which has a rectangular opening drilled and filed out as shown in Fig. 6. This lower adjuster is used to bring the position of the first finger hole higher up the tube so that it can be covered comfortably by the little finger.

First, then, make the two adjusters and push them carefully into place with a piece of ½in. dowel rod (Fig. 6).

Proceed then to tune the fundamental note to F. Take care as usual not to get the note sharp. When the correct note has been attained, test the position of the lower adjuster. It should now be approximately 3¾in. from the lower end.

The position of the finger holes is given in Fig. 7. The first finger hole is drilled 3/16in. dia., but is ¼in. off centre of the wind-way opening for ease of covering with the little finger of the right hand. It is centred 3⅛in. from the base of the recorder. Open it gradually to be tuned to G.

The second, third and fourth holes are positioned at 4½in., 5 7/16in. and 6¼in. respectively from the base of the tube. The third hole may be rather larger than the others. The second hole is tuned to A and the third to B flat with the lower two holes covered, or B natural when uncovered. The fourth hole is tuned to C.

The top three finger holes are centred 8¼in., 9¼in. and 10¼in. from the base. The fifth hole is tuned to D and the sixth to E. The tope hole is tuned to F with the hole second from the top covered.

Finally, the thumb hole at the back is 10¾in. from the base. This hole is tuned to upper G with the hole second from the top covered.

When all the finger holes are completed, attention can now be given to the correction of the notes of the upper octave by slight movements of the adjuster in the same way as described for the descant recorder.

The Tenor Recorder

For the tenor recorder a piece of ebonite tubing 24in. long and with 1in. bore and ⅛in. thickness walls is required together with a piece of 1in. dia. ebonite rod for the mouthpiece plug and the adjusters.

The mouthpiece is constructed in the usual way except that the piece to be removed is sawn away ⅞in. from the end of the tube. The opening is centred 1⅜in. from the end of the tube and is filed out to be 7/16in. and 3/16in. deep. File out and finish with a chisel the shallow windway leading to the opening. The slope to the lower edge of the opening extends down for ½in. with the blunt top, which is afterwards sharpened, extending down 1/16in. Fit the end plug carefully, making a flat at the end ½in. wide and narrowing down to the width of the opening. Trim off the surplus part of the plug and smooth off with file and emery cloth.

Two adjusters are needed as for the tenor recorder. They are shown in Figs. 8 and 9. The lower one is pushed up the tube 6¼in. and the upper one is pushed down the tube 11in. from the extreme end.

With the adjusters in place the tuning of the instrument may be proceeded with. This tuning is precisely an octave below that of the descant recorder, therefore, proceed to tune the fundamental note to C, which will be equivalent to the middle C of the piano keyboard.

The first finger-hole is off-set from the centre line of the other holes by ¼in. so that it will fall easily under the little finger. It is 5⅛in. from the bottom end of the tube and is tuned to D (Fig. 10).

The next hole is tuned to E and is 6 11/16in. from the lower end of the tube. The F hole is centred 7¾in. from the base and enlarged to be in tune with the two lower holes covered. With the lower holes exposed it will produce F sharp. The remaining right-hand hole is 9in. from the end and is tuned to G. All these holes will be a little larger than usual, being a trifle over ¼in. dia.

The holes for A and B are measured up 11¾in. and 13⅜in. from the base. The top C hole is centred at 14 7/16in. up and remember to tune it with the hole next below covered.

Finally, the thumb hole at the rear of the instrument is 15in. from the base. It is tuned to upper D with the second down front hole covered as for the note top C.

It now remains to test the harmonics of the instrument as explained for the other types of recorder. A completed treble recorder is shown being played in Fig. 11.

A Pan and Tilt Head

Use This with Your Studio Camera By R. Lister

THE fully adjustable head shown in Fig. 1 is easily made and will give perfectly rigid support fo a camera up to quarter-plate size, at any angle even when fully extended and out of balance. For vertical work it throws the camera baseboard well clear of the tripod legs. It has the added advantage that the individual movements—up and down, sideways and angular set of the camera—can be adjusted independently and precisely and once fixed there is no fear of the setting being disturbed when inserting or removing focusing screen and dark slides or manipulating the swing back.

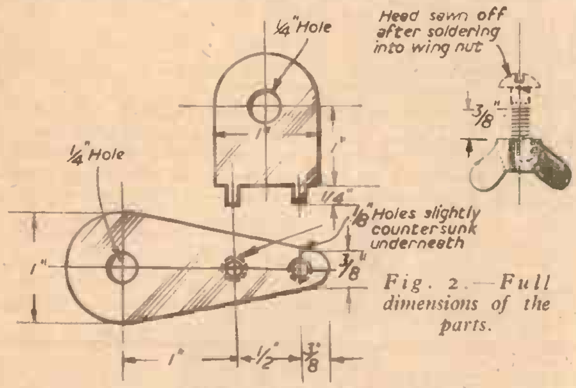


Fig. 2.—Full dimensions of the parts.

Materials Required

These are as follows: about 10in. of 1in. × ⅛in. brass strip; two ¼in. Whitworth brass round head screws; three ¼in. Whitworth brass wing nuts; two ¼in. brass washers.

Construction

Fig. 3 shows the arrangement of the component parts and Fig. 2 gives the dimensions of each piece. The two movable parts of the head are identical and each is constructed of two shaped pieces which are shown ready to rivet together. For this job, the projections which form the rivets should be softened by heating and quenching, and when hammered down the excess length will just about fill the countersinks of the rivet holes, leaving a slight hump to be filed smooth. One of the ¼in. screws is used for the pivot, and the other is screwed into one of the wing nuts, soldered in position and then the head sawn off as shown in Fig. 2. The wing screw so made is to attach the camera by means of its tripod bush.

Optional Modification

Reference to Fig. 1 will show that a long pivot screw with a 1¼in. tubular distance piece has been used to bring the middle nut into a more convenient position. If the head is not to be carried about regularly this is worth doing, but if weight and compactness are considerations it is not essential and has therefore not been included in the drawing.


Fig. 1.—The tripod head in use.

There may arise one small difficulty. The standard ¼in. Whit. centre screw on the tripod usually projects about 5/16in. above the top plate and as the strip out of which the head is made is ⅛in. thick this will leave 3/16in. of thread for the wing nut. This is quite enough, but if the screw should be on the short side it is usually a simple matter to remove it from the tripod and fit another ⅛in. longer. When the head is out of use and detached from the tripod the bottom wing nut and the top wing screw will be loose and should be screwed together through one of the vacant holes to prevent their being lost.

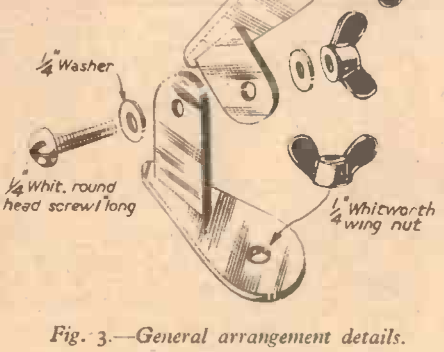


Fig. 3.—General arrangement details.

Putting Photography to Work

Here are Some of the Camera's Tasks

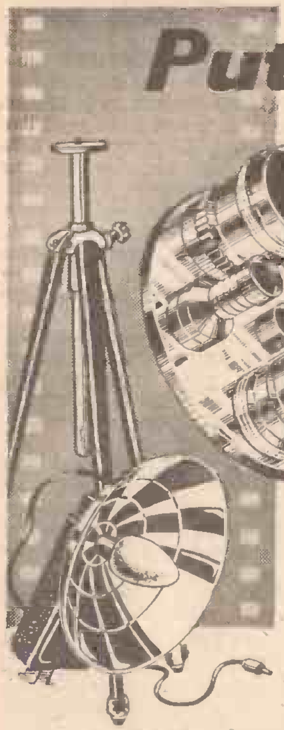


Fig. 1.—A desk model of a "Recordak" microfilmer. Courtesy of Kodak Limited.

PHOTOGRAPHY in its amateur application is familiar to everyone, but not many people realise the thousands of uses that photography, ciné-photography and television have in the fields of commerce, industry and science. Just a few of these applications will be described here.

Photocopying

The advantage of a quick method of photocopying in an office where a dozen copies of long and involved schedules are frequently required is patently obvious. Modern apparatus provides this quick method. The process is basically the ordinary reflex copying process, photographic paper being exposed in contact with the document to be copied, but the wet stages of developing and fixing are accomplished using a porous block on which the paper is placed and the solutions squeegeed on with a sponge. There is also available a faster process using an "Autopositive" paper which provides a first time positive image without the necessity for an intermediate negative. No camera, darkroom or running water are used.

When a camera is used and a negative made, it is possible to vary the size of the copies required, which is an advantage when copying intricately detailed drawings. As many copies of drawings as are required can be turned out in much less time than it would take a team of expert tracers to copy them and this applies equally, of course, to typists copying documents.

When great masses of past correspondence have to be kept for a number of years and referred to from time to time, "microfiling" is the ideal solution. Some 8,500 letters can be recorded on 100ft. of 16mm. film in some modern apparatus, while with other types 1,500 documents can be copied in an hour and the same apparatus used later to project the processed film for reference as required. Fig. 1 (right) shows a desk model of a "Recordak" microfilmer. Up to 99 per cent. of filing space can be saved by this method and there is the additional advantage that a facsimile copy of the original can be made at any time from the microfilm.

Libraries, too, are using this type of apparatus and Messrs. Kodak now supply regularly microfilm copies of "The Times" newspaper to libraries all over the country. In the reading room all the operator has to do is to rotate a handle, until the required page is shown on the screen, and commence reading.

Instrument Recording

Another example of the camera being used for recording purposes is taking a series of photographs of, for example, dials or gauges, at pre-arranged intervals. During the last war a great many cameras were used in this way, thus releasing manpower for other duties. Where a great many dials have to be read at once, as when testing an aircraft, it is often beyond the powers of the pilot to do this and fly the plane at the same time, so the recording camera takes over. Sometimes after a test plane has crashed, the recording camera is the only source of information on the reason for the crash.

Photo-micrography

In many branches of science and industry the microscope has become a standard instrument for investigating the structure of materials and it is vitally necessary for the purposes of comparison that records of these investigations should be available. This is the job of the photo-micrographist. This branch of photography is widely employed in studying the structure of metals and identifying the characteristics which indicate hardness, strength, etc. Perhaps the best known branch of photo-micrography is in the fields of zoology, botany and medicine where slides are prepared with coloured stains to demonstrate a particular point. In the hands of the expert the camera can accentuate colour differences and increase the effectiveness of the slide by photographing it.

Radiography

Mass X-rays and the wide use to which X-rays are put in modern hospitals has familiarised almost everyone with the principle of radiography, but it is perhaps less well-known that radiography using gamma rays has wide applications in industry. Gamma ray photographs of metal castings can provide much information to the manufacturers. Imperfections will be revealed, and if the same

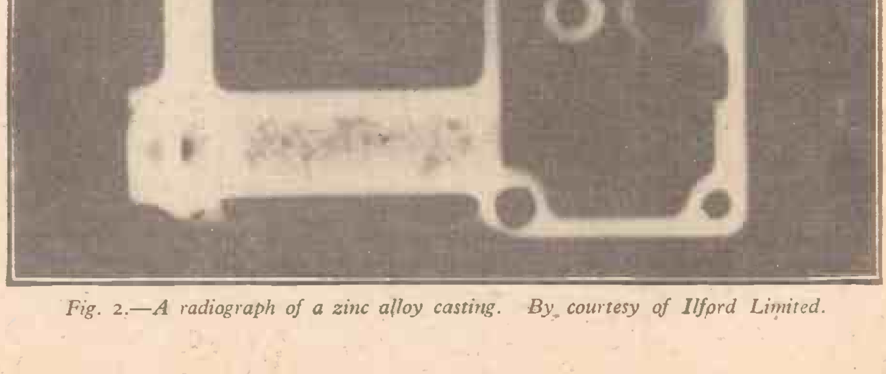


Fig. 2.—A radiograph of a zinc alloy casting. By courtesy of Ilford Limited.

Fig. 3.—The stress analysis of a hammer striking a nail. By courtesy of Kodak Limited.

imperfections are seen in a number of castings, they will know the process is at fault. Fig. 2 shows a typical radiograph of a zinc alloy casting. The dark mottled patches show the presence of voids in the metal. When a regular radiographic check is not made, the manufacturer often makes his castings more bulky than is necessary to give a margin of strength. This extra material can be saved by radiographic checking. Even if faults are not discovered, radiography enables the manufacturer to give a really comprehensive guarantee to purchasers.

Stress Analysis

Machine parts which operate under load are invariably subject to stress. To check that the strain in operation on various components is not too great they are subjected to photo-elastic stress analysis. This entails the production of a scale model in transparent plastic, which, while under load, is observed in polarised light and photographed. Fig. 3 shows the stress analysis of a hammer striking a nail. The results obtained can be applied to the actual object which it is desired to test and the method can be used for any object of metal, concrete or other homogeneous material.

Metal Analysis by Spectography

The original use of spectography was to determine the composition of stars and was used by astronomers. The principle is that characteristic line spectra are given out when elements are heated. When elements are mixed, the line spectrum given out is complex and comprises characteristic lines of each element of the mixture. The lines resulting from metals can all be recorded by photography. Only a small amount of metal needs to be used and spectography has the advantages over chemical analysis that it is several times cheaper, very much quicker and yields a permanent photographic record.

High Speed Photography

This is the method of filming a very high-speed action which is too fast for the eye to see and then slowing the film down on projection so that it can be seen in slow motion. The speed in the camera varies between 1,000 and 16,000 frames per second and when these are projected at the standard speed of 16 frames per second the action is speeded up between 60 and 1,000 times.

A special film camera is used for this work. An Eastman high-speed camera is shown in Fig. 4. The normal ciné camera carries the film across the front of the lens in jerks so that each exposure is made when the film is stationary. In the high-speed camera the film is carried through the gate continuously and the exposures are made by means of reflection on the sides of a prism which is rotated between the gate and the lens. The rotation of the prism faces is synchronised with the movement of the film so that the image is not blurred. By this means, using an 8-sided prism, 16,000 pictures per second can be achieved.

There are many uses for this type of filming. Fast automatic machinery may carry out, say, 500 operations per second, but when this speed is exceeded may fail. High-speed photography can show why the machine fails. A high-speed film of any automatic process, even one which is working well, can show potential causes of failure and lead to an improved technique. Applications range from recording the flame fronts from rocket motors and ramjet engines to discovering why cut grass misses the lawn-mower grass box.

Fig. 4.—An Eastman high-speed camera. By courtesy of Kodak Limited.

Training Information and Selling

Under these heads come some of the most extensive uses of photography. In training, a series of photographs or a short film will illustrate a new technique far better than thousands of words, either written or spoken.

The modern trend of using photographs to relay news and information is shown by the increasing number of pictures which appear in to-day's newspapers and magazines. A great number of photographs are reproduced every month in PRACTICAL MECHANICS and the step-by-step series is sometimes used as well.

A glance at the advertisement columns will provide examples of how photographs help to sell goods, but an even better example can be seen in the typical mail order catalogue. Photographs are used extensively at all levels in the commercial world to show goods for sale and commercial photography to-day is very big business, indeed.

Developing and Printing Equipment

Amateur camera users who make use of the 24-hour day and postal services may sometimes wonder how it is possible to produce contact prints in such a short time for the thousands of people who use the service. The answer lies in automatic processing equipment. Typical of this type of machine is the Ilford type "N" printer shown in Fig. 5. Not every agent, of course, will own complicated equipment, but for the large-scale operator very elaborate and speedy equipment is available.

For example, the high-speed projection printer shown will accommodate negative sizes between 34mm. and 120 size and can produce contact prints, small enlargements or enprints at the rate of 1,200 prints an hour. It works the opposite way to a standard enlarger, the negative holder is on the baseboard and the printing paper, which is in 250ft. rolls, is carried in the enlarger head. Focusing is automatic as the lens and paper magazine head is moved up and down for the different magnifications. Exposure is estimated and controlled by a photo-electric cell working with an electronic timer and exposing lamp. A foot control governs the exposure and the motorised paper transport.

From this printing machine the continuous paper roll is taken to a continuous paper processer. The time the paper spends in each solution is adjustable by means of control rods and the paper runs in sequence through developer, stop bath and fixer and washing bath. From this point it can be wound straight on to the glazing drum. This is made of stainless steel and water jacketed, being thermostatically heated to maintain the correct temperature within 1° F.

In the final stages of development is an automatic guillotine which will cut the prints apart neatly.

There are many aspects of photography in industry which have not been mentioned here, but some idea can be gained of the way it is spreading through industry.

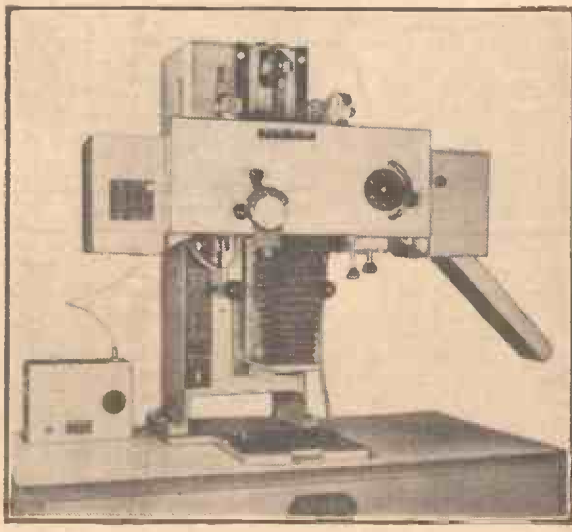
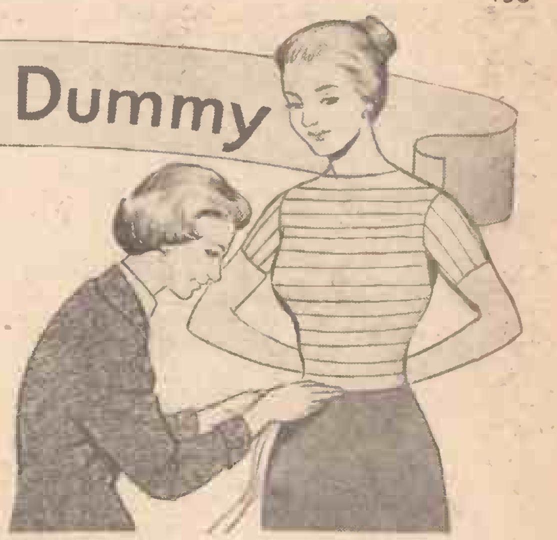


Fig. 5.—An Ilford type "N" printer. By courtesy of Ilford Limited.

How to make Your own Dressmaker's Dummy



By F. T. Day
It Costs Under £1

THE dressmaker's dummy made up in the shops and stores can be expensive, but it is possible to make up an accurate and neat dummy, in the home, to the exact measurements of a figure, with the aid of gummed paper tape, and all for well under £1 in cost.

The Gummed Tape

Brown paper tape is sold in practically every stationers. Tape that is 2in. wide is best and a fairly strong grade should be chosen. One dummy will use approximately one small roll. Where several dressmaker's dummies are being prepared, large diameter coils of tape may be purchased from a commercial stationers. Colour is not important, as the tape is finally covered with muslin to give the dummy a first-class finish and appearance. If, however, the modeller decides to leave it plain, a coloured tape may be desirable.

The application of cut off strips of tape entails a good deal of moistening. This is best carried out with a wet cloth or sponge. Too much moisture, however, must be avoided as a part of the adhesive may be washed away and poor bonding of material result. On the other hand, too little water or moisture will often hardly activate the glue. After an initial trial, the correct amount of water can be ascertained.

Preparing the Figure

The model first slips a yard of closely woven mutton cloth over the head and on to the figure. This must be smoothed down to obviate any wrinkles. Any old vest, jumper or similar garment may be worn over the figure as an alternative, but it must fit snug and tight to the figure. It is to this muslin or vest that the moistened tape is applied—it actually forming the base of the dummy make up. Some dummies are made just up to the shoulders, but sleeves, elbow length, may be included and in such cases allowance must be made for this extra length by the application of base muslin or other material.

In the same way, a collar length may be included and this may be allowed for in the preparation of the base or at a later stage when the mould is fitted on to its stand. An extra piece of thin cardboard may be added then for the neck and taped on to the model.

Applying the Tape

Suitable strips of well-moistened glued tape are wound round the figure from the thigh line continuing upwards in a spiral form to the hips, on up to the waist, covering the bust and finishing at the shoulders or elbows and up to the neck line (see Fig. 1). The trunk of the figure will now be completely covered with 2in. wet tape, which dries off almost immediately after application. This first covering of tape is then strengthened by an additional layer of tape, wound in the same fashion, but this time the tape is overlayed in the form of bandage application. This gives added strength. The dummy now begins to take shape and some strength, but for a first class durable job, to last for all time, strips of wet tape are applied from the thighs diagonally up and over the shoulders. One application goes from the left thigh up and over the right shoulder and the other from the right thigh to the left shoulder. The mould is now complete in its first stage of make up.

All tape applications must be carefully applied and smoothed down to avoid blisters or wrinkles and untidy edges of tape around the neck line, the shoulders or elbows, and the thigh line should be carefully trimmed away with a pair of scissors or a sharp knife.

Removing the Dummy

This is carried out by carefully cutting the applied tape on its base make up, with a pair of scissors. The mould is cut up the back when it will be found that it may be removed just like a suit of armour (Fig. 1). It is firm and durable and, at this stage, it should be immersed in water for a short time. When removed, it will then dry out quickly, be rock hard and almost unbreakable.

It is advisable at this stage to measure the dummy and the person used for the work. Any slight discrepancy may be adjusted when the mould is fitted on to its stand by cutting out a small strip of moulding along the back already cut or adding a suitable number of strips when it comes to making the join of the back again.

Making the Dummy Stand

Any kind of post, say, 2in. × 2in. in size

(*Concluded on page 413*).

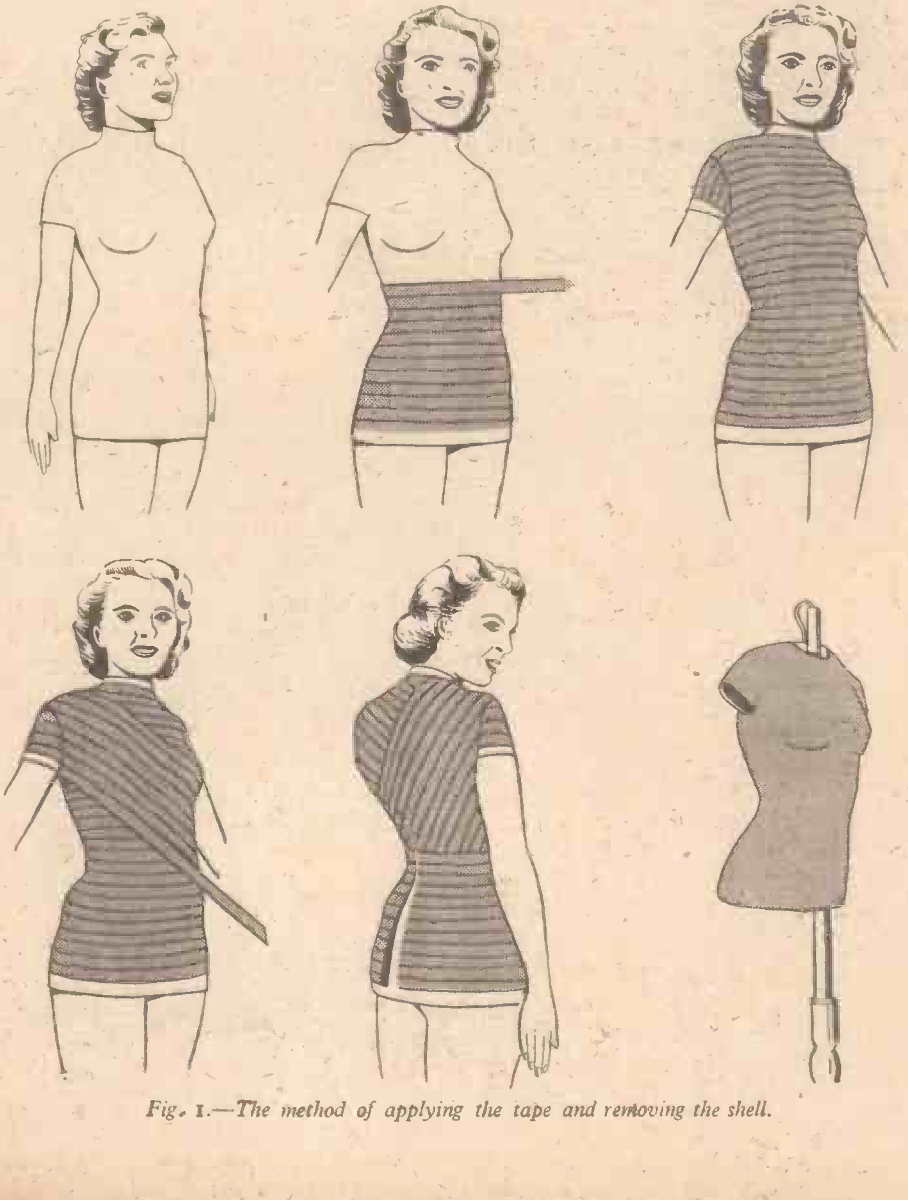
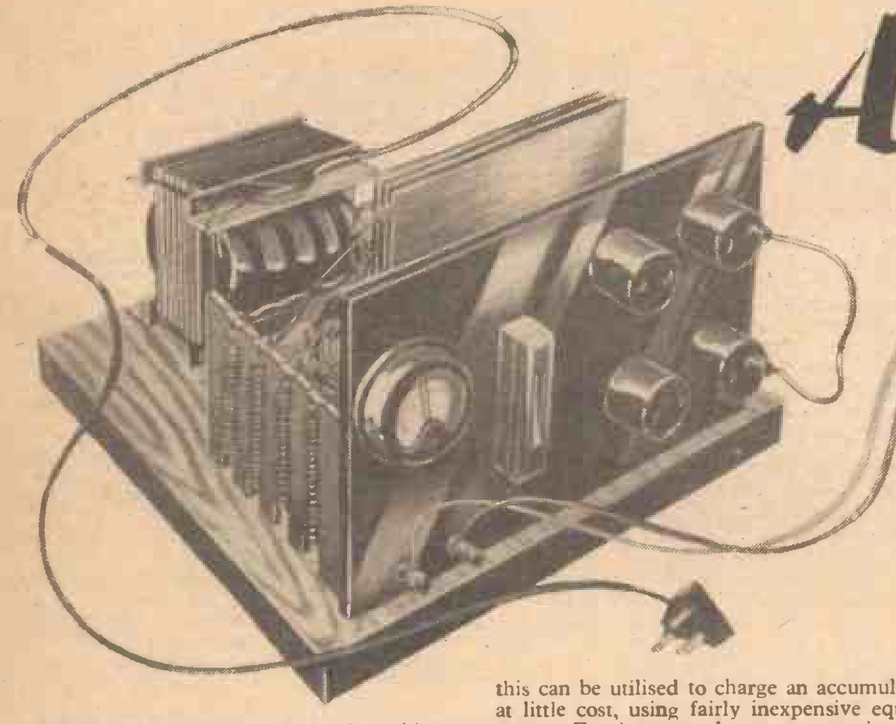


Fig. 1.—The method of applying the tape and removing the shell.



A Versatile B

Do Your Own Re-

By J. L. W

THERE are many purposes for which a low-voltage D.C. supply is required, such as motor cars and motor cycles, electroplating, model trains and other mechanisms. For most purposes it is desirable that the D.C. supply should be as steady as possible, and for this purpose a substantial accumulator is usually the best source of supply. These, however, are rather heavy items to transport to a charging station and, apart from the cost of periodical charging, it is usually much more convenient if the accumulator can be charged at home, as may be done overnight.

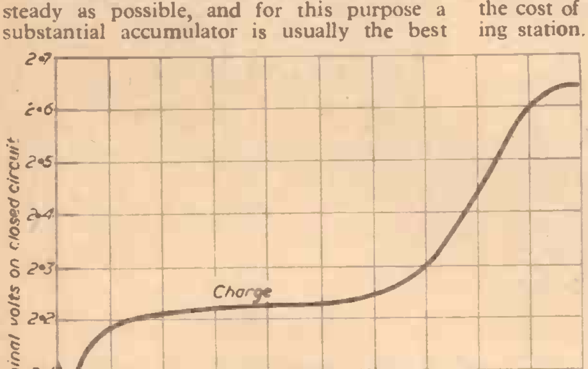


Fig. 1.—Variation of terminal voltage of a lead-acid accumulator cell on charge and discharge.

Accumulator Capacity and Charging Cost

The capacity of an accumulator is measured in ampere-hours. The ampere-hour capacity of an accumulator may be taken as equal to the product of the normal discharge current (amps.) and the number of hours for which the full-charged accumulator can deliver this current. The ampere-hour capacity may be somewhat reduced, however, if it is discharged at a high rate. Where a normal A.C. supply is available this can be utilised to charge an accumulator at little cost, using fairly inexpensive equipment. For instance the power required to charge a 12-volt 60-amp.-hour accumulator is in the region of 1.5 kilowatt hours. Thus if the electricity costs 1d. per unit the electricity used to charge the accumulator will be about 1½d., which is very much below the cost of having this done at a local charging station.

2/12 Volt 6-amp. Charger

The equipment to be described is suitable for charging either a 12-, 6-, 4- or 2-volt accumulator at a rate up to 6 amps. A 60-amp.-hour accumulator can thus be charged in 10 hours. Provision is also made for charging at a lower rate if required, as this may be more convenient if a partly discharged accumulator is to be recharged overnight, or an accumulator of lower amp.-hour capacity is to be charged. The main items of the charger are the transformer, which is used to step down the A.C. supply to a suitable voltage, the metal rectifier used to convert the low-voltage A.C. to D.C., and the variable resistor which acts as a ballast resistor and also enables the charging current to be varied if required.

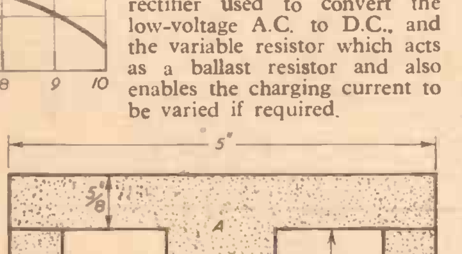


Fig. 2.—Dimensions of transformer core stampings.

Charging Voltage and Current

The current (I amps.) passed through an accumulator on charge is equal to $\frac{V-E}{R}$ where V is the applied D.C. voltage, E the back E.M.F. (volts) of the accumulator, and R the resistance (ohms) of the charging circuit. Normally the internal resistance of an accumulator is quite low, so that quite a high charging current can be passed if the applied voltage is only slightly in excess of the back E.M.F. of the accumulator. However, as indicated in Fig. 1, the terminal volts of a lead-acid accumulator cell may vary from about 1.8 volts when the accumulator is fully discharged to about 2.3 volts when charged, these values being measured with current flowing through the accumulator. Continuing the charge causes gassing due to the production of oxygen and hydrogen at the plates. These gases increase the internal resistance of the cell and also set up an increased back E.M.F., so that a higher voltage must be applied to pass the current. It will be realised that if a steady D.C. voltage is applied to an accumulator through a low-resistance charging circuit the rise of back E.M.F. as charging proceeds will cause the charging current to fall appreciably as the battery becomes charged. By using a ballast resistor in the circuit its resistance is increased, so that a more uniform charging current is obtained throughout the charging period.

The rectifier converts the low-voltage A.C. output of the transformer into a pulsating direct current, and charging current only flows during the instants when the rectified voltage exceeds the back E.M.F. of the battery. In order to pass an average charging current of 6 amps. into a battery the secondary windings of the transformer should be capable of delivering a R.M.S. (virtual) A.C. current of about 8.4 amps. For charging a 12-volt accumulator the secondary windings of the transformer should be rated at about 17 volts when using a ballast resistor. Thus for charging a 12-volt accumulator at 6 amps. the transformer should have an output of 8.4 amps. at 17 volts = 143 volt-amps.

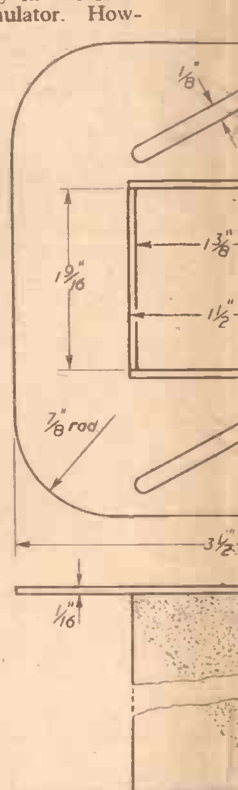
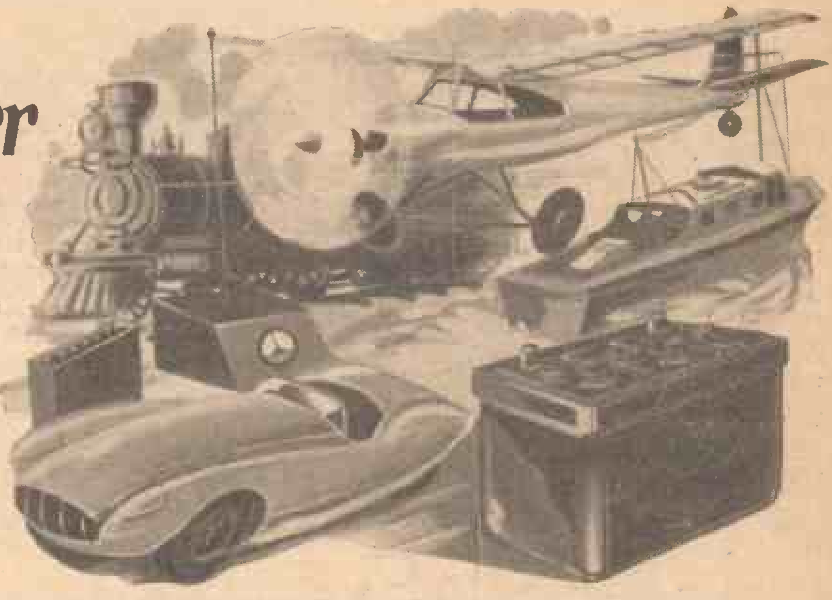


Fig. 3.—Dimens

The Transformer

Such a transformer may be constructed with a core of stalloy stampings approximately 0.014in. thick to the dimensions given in Fig. 2. The stampings should be lightly

Battery Charger

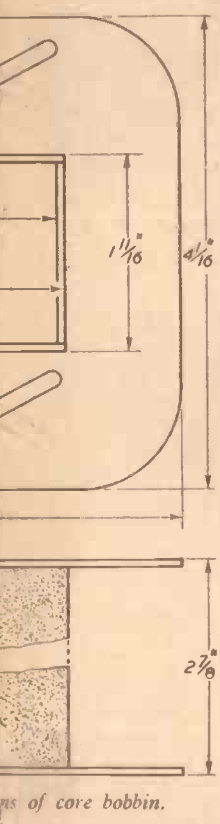


charging at Home

ATTS

insulated with oxide scale, insuline, varnish or similar material to minimise eddy currents in the core, which cause heating of the core and loss of efficiency. The core is to be built up to 1 9/16in. thick, so that approximately 110 of each shape of the stampings will be required.

The simplest way of winding the transformer coils is by using a bobbin of bakelite, presspahn, pirtoid or similar material. The dimensions of a suitable bobbin, having 1/16in. thick walls and two slots for the winding leads, are given in Fig. 3. It will be appreciated that these bobbins are rather fragile and the bobbin should, therefore, be supported by a wooden jig during winding. This could be made with wooden ends 4¼in. square × ½in. thick, which are screwed to a wooden centrepiece 1⅛in. × 1 9/16in. × 2⅞in. long. Slots should be cut in the end pieces to correspond with the slots in the former. If a lathe is available a hole may be drilled through the wooden centre piece of the jig so that the jig can be mounted on a screwed rod secured in the lathe chuck.



ns of core bobbin.

The primary winding is wound with 22 s.w.g. copper wire, enamel covered. About 1½lb. will be required. For use on a 240-volt 50-cycle supply 960 turns are needed. The transformer can be wound for other voltages than 240 if required; the number of primary turns being proportional to the voltage at 50 cycles, without change of the secondary winding. Thus for 200 volts at 50 cycles the primary could be wound with 800 turns of 22 s.w.g. For lower voltages than 200 volts thicker primary wire is advised.

The primary winding may be commenced by passing about 12in. of the wire through one of the slots in the end of the bobbin, after passing this through a systoflex sleeve. The turns should be kept close together and the winding made as tight and flat as possible to conserve winding space. With care about 87 turns may be placed on each layer. After winding on one layer a strip of thin paper, about 0.0015in. thick, should be wrapped round the layer before winding on the next layer. Some experiment may be necessary to find the exact width of paper required, and the ends of the paper should not overlap by more than about ¼in. The winding should be continued until 960 turns have been wound on (for 240 volts), with a layer of paper between each of the layers of wire. It may be possible to accommodate the 960 turns in 11 layers, but it is not very important if there is a twelfth layer. The end of the wire should then be slipped through a piece of systoflex sleeving and brought out through the slot in the end of the bobbin.

Secondary Winding and Tappings

After completing the primary winding it is necessary to provide sound insulation between the primary and secondary. A strip of 0.010in. leatheroid is cut 2⅝in. wide and about 32in. long, this being wrapped tightly over the primary winding, followed by a similar strip of 0.010in. empire cloth. The secondary is to be wound with 74 turns of 13 s.w.g. double silk covered copper wire. About 1¼lb. will be required.

To start the secondary winding about 12in. of the wire is passed through a systoflex sleeve and passed out of the bobbin through one of the slots in the cheek, as at C in Fig. 4. About 23 turns may be wound on the first layer before starting to wind the second layer. After winding a total of 37 turns, i.e., about 14 turns on the second layer, the wire should be bent and brought out radially from the coil; this must be done on the narrow side of the coil, i.e., on the same side as a slot. The wire should then be bent back, leaving a loop about 12in. long outside the coil as at D in Fig. 4. A systoflex sleeve should then be passed over the loop, the ends of the loop tied together close to the turns, and the winding continued to the end of the second layer, when a loop should be brought out of the coil at a total of 43 turns as at E in Fig. 4. This loop should be covered with a systoflex sleeve but, in this case, the loop is brought out through a slot in the coil cheek.

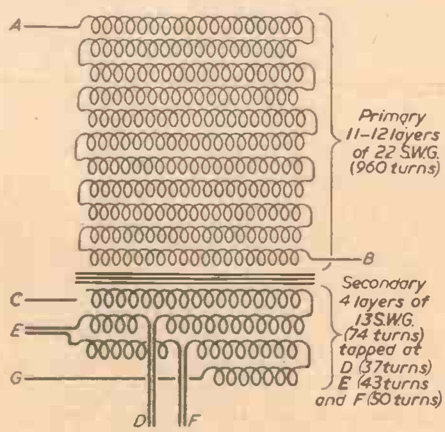


Fig. 4.—Details of transformer winding.

The third layer is continued, with a loop brought out radially at the 50th turn, as at F in Fig. 4. This loop is covered with a systoflex sleeve and brought out radially on the narrow side of the coil. The third layer is completed and, after winding on the fourth layer the number of turns required to complete the 74 turns, the end of the wire is tied in position and brought out through a slot in the cheek, as at G in Fig 4. The finished coil may then be wrapped with empire cloth.

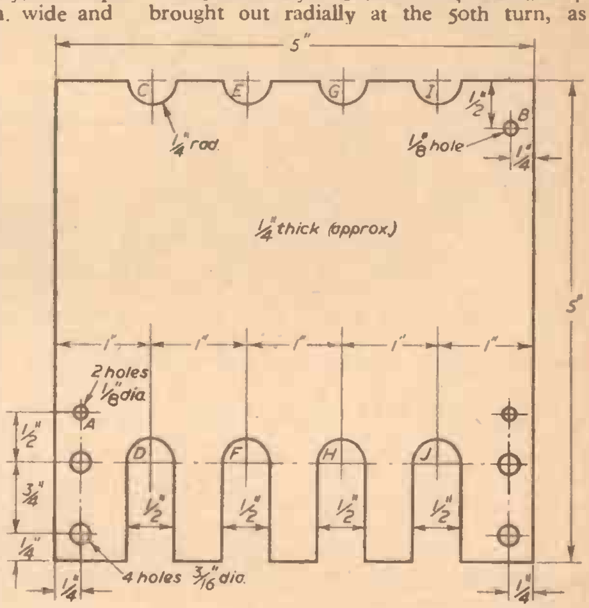


Fig. 5.—Dimensions of asbestos board resistor support.

Assembling the Transformer

The laminated core may next be fitted. In doing this it is important that the insulated sides of the stampings should all face the same way. Two of the T-shaped stampings (A in Fig. 2) are first passed through the bobbin, one from each side. A U-shaped stamping (B in Fig. 2) is then laid on the first T stamping opposite the second T stamping, and the core built up with alternate T and U stampings at either end. It is important that the stampings should be tapped together so that there is no air gap between the two halves, and that they be tightly packed.

The core may be clamped together with two pairs of clamps, each piece consisting of 5¼in. of ½in. × ½in. × ⅛in. angle iron with 3/16in. holes drilled ¼in. from each end through which 3/16in. screwed rods about 2½in. long are passed. A strip of fibre about 1/32in. thick should be placed between each clamping piece and the stampings, and the screwed rods should not be allowed to touch the edges of the stampings.

The Control Resistor

To support the resistor a piece of asbestos board about ¾in. thick may be made to the dimensions given in Fig. 5. The resistor itself consists of about 12ft. of 15 s.w.g. nickel-chrome resistance wire, but it is advisable to obtain 2ft. more than this to allow for the leads. About 12in. of the wire is to be passed through the hole A in Fig. 5 to act as a lead to the rectifier. From the hole A 3½ft. of the wire should be coiled into a tight spiral about ⅜in. internal diameter. This wire is then uniformly coiled from the hole A round the back of the support to the slot C, down the front of the support from C to D, then up the back of the support to the slot E. The arrangement will be clear from Fig. 6. At E the wire is twisted together to form a loop about 2in. long. From E 2½ft. of the wire is coiled as before and passed from the groove E to the slot F down the front of the support and then up the back of the support to the groove G. Again a loop is made before coiling 2½ft. from G to H and back to I. The final 2½ft. of wire passes down the front of the support from I to J, and up the back of the support and out through the hole B, where it is secured, leaving about 3in. for a connection.

Connecting Up

A bridge-connected metal rectifier having an output of 6 amps. at 12 volts should be purchased and the unit connected up, as shown in Fig. 6. The whole may be mounted on a metal base, the resistor board being fitted vertically by means of small angle brackets fastened through the 3/16in. holes, shown in Fig. 5. The metal rectifier may be mounted by means of angle brackets fitted to the centre bolt of the rectifier. The charger takes less than one amp and is conveniently fed through a three-pin plug. The fuse F_1 should be rated at about one amp., and it is most convenient to use a three-pin plug having a cartridge fuse fitted in the "live" pole.

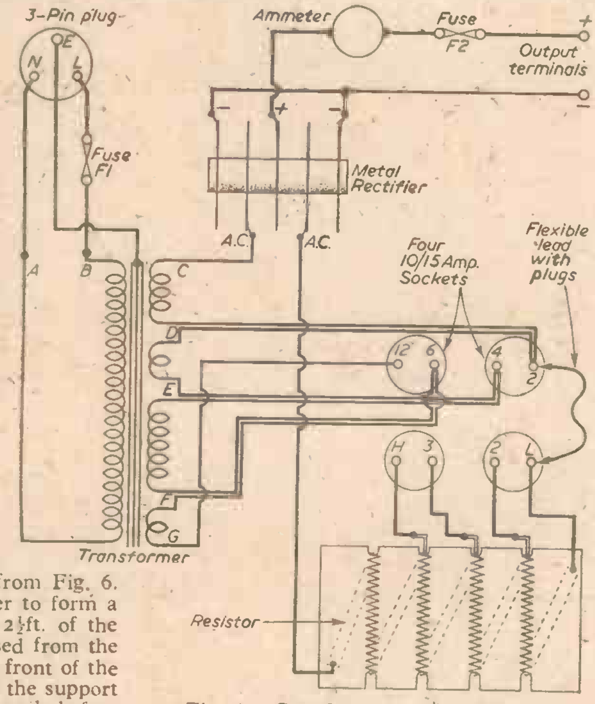


Fig. 6.—Complete connection diagram.

The fuse F_2 is not essential, but provides additional protection. This should be rated at about 6 amps. A moving-coil ammeter calibrated at 0 to 10 amps. is very useful. In order to avoid having two tapping switches, four 10 or 15 amp. two-pin socket-outlets may be used, as in Fig. 6, and these should be marked as indicated. Connections between the resistors and the socket-outlets may be made by means of 13 s.w.g. copper wire, as used for the transformer secondary winding, this being connected to the resistor tappings by means of nuts and screws with brass washers and spring washers. The socket-outlets and D.C. terminals may be mounted on a suitable wooden or bakelite panel. If required the whole charger may be fitted in an *adequately ventilated* metal case.

Operation of the Charger

Two contact pins are required to fit into the sockets, these being fitted with fibre or wooden handles and connected together with 40/0.0076 flexible cord. If it is required to charge a 12-volt battery one contact pin is placed in the socket marked 12, for maximum charging current the other contact pin is placed in the socket marked H; for minimum charging current this contact pin is placed in the socket marked L; for intermediate charging currents the contact pin is placed in the sockets 2 or 3. For charging a 6-volt accumulator the first contact pin is placed in the socket marked 6; the other contact pin being fitted in one of the sockets marked H, 3, 2 or L, depending on the charging current required. When the pins are placed in the sockets marked 2 and L (Fig. 6) the charger is set for giving minimum charging current to a 2-volt accumulator.

A Candle Power Blow Lamp

By J. C. LOWDEN

THE materials required are:

(a) The Candle Tube: One piece metal tube of ¾in. inside dia., of 6-8in. length. Conduit tube of 1in. outside dia. is perfect for the job, but any similar tube will serve.

(b) The Blow Tube: One piece of fine gauge tube about 10in. length. The finer the bore and the thicker the wall the better. For ease of working and soldering, copper gas piping of 3/16in. outside dia. is ideal.

(c) The Clip: One piece of thin brass strip 6in. long by ½in. wide.

(d) The Mouth Tube: One length of flexible tubing of such a size as to fit tightly over the end of the blow tube. Fine rubber gas tubing is often used, but clear plastic tube is pleasanter in use. The length is not critical, but a longer tube tends to reduce the expulsion of saliva into the flame. About 24in. would suffice.

Construction

Prepare the candle tube by cleaning a ½in. strip around the dia., about 2in. from one end. After cleaning, the strip should be lightly "tinned." Tin one side of the strip of brass. Bend the strip around the tube, squeezing in the vice. Apply heat to the brass strip. The projecting ends held in the vice must be left free to accept the blow tube.

When preparing the blow tube, slightly bend one end. Over this end is to be fitted the mouth tube. In preparing the blow tube all curves must be smooth and gentle, without any crushing of the bore.

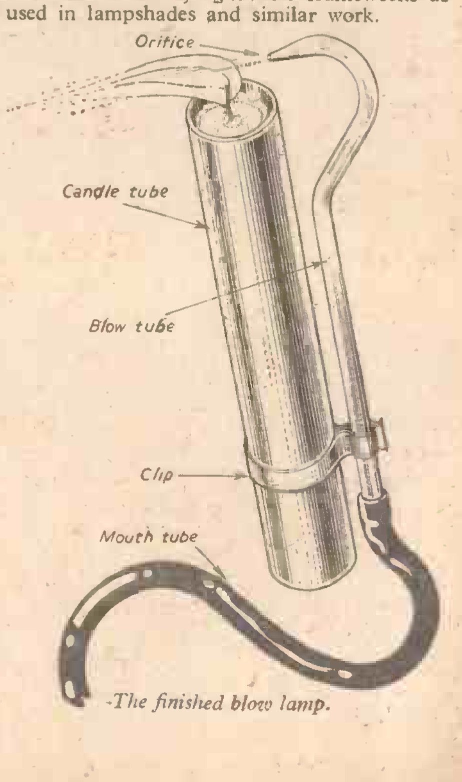
The airblast end of the tube must first be sawn and filed so that the orifice is circular. The wall of the tube at the orifice end is "sharpened" by gentle filing and bent at that end into a smooth curve. The object of this curve is to aim the airblast so that it impinges directly upon the candle flame.

At this stage the blow tube should be secured within the two ends of the circlet clip so that the blow tube stands off from the candle tube by about ½in. When satisfactory, the blow tube is soldered firmly in the clip. Final fine adjustment is then made by careful bending of the blow tube at the orifice end. Use a tallow dip for the candle.

The candle is pushed up the bore of the candle tube, lighted, the wick trimmed and a pool of grease allowed to form. During all operations, hold the lamp vertical. As the candle is burned away, it may be fed up the candle tube with a stick or finger.

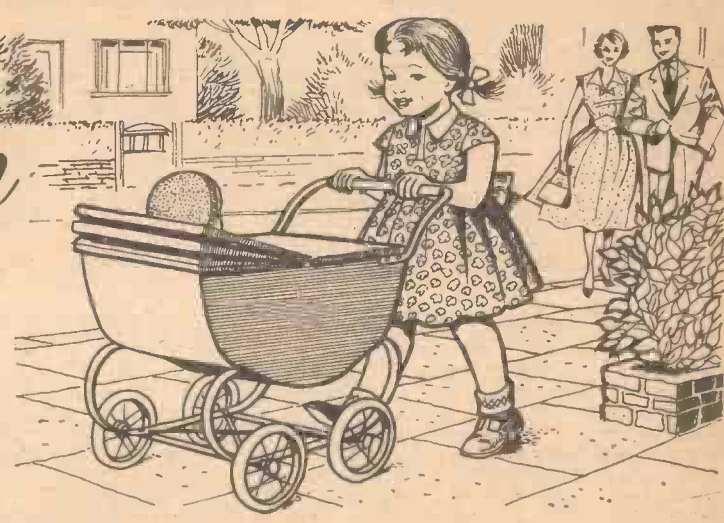
When the orifice is correctly positioned and the candle well alight, gentle blowing down the mouth tube will send forth a concentrated pencil of flame. Air pressure must be gentle at first—the effect of puffing will be obvious—but pressure will soon be built up, and a working heat obtained within a second or so.

The flame generated is adequate to melt, very quickly, light Tinman's Solder or most of the low melting point flux cored solders now in widespread use. The pipe is very useful for such work as tinning the ends of electrical flexes, light wire frameworks as used in lampshades and similar work.



The finished blow lamp.

Making a Doll's Pram



An Attractive Present for Your Small Daughter's Birthday

By H. C. Piggin

THIS doll's pram will be an acceptable gift for any little girl and, properly made, will be the admiration of many a big one, too! Specially designed for the home constructor it costs about half the shop price, and even this can be reduced if less lavish upholstery is provided. The completed pram is shown in Fig. 3.

The Body

The sides of the pram body may be cut direct from $\frac{1}{2}$in. thick plywood, or may be framed-up, as indicated in Fig. 1. The former method is the simpler; the latter is somewhat cheaper.

Whichever method is used, however, it is important to get the sides exactly identical in shape. After roughing out they should be clamped together and the curves worked-up with a rasp or spokeshave. The use of a template cut from thin card is recommended to ensure accuracy.

The sides are glued and nailed to the 10in. spacers, which, when the glue is set, are "faired-off" to follow the curves of the body where necessary (Fig. 1).

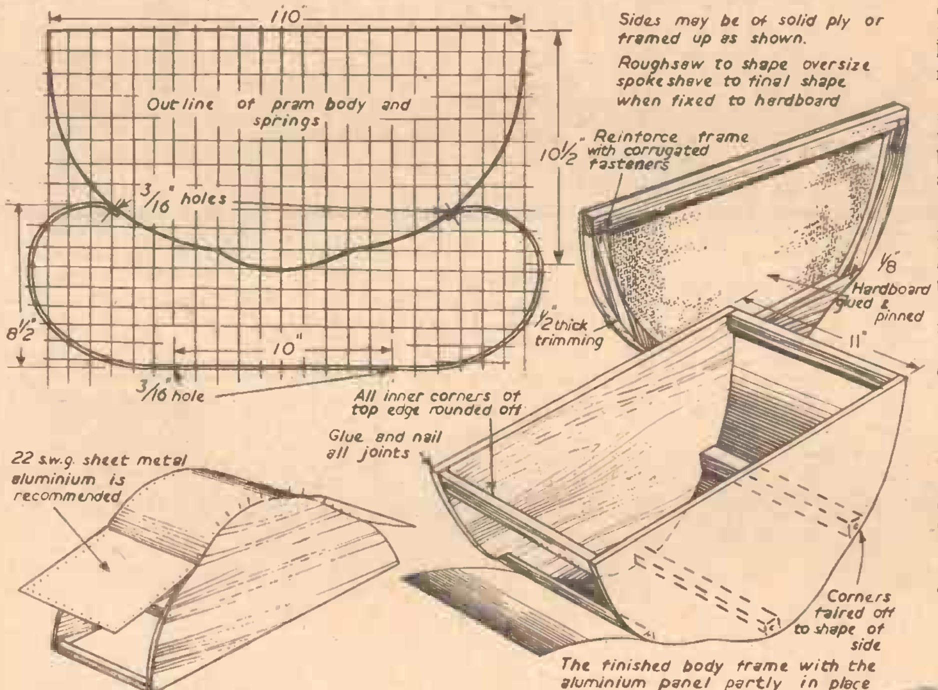


Fig. 1.—Outline of body and springs, two methods of making the sides and pinning the metal to the body.

Fig. 3.—(Right) A view of the completed pram.

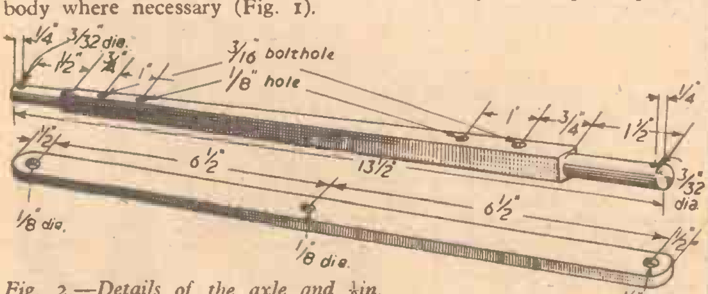


Fig. 2.—Details of the axle and $\frac{1}{8}$in. thick axle tie. Two of each are required.

The body is completed by nailing into place a strip of 22 or 24 s.w.g. sheet-iron or aluminium, as shown in Fig. 1. The "nails" are 18 s.w.g. panel pins, and should be inserted at about 2in. intervals starting at the middle and working the metal into the curves a little at a time. All nails and pins should be punched below the surface of hardboard or plywood, and flush with the metal surface.

All woodwork should be glass-papered smooth and the nail-holes filled with plastic-wood, before a final smoothing. Dents and blemishes in the metal can be stopped with a metal filler, and smoothed with emery.

A coat of priming, followed by two appropriate undercoats, all well rubbed down with fine glasspaper, should provide a sound foundation for a coat of finishing hard-gloss in the chosen colour.

However, before the final paint is applied it will be as well to make the metalwork, as in adjusting it to fit the body some slight damage to the paintwork may be caused.

The Springs

The best material for these will be 1in. × $\frac{1}{8}$in. spring-steel 36in. long. Any blacksmith usually has odd pieces to dispose of and will do the bending for a reasonable sum. However, this is far from difficult. (1in. × 3/16in. mild steel can be substituted for the spring steel should there be difficulty in obtaining it.) The correct shape is shown in Fig. 1.

The large curves can be worked fairly easily cold, but the tighter bend at the fixing-

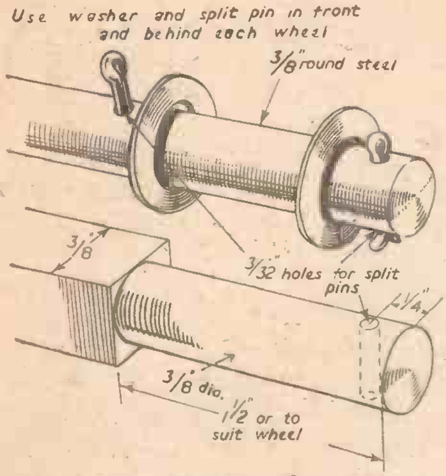


Fig. 4.—Two methods of fixing the wheels.

points will need to be bent red-hot. It is important after heating to allow the metal to cool slowly so as to maintain its annealed (softened) state, or it may be impossible to drill it.

The curves can be worked by levering the metal gradually to shape between two odd pieces of round iron held upright about ½in. apart in the vice.

For such a light structure there is no need to set-up or temper the springs. (The pram shown was tested under the weight of an 11 stone adult.)

The Axles

If a metal lathe is available, the angles are best made from ⅜in. square mild steel, the ends being turned to suit the wheels, as shown in Figs. 2 and 4. However, ⅜in. dia. bright mild steel will be equally successful with the addition of a backwasher behind the wheel, as indicated in Fig. 4.

The cross-ties are riveted to brace the axles diagonally, and the springs themselves are bolted to the axles (Fig. 5).

The whole chassis is cleaned-up thoroughly before painting. It looks well when finished in aluminium paint.

The Wheels

Spoked wheels 6in. dia., complete with tyres and nickel plated hub-caps, cost about 3s. 9d. each. Disc wheels are rather cheaper but do not look so well.

As the length of the hub varies a little with different makes of wheels, it is as well to check before drilling for the split-pins, otherwise additional washers will be needed to prevent excessive end-play.

Fixing Body and Chassis

If the framed sides are used, long 3/16in. bolts can be passed through the frame to secure the spring-ends to the body of the pram.

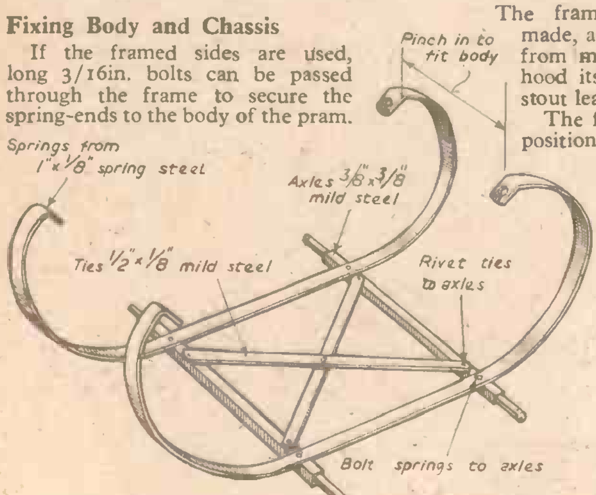


Fig. 5.—The completed chassis.

In the plywood version, the springs are fixed with roundhead woodscrews. Pilot holes must be drilled for these, so as not to split the plywood.

Handle

The metal side-pieces of the handle in the photograph need to be hot-forged to shape. There is no need, of course, to use this more difficult curved shape detailed in Fig. 6. Straight pieces of ½in. × ⅛in. mild steel strip look just as well, and may be secured to the dowel top-piece with stout roundhead woodscrews (see Fig. 7).

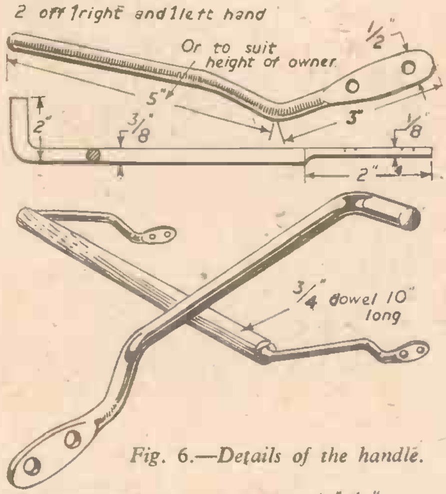


Fig. 6.—Details of the handle.

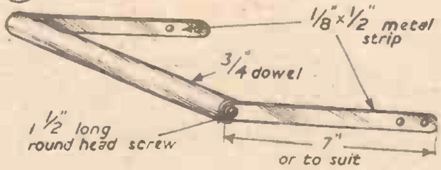


Fig. 7.—A simple alternative handle.

Lining the Body

Pram-cloth (a light-weight leather cloth) is used to line the interior of the pram, being stretched over a padding of upholstery wadding, kapok or folded newspaper. It may be secured as necessary with impact adhesives and tacks. The top edge may be finished with a length of tape to match the pram-cloth, being fixed with large covered-head upholstery tacks.

The Hood

The frames for this are made, as shown in Fig. 8, from mild steel, and the hood itself is made from stout leathercloth (Fig. 9).

The frames are held in position as required by a turn of the wing-nuts on coach-bolts through the sides of the pram. These nuts are made "captive" by burring the screw ends.

The fabric is cut into three pieces, as shown. It is best to work from paper patterns cut to suit the individual job and tested against the erected framework. The pieces of material are machined together to form the "box" shape.

The bottom edges of top and sides are turned under and fixed with rustless tacks to the edge of the pram body. Then the cloth is pulled taut over the erected metal frames, and the front edges are folded over it. These are secured with fabric adhesive, but for extra strength they should be stitched about every 2in. The fabric is also stitched on to the other two frames.

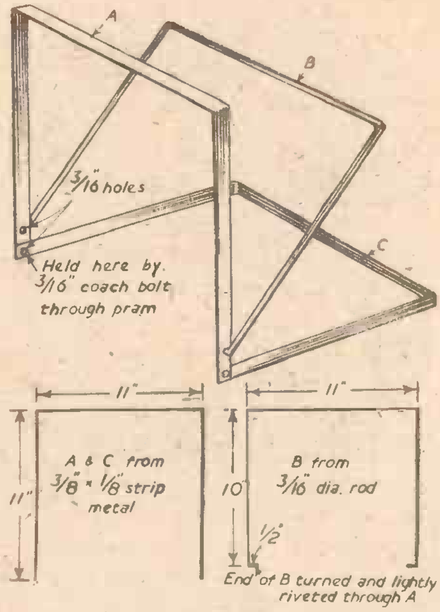


Fig. 8.—Constructing the hood frames.

The storm-apron can be easily devised from a strip of the hood leather-cloth to fit over the front part of the pram, being secured with elastic loops to the hood wing-nuts. The fabrication of mudguards and brake, the addition of lining, etc., are matters for the individual.

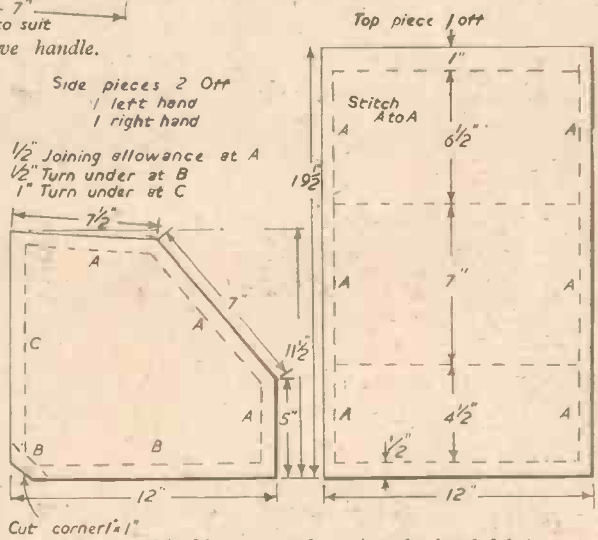


Fig. 9.—Marking out and cutting the hood fabric.

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Make your own Lantern Slides

Contact Printing Positive Transparencies from 35mm. Negatives

By J. Bowick

AN ordinary 3¼in. × 2½in. printing frame can be used, but it might be found more convenient to use two pieces of glass hinged together along one edge. The glass should be about 3in. long × 2in. wide. Two 3¼in. × 2½in. plates with the emulsion cleaned off with hot water will do very well.

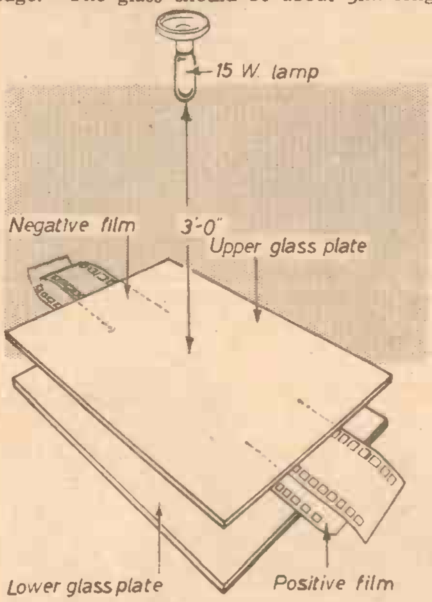

Fig. 1.—The optical arrangement.

Most dealers supply 35mm. positive film and it is quite cheap to buy. A 25ft. length costing 6s. 6d. contains enough film to make over a hundred slides.

In addition to the normal equipment used for processing a contact print, a 15-watt lamp (clear) will be required for making the exposure. It is important to notice, however, that since positive film is much more sensitive to light than contact paper an orange safelight must be used.

Since the emulsion on positive film is similar to that on bromide enlarging paper, the choice of a suitable developer is quite a simple one. Johnson's Universol Developer, diluted one part of developer to seven parts of water, gives excellent results, but any similar developer suitable for bromide paper would do.

Suitable Negatives

Since the very small original is to be projected to give a picture of some 4ft. × 3ft., or larger, it follows that the negative must be sharp and free from grain. When taking photographs for slide making a shutter speed of not less than 1/100 sec. is advised. The negative should show a good range of tones, particularly in the shadows. Scratches and pinholes should be avoided, since these will appear greatly magnified in the projected picture.

Making the Positive

This is done by contact printing the negative image on to the positive film in exactly the same way as you would make a contact print. Cut a short length of positive film (about 2in.) and place it, emulsion side uppermost, on the lower glass plate (Fig. 1). (The film tends to curl with the emulsion side innermost.) Place the negative, which may be single, or one of a short strip of negatives, on toop so that the emulsion sides are in contact and lower the top glass plate.

The plates should be held directly below and at a distance of 3ft. from the 15-watt lamp (Fig. 1). Switch on the lamp and expose for ten seconds (for a normal negative).

Development

Follow the maker's instructions for the particular developer being used. The full developing time should be given, and it is important to agitate well during the whole period of development. Single positives may be developed in a measuring glass (Fig. 2). With Universol, develop for two minutes at 65 deg. F.

Development time and lamp-to-film distance should remain constant whether the negative is normal or not. Allowances for dense or thin negatives should be made by altering the exposure time. This is best found by trial and error, but the following table will serve as an approximate guide.

Using a 15-watt clear lamp 3ft. from the film:

Normal negative	10 secs.
Dense negative	14 secs.
Thin negative	7 secs.

Where a number of negatives of equal density occur together on a short strip these may be printed at one time with a single exposure. In this case all that is necessary is to cut a longer length of positive film and to use longer pieces of glass. It is not advisable to attempt exposing more than four frames at one time since the light tends to fall off towards the ends.

Fig. 2.— You may find it more convenient to develop single positives in your measuring glass.

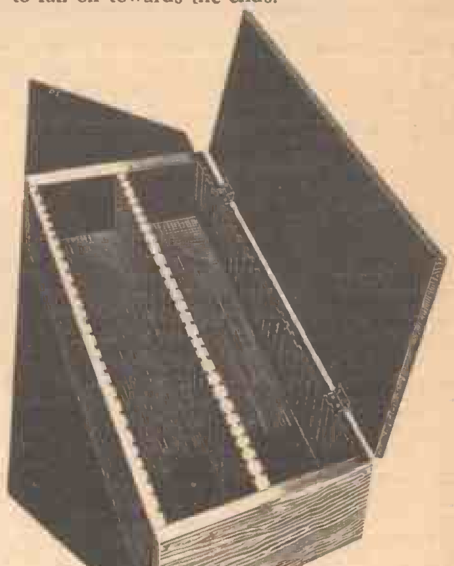

Fig. 3.—A suitable slide storage box.

When development is complete the film should be given a brief rinse in water, then transferred to a fixing bath and left for about 20 minutes. If a hardener is to be used this may be incorporated in the fixing bath. Finally, the film is washed in running water for at least half an hour then allowed to dry in a dust-free atmosphere. A little wetting agent used in the final wash will help to prevent drying marks.

Mounting and Storing

Cut-out cardboard masks are cheap to buy and simple to use. No cover glasses are required. Where a more lasting and dust-free mount is required the metal type (or plastic) should be used. These are supplied complete with cover glasses. A suggestion for a suitable slide storage box is shown in Fig. 3. The slots are simple sawcuts. Constructional details are left to the reader.

Making a Hand-Anemometer

A Useful Piece of Apparatus for the Amateur Yachtsman

By E. Rolfe-Hunter

THIS instrument is based upon the principle that the wind exerts a pressure upon the hinged "gate" which can be measured by the formula $P=.005V^2$, where V=wind velocity in miles per hour and P=the pressure in pounds per square foot. The effect of turbulence inside the casing is of necessity ignored. In this respect it is suggested that the instrument might be compared with the readings shown on a standard-type anemometer, the scale being modified if and where necessary.

The Casing and Spindle

The casing is made from a stout tin with the bottom removed. The tin should be a little larger in circumference than that of a circle circumscribed about a square of sides 2in., and is screwed to part of a discarded brush-handle by which it is held with its axis parallel to the wind stream. Holes are punched in the tin, to take a short hat-pin which forms the spindle. These holes should be large enough to admit the spindle without rubbing, since it pivots in holes in the frame which carries the scale. After passing through the latter the hat-pin is bent at right angles to form the pointer (see Fig. 2). After the scale has been fitted a small tin washer is slipped over the pointer to act as a distance-piece which prevents excessive side-play. The scale, after it has been calibrated according to the table given, is glued to the frame, behind which the glass of an old spirit-level is puttied or fixed into place with a little plastic metal. A perforated windscreen shields the pointer itself from the wind, or alternatively, the pointer and scale could be boxed in and covered by a piece of Perspex or glass.

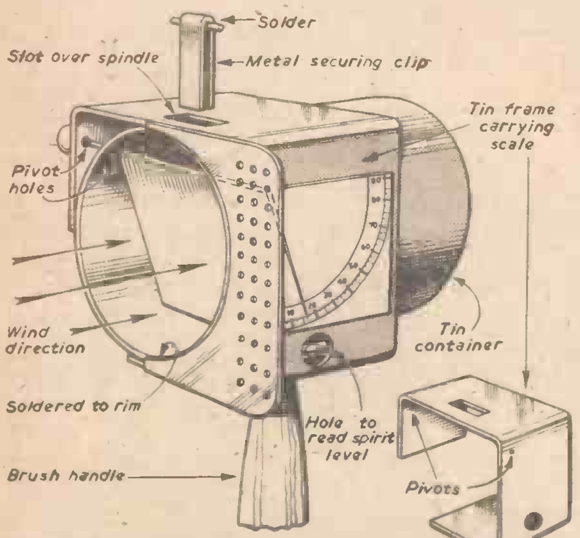

Fig. 1.—A perspective view of the anemometer.

The completed anemometer should be given a coat of grey lacquer, the scale coated with clear varnish and the bearing points lightly oiled.

The "Gate"

This consists of a thin but rigid square shaped piece of metal exactly 2in. × 2in., and weighing exactly 1oz. when measured on a chemist's balance. The weight can be adjusted by sweating additional pieces of metal to the side away from the wind, or by careful filing of the same surface. When the correct weight has been obtained the gate is soldered by its edges to the spindle, making sure that the pointer lies in the same plane as the gate. This is clearly illustrated in Fig. 1. A locking device in the form of a clip is passed through a hole in the top of the tin to grip the gate when not in use.

The Scale

Wind speeds are marked on a piece of white cardboard in the form of lines radiating from the axis of the pointer where it passes through the scale. The angles given in the following table are the angles at this point.

Scale Markings

Miles per hour	*Angle of Pointer in Degrees*
5	2
10	11
15	26
20	41
25	54
30	63
35	70
40	74
45	77
50	79
55	81

After marking out, the pointer is slipped through a hole pierced at the point of intersection of these lines and the scale glued into position, making sure that the pointer registers zero when the gate hangs vertically downwards and the bubble of the spirit-level is visible through the aperture in the scale.

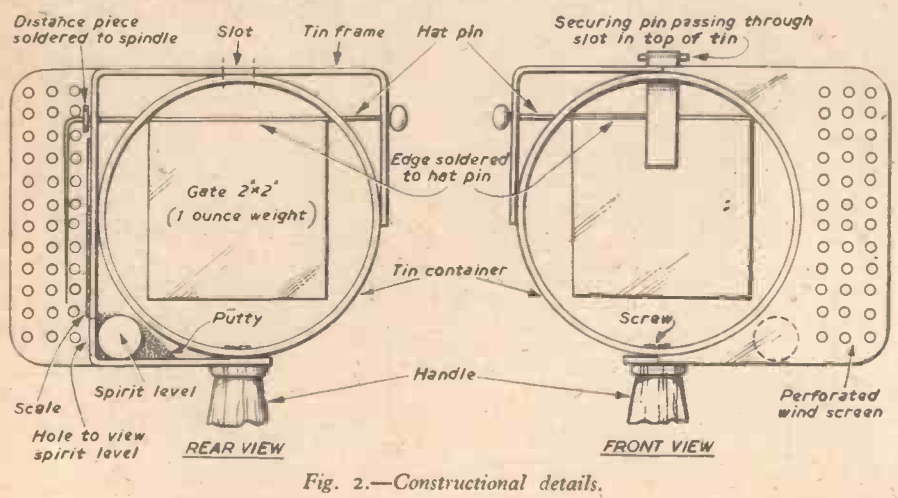

Fig. 2.—Constructional details.

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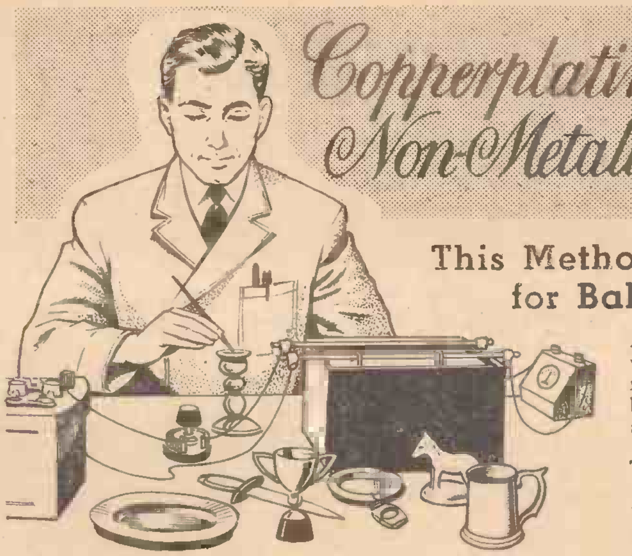

Copperplating Non-Metallic Objects

This Method is Suitable for Baby Shoes

FROM time to time we receive requests for information from readers who wish to preserve their baby's first shoes by plating them. Similarly, information is often requested on plating other non-conductors—plaster ornaments, items of wood, etc. The method described below will allow the deposition of copper on any of these materials, although a baby shoe is described specifically.

The first necessity is, of course, a tank. This need hold no more than one gallon of liquid and can be of glass, enamel ware or stone ware, a small glass aquarium is ideal. Polishing equipment should include brass wire scratch brushes, polishing felts, etc. Lathe owners or those having one of the popular electric drills would probably prefer to use the special polishing accessories available.

The plating solution consists of one gallon of distilled water in which is dissolved 32 oz. of crystallised copper sulphate. Five fluid ounces of sulphuric acid must be added very gradually to this solution. All the usual precautions must be observed in handling this acid. Do not let it come into contact with hands, clothes, etc., and keep it in a well-labelled bottle out of the reach of children.

For the 6-volt power supply dry batteries may be used, but better still is a storage battery of the type used in some of the smaller cars. In addition a 30Ω, 5-watt rheostat is required and an 0-6 voltmeter.

Also required are copal varnish, plaster of paris, metallic copper powder, brass rods and copper anode.

The Circuit

This is shown in Fig. 1. The rheostat is connected in series with the battery and the solution in the tank, while across the anode and cathode is connected the voltmeter.

Plating a Baby Shoe

The first step is to mix up some plaster of paris and fill the shoe with it, smoothing out any deep folds in the material but not removing them altogether. While the plaster is still wet stick a piece of 14g. wire into it and leave to set. Paint the plaster-filled shoe with copal varnish, and while this varnish coat is still wet, dust over it a coat of metallic copper powder with a camel-hair brush. An alternative to this coating procedure is to dust the shoe with blacklead, graphite or special electrotyper's plumbago.

When the shoe has been varnish coated, copper dusted and dried, it should be rinsed in running water to remove any loose dust,

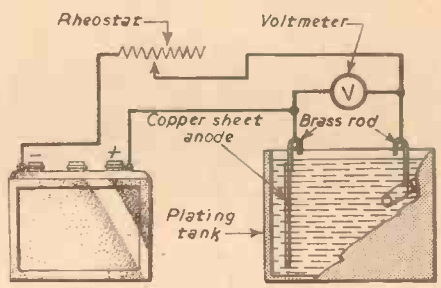

Fig. 1.—Circuit details.

then dipped in denatured alchohol and water and finally rinsed in clean water.

Lengthways across the top of the tank are laid two brass rods, see heading sketch, to the ends of which the connections are made. These rods act as supports for the anode and cathode. The anode is a sheet of copper nearly as large as one side of the tank and the cathode is the article to be plated (i.e. the baby shoe), this being suspended by means of the 14g. wire which is bent into the shape of a hook.

When all is prepared, put the shoe hook over the rod connected to the negative side of the battery, holding it clear of the solution. Switch on the current and immerse the shoe.

Adjust the rheostat until a reading of 1 volt is obtained on the meter. If a voltmeter is not being used, set the rheostat at about three-quarters strength and gradually adjust until the rate of deposition is satisfactory. If the plating is dark and burnt looking, too much current is being used. A gritty crystalline deposit is the result of using too low a current. A pinky tinge will spread from the wire over the shoe when everything is properly adjusted and the deposit, while in the solution, will have a white appearance.

When the copper deposit reaches a good thickness, remove the shoe and scratch brush it, using plenty of water, then replace it in the solution. Repeat this several times until the shoe has received an even layer of copper all over, then step up the current as far as is possible without burning the deposit.

On completion of the plating, the shoe is dried and rubbed over with a cloth buff and white rouge, taking care not to perforate the high parts of the plating. There is no need to polish the depressions.

Finishing

Scour the shoe with a hot solution of caustic soda, rinse with cold water and scratch brush lightly. Next apply a hot solution of liver of sulphur mixed with distilled water. This is painted on with a soft brush until the copper turns a rich brown. Another application of the scratch brush follows and then another painting with liver of sulphur solution and another scratch brush treatment. When the shoe is dry, touch up the highlights with the scratch brush and then apply a coat of transparent lacquer.

If a copper finish is not desired, the copper plating can be covered by subsequent deposition of silver, nickel or chrome.

All the plating materials mentioned in the article are available from Messrs. W. Canning & Co., Ltd., Great Hampton Street, Birmingham, 18.

PUZZLE CORNER

1.—Sent in by John Bowick: The Wine Merchant's Dilemma

A WINE merchant wished to distribute among three persons 21 casks of wine, 7 of them full, 7 of them half-full, and 7 of them empty, so that each of them should have the same quantity of wine, and the same number of casks. How was this done?

2.—From D. Ewins: Ship Spotting

EVERY day at 9 a.m. (G.M.T.) a ship leaves New York for Southampton and simultaneously one leaves Southampton for New York. The time for the trip in either direction is 144 hours. How many ships from New York will one going from Southampton meet?

3.—Cycling—A Man's Sport?

JIM and his sister often went cycling. One day Jim decided to set the pace at 8 m.p.h., but his sister could only manage 6 m.p.h. After going for 5 hours, Jim suddenly had a conscience so he turned back. How far from their original starting point did he meet his sister?

Answers

1.—First person, 2 full, 3 half-full, 2 empty. Second person, 2 full, 3 half-full, 2 empty. Third person, 3 full, 1 half-full, 3 empty.

2.—One for each 24 hours after it has left (6) *plus* one which leaves at the same time (1), *plus* the 6 which have left each 24 hours preceding the departure, i.e., total of 13 ships.

3.—After 5 hours Jim is 10 miles ahead of his sister. On returning his relative speed is 14 m.p.h. He meets his sister after $\frac{10}{14} = \frac{5}{7}$ of an hour. In this time his sister has travelled 4 2/7 miles or a total of 35 2/7 miles.

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REGISTRATION of DESIGNS

Procedure is Described Step by Step by "Attorney"

A DESIGN within the meaning of the Registered Designs Act, 1949, is in some respects vastly different from the popular notion of design in that it does not apply to a method or principle of construction; neither does it apply to an arrangement of machinery or to engineers' drawings. On the contrary, a design to be registrable must consist of new or original features of shape, configuration, pattern or ornament applied to an article of manufacture by an industrial process or means and those features must appeal to and be judged solely by the eye. In a sense, therefore, a design to be registrable must involve artistic merit. If the features of shape or configuration are dictated solely by the function which the article to be made in that shape or configuration is to perform, design registration could not be achieved. In view of the meaning of "design," various kinds of printed matter primarily of a literary character cannot be registered as a design, such as, for example, book jackets, leaflets, maps, plans, advertisements and so forth.

A design to be registrable must be new or original, i.e., it must possess substantial novelty. If a design sought to be registered has been applied previously to the same or any other article it is incapable of valid registration. The same is true if the new design differs from a prior design only in immaterial details or in features which are common variants in the trade.

Application for Registration

An application for registration of a design as applied to any article must be made to the Designs Registry of the Patent Office at 25 Southampton Buildings, Chancery Lane, London, W.C.2. In the case of a design for a textile article, an application may, however, be made to the Manchester Branch of the Designs Registry, at Regent House, Cannon Street, Manchester. Except in the case of designs to be applied to a set of articles or to textiles, an application for the registration of a design has to be made on Designs Form No. 2 in the name of the proprietor of the design. The proprietor is usually the author of the design. If, however, a design is executed by the author for another person for good consideration, then that other person can be recognised by the Registrar as the proprietor of the design. The name, address and nationality of the proprietor must be stated on Designs Form No. 2. This form must further state or identify the article to which the alleged new design is to be applied. The form has to be impressed with a £1 Inland Revenue stamp. For the convenience of applicants, there is an Inland Revenue Office (Room No. 28) in the Patent Office

Design Representations

Designs Form No. 2 has to be lodged in the Designs Registry together with three identical representations or specimens of the design. The purpose of a representation is to give an accurate and complete picture of the shape or configuration, pattern or ornament of the article when the design has been applied to it. Drawn or photographic views are acceptable for the representations and sufficient views from different viewpoints must be provided so as to leave no doubt whatsoever as to the complete shape, configuration, pattern or ornament of the article. Since internal features of an article that are not visible to the eyes cannot be registered, sectional views of the article are inadmissible, except where such views facilitate the disclosure of the external shape or configuration of parts of the article. Each view must be designated, e.g., perspective view, front view, plan view or otherwise as the case may be. Each representation must be upon stout paper 13in. × 8in. in size with the view or views executed or mounted in an upright position on the sheet. When photographs are used for the representations they must be firmly mounted on the sheet by adhesive. Specimens may be furnished in lieu of drawn or photographic representations, provided they are capable of being mounted flat on sheets of the prescribed size and provided they are not of a fragile nature. Apart from designation of the views, no words, letters or numerals must be shown on the representations or specimens.

An application to register a design must be accompanied by a separate statement of the features of the design for which novelty is claimed, i.e., whether of shape, configuration, pattern or ornament.

Examination

After an application has been lodged in the Designs Registry, the Registrar of Designs conducts an examination to see that the formal particulars on Designs Form No. 2 and the representations are acceptable. If they do not comply with official requirements, the applicant is informed about necessary amendments. Since, as stated above, a design can only be registered if it is new or original, the Registrar is entitled to refuse an application if, in his opinion, there is no substantial novelty in the design.

The Registrar is entitled to draw attention to illustrations of previously registered or published designs which in his opinion show that the design applied for lacks substantial novelty. In the case of a prior registered design, the applicant is referred to the number thereof which enables him to inspect or obtain copies of the representations of the previous design. Quite frequently, the Registrar will refer to illustrations in previously published catalogues in support of his refusal of an application. The applicant is entitled to apply for a hearing before the Registrar in order to argue against the refusal. In the event of refusal the applicant may file Designs Form No. 7 requesting the Registrar to state in writing the grounds of his decision. Within a prescribed time from the date of the decision the applicant is entitled to lodge an appeal which is heard by a High Court Judge constituting the appeal tribunal.

Period of Design Registration

In the absence of official objections or, if any, after they have been overcome, the applicant is provided with a Certificate of Registration to which is attached one of the representations of the design. The registered proprietor then has copyright in the registered design, i.e., the exclusive right in the United Kingdom and the Isle of Man to make, sell or use the article conforming to the design registered. This right may be transferred to another person, but the document of transfer needs to be registered at the Designs Registry without delay in order to avoid penalties. The copyright in the design initially extends for a period of five years from the date of registration. Before the expiration of this period, the proprietor may apply to extend the copyright for a second period of five years upon payment of a renewal fee of £4. Before the end of this second period, the copyright may be extended on the application of the proprietor for a third and final period of five years upon payment of a renewal fee of £8. The renewal fees are tendered respectively on Designs Forms Nos. 9 and 10, each impressed with the appropriate Inland Revenue stamp fee.

Registration of Same Design for Other Articles

If, after obtaining a Design Registration, the proprietor wishes to register the same design as applied to another article or articles or wishes to register modifications or variations in the original design he may apply for additional design registration which, if allowed, will have its copyright period limited to that of the originally registered design or any extensions thereof.

Public Inspection of Designs

Registered Designs, other than those in respect of textile articles, wallpaper and lace are open to public inspection immediately on registration upon payment of an official fee of 2s. in respect of each design inspected. Designs registered in respect of wallpaper and lace are not open to public inspection until the expiry of two years from the date of registration and in respect of textile articles until the expiry of three years from the date of registration. Photographic copies of representations of designs open to public inspection can be obtained from the Designs Registry by payment of a small fee.

Marking "Registered"

Articles manufactured and sold under a registered design should be marked with the word "Registered" or an abbreviation thereof and be accompanied by the number of the design registration. Failure to do this will enable a defendant in an action for infringement of the copyright in the registered design to escape damages on the ground that he was not aware and had no reasonable ground for supposing that the design was registered.

Information About Registered Designs

By filing in the Designs Registry, Designs Form No. 21 or 22 any person may request the Registrar to carry out a search with a view to revealing whether a representation or specimen of a design filed with the form is identical with or closely resembles a previously registered design. After carrying out a search the Registrar is entitled to inform the person requesting the search whether the design is registered and, if so, in respect of what articles, whether the design registration is in force, the date of registration and the name and address of the registered proprietor.

Cancellation of Registered Design

After a design has been registered any person may apply on Designs Form No. 26, duly stamped, for cancellation of the registration on the ground that the design was not new or original at the date of registration of the design. The grounds of cancellation must be set out on the form. If the Registrar makes a cancellation order the registered proprietor is entitled to appeal to the appeal tribunal.

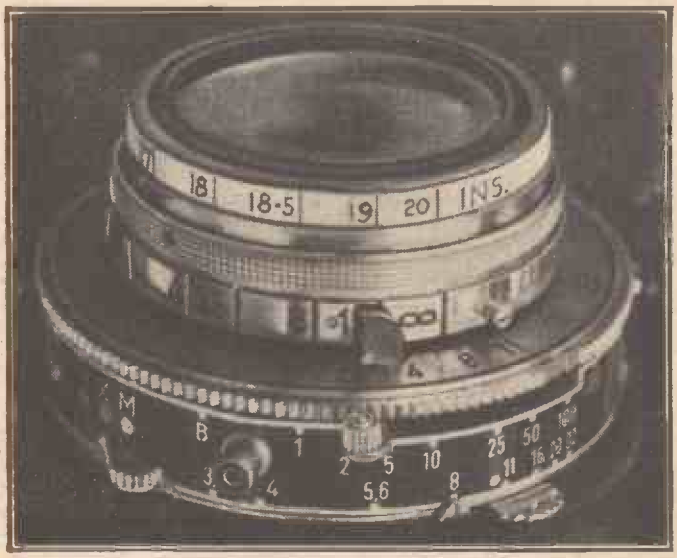
Advice on Design Matters

The Designs Registry does not undertake to give legal advice or opinions on questions of infringement or on any other matter connected with Designs Law. Advice may, however, be obtained from patent agents whose functions extend to all matters relating to design registration.

DIRECT FOCUSING WITH SUPPLEMENTARY LENSES

By F. G. RAYER

Details for Making and Fitting a Scale



1.9 *dioptre lens with mount calibrated in inches.*

POPULAR folding cameras will not focus upon objects nearer than about 3ft. or 1 metre, unless a supplementary close-up lens is added. The exact distance covered with such close-up lenses depends on the adjustment provided on the camera, but is about 18in. to 39.4in. with a 1 dioptre lens, 12in. to 19.7in. with a 2 dioptre lens, and 9in. to 13.1in. with a 3 dioptre lens.

When using these supplementary lenses it is necessary to measure the distance to the subject, then consult the table provided by the lens maker, which gives an equivalent setting, in feet, for the camera focusing scale. Errors may arise while doing this—in reading the figures, in transferring them from the table to the camera scale, or in measuring the distance of the object. In addition, the tables frequently give fractions which are awkward in practice. For example, with a 3 dioptre lens the camera scale must be set at 25ft. for a subject distance of 12.55in., 30ft. for a distance of 12.65in., and 50ft. for a distance of 12.85in.

When the camera scale is calibrated in metres setting is even more troublesome. It is also necessary to keep the tables always to hand, and to avoid taking one lens in mistake for another.

These difficulties can be overcome by marking the new, close-up scale directly upon the supplementary lens mount. Any popular camera with front-cell focusing can then be as readily adjusted for close-up work as for ordinary distances. It is only necessary to measure the distance between camera and subject, and rotate the front cell until the supplementary scale indicates the correct figure.

Preparing the Scale

When the supplementary lens holder is pushed upon the front cell of the camera the greatest distance marking on the supplementary scale must always coincide with the "Infinity" mark on the camera scale, as in Fig. 1. All other markings will then be correct.

Fig. 1 shows the focusing scale of a camera normally covering distances between 3ft. and infinity. The supplementary scale is drawn up from the maker's table or instruction leaflet, which will give the new distances for each setting of the camera scale.

When the camera is calibrated in metres and the close-up lens table is in feet the table must first be converted. As 1ft. equals .3048 metre, multiplication will furnish the equivalent distances for the metre scale:

4ft. = 1.2192 metres
5ft. = 1.524 „
6ft. = 1.8288 „ etc.

By estimating the positions of fractions a supplementary scale can now be drawn up, as in Fig. 2. By once again estimating fractions as closely as possible the simplified scale for the lens holder is obtained. This simplification is also wise with the scale in Fig. 1, as it avoids crowding of figures and makes measuring up easier.

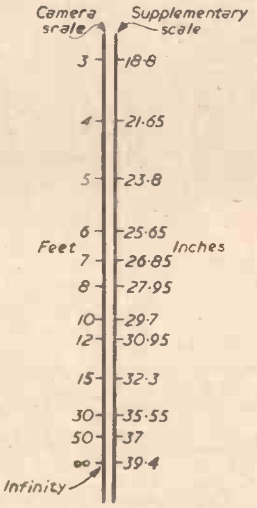


Fig. 1.—Feet scale with 1 dioptre lens.

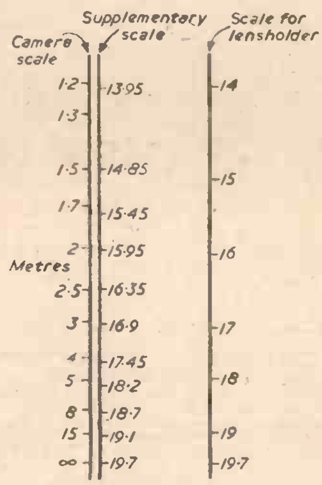


Fig. 2.—Metre scale with 2 dioptre lens.

The supplementary lens holder is now placed on the camera and markings made on the holder for the new distances. This can be done by applying black varnish thinly to the rim of the holder, allowing to dry and scribing on this with a metal point. Or a thin strip of paper may be fixed with Durofix, marked in pencil, then protected by clear varnish. If more than one supplementary lens is used, each should have its own holder and scale. The inches scale on the supplementary mount is read off against the same index as that fitted for the feet or metre scale of the camera.

Accuracy

Reasonable care in making the scale will give sufficient accuracy. With all normal close-up subjects, other than printed and similar matter, there is some variation in plane, so that the two decimal places of the maker's supplementary scales become rather pointless, even if the distance could be measured out with such high accuracy. There is thus no need to fear a loss of sharpness.

Unknown Lenses

With unknown lenses, obtained second-hand, or without tables, a scale can be drawn up by trial. A piece of ground or etched glass as sold by photographic dealers for focusing screens should be inserted in the back of the camera. The etched side should face the lens and occupy the plane of the film emulsion. Elastic bands round two empty spools will hold it in position, and the camera is best placed on a tripod.

With the supplementary in position and the camera lens aperture at maximum, a subject such as brightly illuminated printed matter can be brought into focus by rotating the front cell, and the distance between subject and supplementary is then measured, and marked on the supplementary scale.

A check with ground glass is wise with any camera when first using a supplementary, because some cameras are scaled in accordance with the distance between subject and film plane, not subject and lens.

MAKING A DRESSMAKER'S-DUMMY

(*Concluded from page 403*)

may be used for the upright of the stand and even a broom stick will serve the purpose. This should be fitted at the base with supports so that it will stand. The length should be in proportion to the model's height. Allowing for the depth of the neck, a strong clothes hanger is now attached to the top of the post or broom stick and fastened strongly, as it is from this hanger that the mould will hang and be suitably affixed with fine nails, drawing pins or some suitable liquid adhesive. When the taped mould has "hung" on to the hanger, the back cut seam of the dummy may be stuck together, but not before a final check up of bust and other measurements have been made and any necessary adjustments carried out. A piece of plywood or hardboard may be cut out in the shape of the oval at the base of the thigh line and neatly fitted into position thus enclosing the dummy at the base.

The Final Covering

For a first class permanent finish, the dummy may be covered with jersey stockinette or white muslin scrim. The muslin is dipped in starch and applied wet to the dummy. All materials added in this way must be smoothed down absolutely flat to give a fine surface to the model. The dressmaker's dummy, with its covering, will be ready to use almost immediately the covering material is dry.

If at any time the figure of the model varies, by cutting the dummy in a straight line up the back, a suitable strip may be cut away with a razor blade or some material added in the case of a larger size being required. With the assistance of a friend to hold the two cut parts apart, the adjustment may be made with added strips of wet glued tape.

Letters to the Editor

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

DEEP SEA BUBBLE

SIR,—Human beings have been unable to go deeper than about two miles under the sea, owing to the enormous pressure of water. The Bathysphere in which Professor Piccard made his descent, had steel plating over 3in. thick.

Yet, if fish and other sea creatures can live comfortably at these depths, then why cannot human beings reach them without undue difficulty? Perhaps the fishes' resistance to the pressure is due to the amount of fluid content in the cell structure of their bodies, and as fluid, such as water or oil, cannot be compressed, the same might apply to the fish, in each minute part of its body. Remembering also that there are living cells in a fish's body, the percentage of fluid to each cell must be of extreme importance.

I calculated that if the noted Professor had used a simply constructed waterproof cabin, with the same cubic capacity as his Bathysphere, and then encased the cabin in a large water-filled sphere or cube, the diameter or sides being about 20ft., and the thickness of plate equal to ¾in., it would have resisted the same water pressure as his Bathysphere. To explain the argument at any length would take up a lot of space, but a simple example would be a hollow glass sphere filled with water.

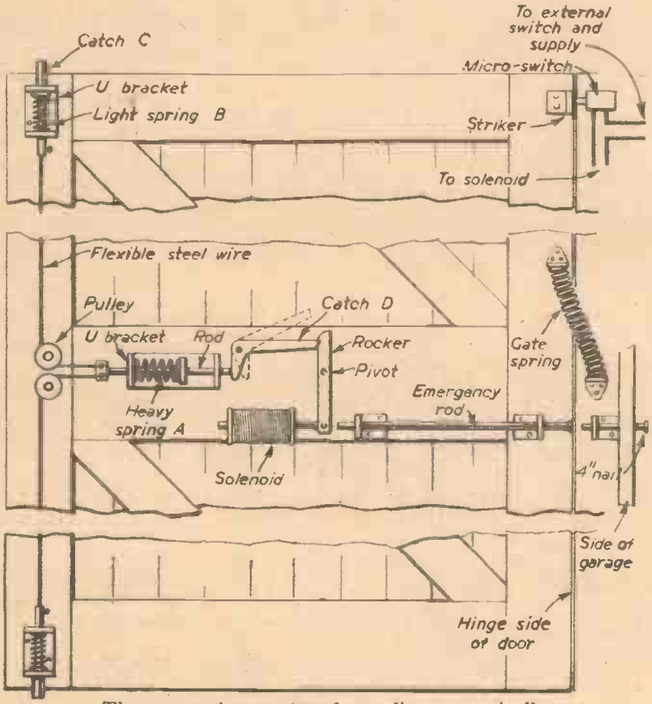
If hydraulic pressure were to be applied externally, it is obvious that if the pressure were radiated into the sphere, the glass, being non-flexible, would break. But, remember also, that the water in the glass was non-compressible, so that it would seem that not only would the glass remain whole, but that the pressure in it would remain at constant—whatever the external pressure may reach!

Accordingly, by allowing a bubble of air into the sphere, so must the thickness of its wall be increased to a definite amount proportional to the external applied pressure. —K. E. LANGNER (Ramsgate).

Automatically Operated Garage Doors

SIR,—With reference to R. Watson's query in the April issue, the following set-up has been operating my garage doors for several years. It is operated from a press switch and not by a car.

Both doors are spring loaded to open. A batten on door one holds door two shut. Spring (A) on the centre bracket is strong enough to overcome combined pull of springs (B). Catches (C) are positioned to engage on threshhold (if fitted) and top stopping. Operation of solenoid pulls rocker in so releasing catch (D). Spring (A) then operates on rod to pull wires and so release door. The micro switch is so connected that the circuit is only made with the door shut. The emergency rod is so positioned that when the door is shut the pressure on the 4in. nail (for unobtrusiveness) operates the rocker. To shut, the catch has merely to be pressed down to engage the rocker and doors can be pushed to.—R. F. LONG (Maidstone).



The garage door system shown diagrammatically.

Silencer for a .22 Rifle

SIR,—With reference to your recent query in "Information Sought" and subsequent letters published on this page in reply, we should like to point out that we manufacture a very effective sound moderator for use with .22 rifles. This, as is the case with all silencers, only suppresses the sound of the escaping gases (generated when the powder explodes) as they impact with the air. The sound moderator is actually a small cylinder fitted with a series of baffle plates in a similar way to a car silencer. Between 80 and 90 per cent. of the gases are accommodated and therefore the report is silenced to the same extent. It is for this reason that the term "sound moderator" is used instead of the more common "silencer."

The accuracy and shooting properties of the weapon are not affected, with the exception perhaps of a lowering by two or three inches of the point of impact for every 100 yards of range. Fitting requires that

the muzzle end of the barrel be screwcut by an expert. Details are available from this firm at the address below.—PARKER-HALE, LTD., Bisley Works, Birmingham, 4.

(*Letters continued on page 417*)

Making the Most of Your Circular Saw

(*Concluded from page 388*)

and-fall saw table. The shoulders can be cut by hand or on the circular saw by adjusting the height and the fence.

Grooves and Rebates

Grooves up to about ⅝in. width can be cut quickly with a wobble saw. This is an ordinary circular saw except that it is fitted with special washers which throw the blade out of square with the axle. Fig. 4 is an edge-on view of it with the saw thrown a ¼in. out of true, and the table set for a ⅛in. deep groove. When revolving at speed its action is not only to cut downwards but sideways also; thus, set as shown, the saw will cut a groove ½in. wide and ⅜in. deep. Feed should be reasonably slow to ensure that the saw is allowed to "cut" its way in the wood rather than to "tear" the fibres. If a deep groove is required it must be cut gradually, certainly not more than ⅛in. at a time.

Rebates can also be cut with the wobble saw but a width of more than ⅝in. should not be attempted in one cut. In actual fact, most saws do not cant beyond this for the reason that too great a strain would be imposed on the bearings at high speed. If a wider rebate is required, it can be done in two or more runs.

Both grooves and rebates can, however, be cut quite well with an ordinary circular saw. The methods are the same as with a wobble saw except that the work is moved successively closer to the saw each time a cut is made. Grooves thus cut will, in effect, be more accurate than those cut with a wobble saw, although not noticeably so.

A series of grooves a specified distance apart can be cut by fastening a length of silver steel, of a section which fits the grooves, to the table top at the required distance from the saw and parallel to it. The author used this method recently when making a number of boxes each to hold 100 2in. colour slides. This idea will be useful for making the slide box mentioned on page 409.

Still Easier screw Fixing

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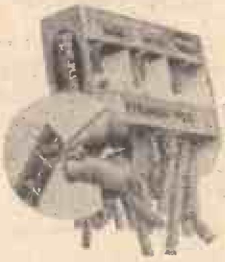
No nervous person need worry now about making fixings with Rawlplugs. With the new Metalide masonry drill it is safe, simple and silent to make the right size holes in the masonry. No mess, no damage to decorations and within a few minutes the job is complete and strong enough to take its load.

Metalide drills are made in the four sizes most suitable for household fixing jobs. They can be used in a hand brace or suitable electric drill.

No. 8 (3/16") Green Wallet	No. 10 (7/32") Blue Wallet	No. 12 (1/4") Brown Wallet	No. 14 (9/32") Grey Wallet
5/6	6/-	6/6	7/-

Each Metalide drill is packed with an instruction leaflet in a strong plastic wallet with transparent window.



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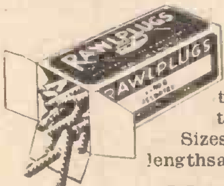

HANDY BOXES 1/-

For those who prefer to keep their Rawlplugs in separate boxes the shilling handy box is a boon. Sizes 6, 8, 10, 12 and 14 in assorted lengths are packed in these individual boxes.

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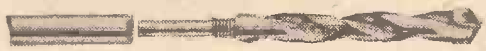
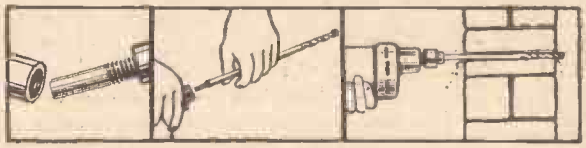


FOR DRILLING RIGHT THROUGH WALLS



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These drills can be fitted with extension shanks to increase the drilling length to 12" or 16". Ideal for making a clean job of taking cables, conduits and pipes through walls. Six sizes ⅜" to 1" diameter.

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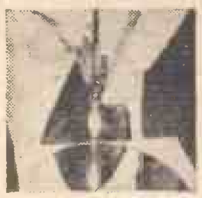

Making fixing holes in mirrors, or drilling pottery for conversion into table lamps you must use the Durium Glass Drill with the tip ground to the most suitable angles.

Cutting Diam.	1/8"	5/32"	3/16"	7/32"	1/4"	5/16"	3/8"	7/16"	1/2"
Price each	6/6	6/6	6/6	6/6	6/9	7/-	7/3	9/-	10/3

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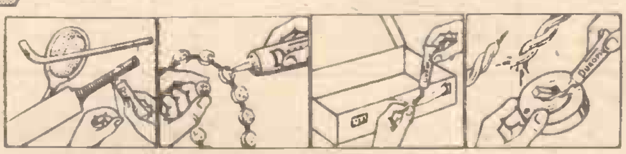

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B638

If it can be stuck Durofix will stick it because it is a universal adhesive which is heatproof, waterproof and being transparent makes almost invisible joins. Valuable ornaments and trinkets can be repaired. When dry and hard it will not become tacky in the hands so it is ideal for sports goods. Once you have proved how useful and reliable Durofix really is, you will never be without a tube in your home.

Durofix Thinner and Remover 1/6 per 2 oz. bottle.

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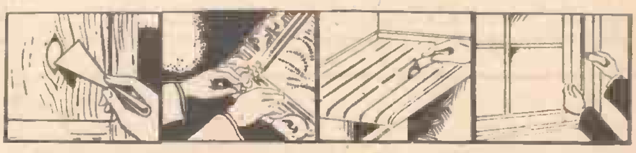

It is surprising how many uses you can find for Rawlplug Plastic Wood in the home. Filling cracks and flaws, making woodwork good before decorating, repairing furniture, making models and so on. Plastic Wood dries hard and can be cut, planed, sanded, painted and varnished like real wood. You can even drive nails and screws into it. Colours:—Natural, Oak, Mahogany and Walnut. Plastic Wood Softening Fluid 1/6 per 2 oz. bottle.

1/- PER TUBE

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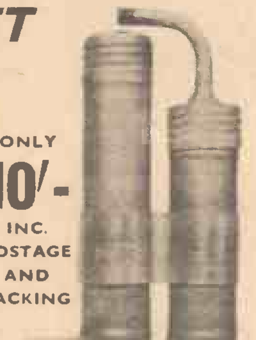

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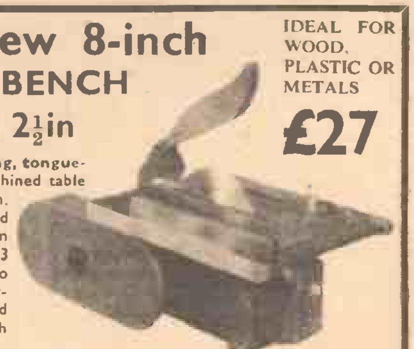

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LETTERS TO THE EDITOR

THE PLANEIST THEORY

[We regret we can accept no further letters on this subject—Ed.]

SIR,—I should like to systematically disprove all the statements Mr. W. Mills has made on the subject of a flat earth.

A sundial's shadow is not as simple as he supposes. The direction to which the shadow points is one variable, caused by the rotation of the earth. There is a second variable—the length of the shadow, which varies both throughout the day and the year. The variation during the year, which would be apparent if one measured the length of the shadow at noon every day for a year, is due to the varying inclination of the earth's axis to the sun. The shadow's movements are no more complicated as, although the sun undoubtedly moves, the earth repeats all its movements.

As for gravity, it is merely the attraction that exists between any body and any other body. As the earth is the nearest body to the sea, the sea is naturally attracted to the centre of the earth, and settles in a sphere round it. Rivers are also attracted to the centre of the earth, and flow downhill towards it. However, Mr. Mills' observations at Witney Bridge are not valid as in only six miles many errors can creep in. If at either end of the six-mile stretch there was a deposit in the earth of heavy metallic ores, whereas at the centre were only light, sandy soils, the water might easily be attracted to the ends of the canal. When another body, such as the sun or moon comes near the earth, the waters of the sea are attracted towards the new body and tend to pile up on one face of the earth. These tides do not occur in small stretches of water such as lakes as there is no room for the water to pile up at one end.

Could any planeist produce a model of the earth which is flat, yet shows the earth's features as clearly as a globe? Why is it, in addition, that one can go round the world? How is it that the sun lights up half the world at any time? If the earth is flat, it must have two sides. What is on the other side? We haven't yet fallen off the edge. There is only one shape the world could have without having sharp corners and an uneven and odd shape, this being a sphere.

Mr. Mills, shadows are quite bogus. Does the shadow of one part of a moving object projected on to another part of the same object, move? No. Not unless the whole thing is rotated. Then, when the thing is rotated, for every degree through which the apparatus is rotated, the shadow appears to move through one degree. In one hour the earth moves through 15 degrees. In one hour also the shadow of any object on the earth appears to move through 15 degrees also.

The movements of the planets can be simply explained by considering the earth to be a sphere revolving round the sun, being one of many bodies all revolving at different distances from the sun. What does a planeist orrery look like? The orbist's model of the solar system is a simple thing, but I am sure the planeist's must be complicated, and, as Lord Rutherford said: "These fundamental things have got to be simple."—S. E. DINWIDDY (Drayton).

★ ★ ★

SIR,—It is a fact well known that the earth's surface comprises 75 per cent. of ocean, which of course always seeks its own level. To put it another way, the surface of the ocean is the same distance from the centre of the earth at all points, for this reason it is more suitable on which to base one's conclusions than the ground would be.

To mention perspective in this connection may appear irrelevant, but I hope to show that it is not without significance.

In conventional perspective it is customary to treat the horizon as a straight line which, of course, is quite true when viewed in elevation; in plan, however, it can be shown to be circular.

Observations made while crossing the Atlantic in a liner provide perhaps the best means of investigating the matter, as an uninterrupted view of the ocean is available showing the line where sea and sky seem to meet.

From these observations it must be obvious that from whatever point of the compass the horizon is observed, whether east or west, north or south, it always appears to be at the same distance from the observer.

It is, therefore, not unreasonable to assume that straight lines drawn from the observer to the horizon will all be of the same length, consequently one is forced to the conclusion that the line of the horizon is the circumference of a circle of which the observer's eye is the centre.

Evidently the observer is elevated more or less above the surface of the ocean, so that straight lines can be imagined which terminate at the horizon resulting in a cone of lines, the vertex of which is formed by the observer's eye, while the base line is formed by the diameter of the horizon. This cone is tangent to a body which must always present a circular outline anywhere in the navigable world, and the only body which fulfils this requirement is that of a sphere. The only conclusion to be reached, therefore, is that the surface of the ocean is spherical, and this applies more or less to the earth generally.
—HORACE W. NEALE (Rotherham).

★ ★ ★

SIR,—Correspondent W. Mills states that it is impossible to obtain more than a 45 degree angle to the sun at any latitude. By a simple geometrical construction, it can be shown that it is possible to obtain any angle from 0 to 90 deg. to the sun. For the benefit of non-geometers such as Mr. Mills, the following construction will be useful: Draw two circles, one representing the sun, and the other the earth. Now draw a line from the centre of the "sun" which touches the circumference of the "earth" (i.e., this line is a tangent to the "earth"). Let the point of contact of this line with the earth be designated P. Now, by a well-known theory in geometry, the line joining the centre of the earth to the point P is perpendicular to the previously drawn tangent. An observer at P will see the sun setting, and this is perfectly consistent with a spherical earth.

When Mr. Mills talks about moving shadows at the equator, etc., I rather think he has forgotten the most relevant fact that the object casting the shadow is moving with the earth. The object and the earth are at rest relative to each other, and this does not imply any specific shape for the earth.

Once again I challenge Mr. Mills to explain the curved shadow of the earth on the surface of the moon during a lunar eclipse (or is this an "anomaly" in the planeist theory?).

A sphere is finite but unbounded. In simple language, you can move about over the surface and not come to any "end." However, this is definitely not true when one considers a plane. If one imagines a fly placed anywhere on a sheet of paper, and then moves in a straight line, sooner or later, it will come to an edge. Why has no one in this world ever found an "edge"?

It seems to me that many facts can only be explained if the earth is assumed to be a sphere, and a few facts can be explained assuming any shape for the earth.—G. G. ALLWOOD (S.E.13).

A 6in. Astronomical Reflecting Telescope

(*Concluded from page 397*)

8. Superior Equatorial Cradle Mounting

A fine sturdy mounting can be made as in Fig. 3 (May issue) and Fig. 21. Rotation of the cradle causes the telescope to follow the rising and setting motion of the stars. The cradle is tilted so that the angle is the same as the latitude of the observatory. This may be readily found from the Ordnance Survey map of the district at the local library. The entire mounting is orientated on to the meridian and the long axis of the cradle, if extended, would pass through the North Celestial point (close to Polaris, the North Pole star). If the telescope is to operate in equatorial regions the long axis of the cradle will be near to the horizontal.

If one has the money the trunnions at A and B should be made to co-operate with good-quality plummer blocks having brass bushes. A suggested simple form of trunnion is presented in Fig. 22. A sturdy tin can is made to contain a thick polygon of wood, this is then made to fit into a felt lined circular aperture in a split block of hardwood. This method was not used on the prototype but there appears to be no reason why it should not suffice where the handyman does not have recourse to a lathe. In this form of mounting the telescope tube must be in excellent balance and this is readily obtained by the judicious use of lead weights at the base of the tube. A slider weight as shown in Fig. 23 may be of great assistance. The whole tube and cradle should move easily but not too freely. It is quite wrong to go to the trouble of fitting high-speed ball races and such fittings, for these are designed for purposes far removed from the small angular movements required of a telescope of this nature.

It is desirable to provide a simple hand control to move the cradle in a direction counter to the Earth's rotation. A gramophone 10in. turntable with a segment of brass cut with teeth to form a small portion of a worm wheel co-acting with a worm is shown in Fig. 14. The worm wheel must be capable of being freed and locked to the cradle trunnion so that the cradle can be moved without using the worm during quick setting operations.

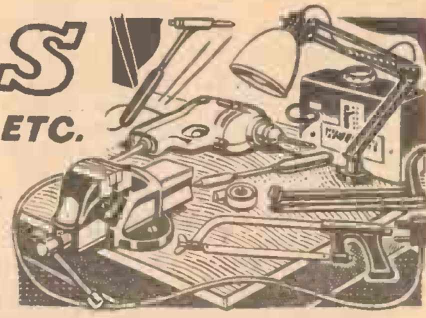
The Finder

Many experienced amateur astronomers use very simple finders on their telescopes. A gunsight comprising a bracket with a hole of ⅛in. and cross wires is excellent. It enables one to see the star field and isolate any brightish star. A length of ¾in. dia. tube was found adequate for most things. If one desires an optical finder there are many low power short telescopic sights available from war surplus stores. The finder should give an inverted view, have a field of about 4 deg. to 6 deg. and be mounted not less than 4in. from the tube wall (see Fig. 25).

An article on maintaining and adjusting your telescope will appear shortly.

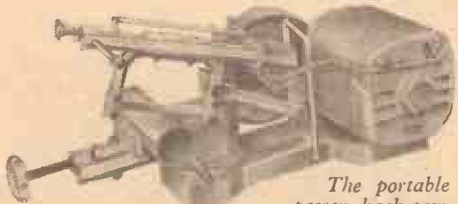
Trade Notes

A REVIEW OF NEW TOOLS, EQUIPMENT ETC.



IMPROVED KENNEDY PORTABLE POWER HACK-SAW

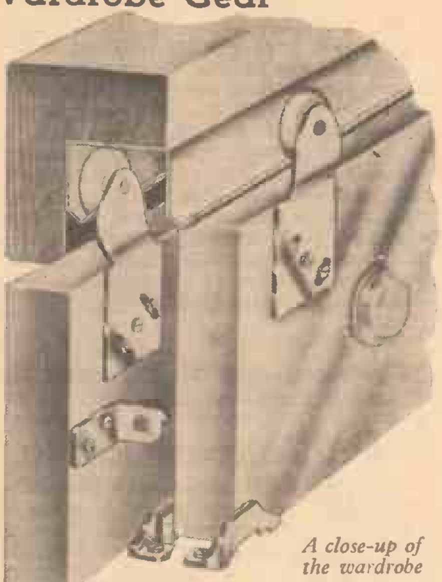
THIS popular little hack-saw is now presented with a number of technical improvements as the Kennedy portable Power Hack-saw, Mark II. The capacity of the hack-saw has been increased to $2\frac{3}{8}$in. and the $\frac{1}{8}$ h.p. Hoover motor now has a thermal overload control. If the hack-saw stops accidentally, the motor cuts out automatically, thus eliminating the risk of a burn-out of the windings. A new zero-cutting edge is incorporated—a simple but very useful idea by means of which the extreme edge of the vice-jaw indicates the path of the saw cut. Additionally, the vice-jaw is now calibrated in fractions of an inch so that short lengths of material can be cut off without the need for marking. The saw-frame arm is now fitted with a handle which enables the release-catch to be operated by thumb pressure alone. One or two other improvements have also been made. The price remains unchanged at £28. Its biggest advantage is that after it has been set up and the electric motor started, then the hack-saw finishes the job without any further supervision or effort being required. Pedestals, tripods and other accessories are also available. The makers are W. Kennedy Ltd., West Drayton, Middlesex.



The portable power hack-saw.

"Double Top" Wardrobe Gear

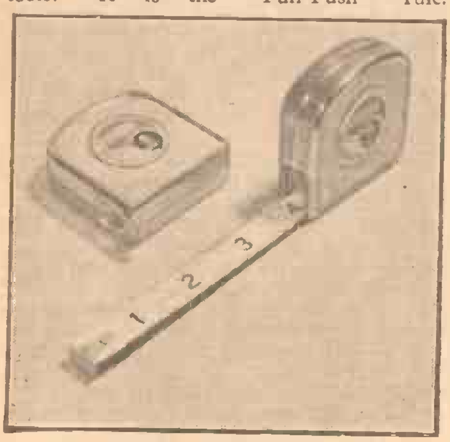
P. C. HENDERSON LIMITED have introduced on to the market their completely new and simple to use wardrobe gear, named "Double Top." This is the first of its kind in the country, designed for space-saving sliding doors to built-in cupboards and wardrobes. Complete standard sets, down to the last screw, are supplied for openings from 4ft. to 8ft. wide, and for two or three doors. Prices range from 34s. per set. All fittings are face fixed to the inside of the doors, invisible from the outside. No mortising or grooving is necessary to fit the gear. The one set of track, hangers and guides can be used for doors from $\frac{3}{4}$in. to $1\frac{1}{8}$in. thick, and up to 60lb. per door in weight. Simply reverse the hangers and adjust the bottom guide accordingly. The noiseless nylon wheels and guides will last a lifetime. The makers state that any handyman can do the installing, aided by the simple pictorial fixing instructions packed with every set. An illustrated list is available for readers giving further particulars and prices, from P. C. Henderson Limited, Tangent Works, Harold Hill, Romford, Essex.



A close-up of the wardrobe gear.

AN IMPROVED POCKET RULE

AN improved design of extending steel pocket rule for the handyman has been produced by the makers of Stanley tools. It is the "Pull-Push" rule.



The Stanley "Pull-Push" rule.

The chromium plated "D" shaped case, handy for slipping in the pocket, and measuring exactly 2in. along the bottom, enables it to be used for accurate inside measurements, as well as for ordinary work. To make the reading 100 per cent. accurate it has a sliding "True-Zero" hook at the end of the blade which automatically compensates for its own thickness on both inside and outside measurements, and a "True-View" mouth, which exposes the graduations on either side of the blade, where it enters the case to eliminate sighting error on inside measurements. "Pull-Push" rules are available in 6ft. and 10ft. lengths at 7s. 6d. and 10s. 6d. respectively. They are also made in 2 metre and 3 metre lengths, graduated in millimetres, or in combinations of both English and metric systems, at the same prices. Replacement blades are available together with instructions for fitting. "Pull-Push" rules are obtainable from all good ironmongers, tool suppliers' and hardware dealers. The manufacturers are Stanley Works (G.B.), Ltd., Rutland Road, Sheffield, 3.

New Bridges Tools

A RECENT addition to the Bridges range of tools is a contractor's kit. The power unit consists of Bridges $\frac{3}{8}$in. Neonic Drill with speed of 900 r.p.m. making it ideal for drilling all types of materials. In addition to the 10ft. lead fitted as standard, a special extension lead with connector is included. Augers for wood drilling, high-speed and carbide tipped drills for masonry, metal and brick-work, holesaws for hole cutting are all part of the kit. The Neonic Eye fitted to the drill gives a warning of any faulty connection or broken earth lead. The price complete with sturdy carrying case and extension lead is £21 14s. 6d.

A further addition to this range is a portable chain mortiser for mortising and pin-hinge slotting without the need for heavy and expensive chain mortisers. When required for pin-hinge slotting, replacing the mortising chain with the pin-hinge chain or serrated chisel is a simple process. The machine is adaptable to vertical and horizontal usage. The maximum depth of cut is 5in., the width of slot 3/64in. to $\frac{1}{4}$in., length of slot unlimited, and the weight is only 29lb. The price of the chain mortiser is £59 10s., a chain sharpening attachment using the mortiser's own motor is available at an additional £9 19s. 6d. The abovementioned tools are made by S. N. Bridges & Co. Ltd., York Road, London, S.W.11.

Thor Hammers

THE Thor Hammer Company, of Highlands Road, Shirley, Birmingham, supply mallet and hammer heads in plastic, rubber, rawhide, copper, cellulose, lead,

(Above)—The Thor rubber-faced hammer. (Below)—A rawhide and copper hammer. Both faces are replaceable.

lignum vitae, lignostone, etc. They also manufacture a non-spark mallet for use where fire hazards exist. Full details of Thor hammers and mallets are obtainable from the above address.

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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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BLOWERS, MOTORISED. 3 phase. 440 v. 1½ h.p., £7.10.0 ea. Cost about £40.
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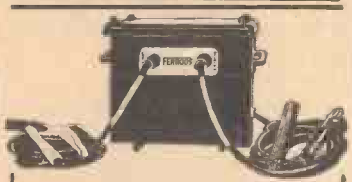

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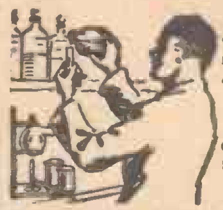
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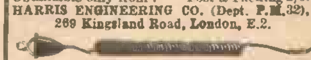
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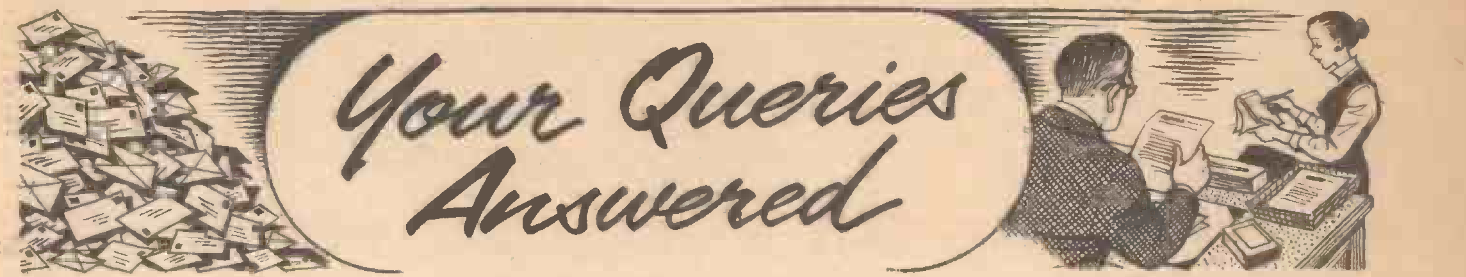

Moulding Polythene

PLEASE suggest a method of forming scrap Polythene into small blocks for radio insulators, etc. I should prefer to do this by solution in some suitable solvent rather than hot pressure injection.—R. C. Robbins (Bristol).

THE most suitable solvent for your purpose is probably Xylene, in which Polythene will dissolve to a treacly mass. This you could pour into simple moulds to harden by evaporation of the solvent. Shrinkage will be considerable.

Polythene, however, liquefies at quite a low temperature; your scrap could readily be melted down in a domestic gas or electric oven and poured into moulds. They should be filled to overflowing and struck off level before the material becomes too viscous.

Armature Rewinding

I HAVE a Bridges ¼in. electric drill and the armature wants rewinding. Would you let me know how to go about it? There are 11 gaps in the stampings and 11 coils on the armature. There are 22 segments on the commutator. I believe the windings are tapped half way through. I do not know how or where the coils are joined to the commutator. There are 150 turns to each coil.—R. M. Page (Swindon).

THE armature could have 11 coils, each with 150 turns of 37 s.w.g. enamelled wire, a loop being brought out from the centre of each coil for connection to the commutator. Use a coil span from slots 1 to 6, etc. With the armature placed so that slots 1 and 6 are equi-distant from the centre of one pole face number the commutator segment which then lies under the brush nearest this point, number 2. All numbering is clockwise at the commutator end. For clockwise rotation at the commutator end connect the start of the coil in slots 1 and 6 to segment 3, loop to segment 4, and finish of the coil to segment 5. Connect the start of the coil in slots 2 and 7 to segment 5, loop to 6, finish of the coil to segment 7, and so on.

For counter-clockwise rotation at the commutator end connect the start of the coil in slots 1 and 6 to segment 23, loop to 244, and finish of the coil to segment 1. Connect the start of the coil in slots 2 and 7 to segment 1, loop to 2, finish of the coil to segment 3, and so on.

Rewinding a Transformer

I HAVE a step-down transformer of the normal type with the secondary wound separately over the primary. Mains voltage 230, output 3 kVA at 150 v.

I wish to rewind the secondary for arc welding to give 60 amps. 50 v. or 120 amps. 25 v. Could you tell me if it would function satisfactorily in this form? If so, what would be the best method, if any, of regulating the output? Also, is the idea practical? Could you advise as to the type of wire to use for rewinding?—S. Russell (London, S.E.5).

RULES

Our Panel of Experts will answer your Query only if the Rules given below are complied with.

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.

THE transformer could be used without modification for arc welding in conjunction with a choke coil, but, assuming it is continuously rated, we consider that the welding current should be limited to about 40 amps. If you require a higher welding current we suggest that you rewind the secondary to give 80 volts, with about 55 amps. welding current. In order to do this the secondary should be rewound with 76 per cent. of the present number of turns, using wire having approximately 132 per cent. of the present cross-sectional area (approximately 115 per cent. of the present diameter). Double cotton covered copper wire could be used. We think that 50 volts is rather low for serious arc welding.

In any case a choke coil should be connected between the secondary winding and the welding electrode. This should be capable of carrying the welding current without overheating, and should have a volt drop equal to about 95 per cent. of the secondary voltage. The output could be adjusted by varying the impedance of the choke coil, as could be effected by using a tapped choke coil or a choke coil having a variable air gap in its iron core.

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*An * denotes constructional details are available free with the blueprints.*

A Finish for Wrought Iron Work

I HAVE recently been making some small pieces of wrought iron work and up until now I have been brush painting first with zinc chromate then with dull black paint. This is very slow especially with small intricate scroll work. The work is built up (from black M/S) by oxy-acetylene welding and brazing with silicon bronze rods. The finish required is dull black and rustproof. Could you please describe a suitable process for doing this?—J. Hetherington (Carlisle).

WE believe either of the immersion processes will suit your requirements and in this connection we suggest you contact these firms:

Messrs. Metal Finishes Ltd, 14, Frederick Street, Birmingham, 1 and Messrs. Chemag Metal Colouring Co., Consul Works, 140, Chester Street, Aston, Birmingham, 6.

Give them full details of the parts you wish treated and at the same time request particulars of their products. Neither of these processes requires current and we are of the opinion the simpler the work, the easier it will be for you.

Screw-cutting Query

I HAVE made a die-stock for use in the tail sleeve of the lathe. The trouble is that the round material being threaded rotates in the three-jaw chuck. It is a new 5in. chuck and the job that I am working on requires a 4in. thread on ⅜in. B.M.S. For use in a vice, I have made some half-round clamps. These are successful, but I always get the inevitable "drunken" thread. I would prefer to use the lathe, can you help please?—L. E. Fordham (Caterham).

DESPITE the fact this is supposed to be a new chuck we suggest a thorough check before attempting further work with it.

Grip a piece of silver steel gently in the jaws. We specify this material because the diameter is both round and parallel to a close degree of accuracy, and we suggest only holding it lightly in order to avoid straining the jaws.

Insert a thin feeler gauge between each jaw and the steel rod—again we suggest a .0015in. feeler, as this is the smallest in a set. Try sliding it under each jaw, first at the front and then at the back; noting whether you can make it enter.

We have a suspicion the material has rotated and caused them to wear slightly—black bar will soon do this—so carefully examine to see if they are scored in any way. If they are damaged, then only grinding or boring will restore them to anything like their original condition.

With regard to the drunken thread, this is common when hand methods are attempted due to the die not starting correctly. A rough screw-cutting operation will remove the bulk of this metal prior to starting the die, and if you can only leave say, .01in. for that tool you should then set the die to the thread and so avoid all signs of this problem. Gradually close the dieholder say, .005in. at the time. You can, of course, perform this work in the lathe, and in this connection we urge the use of a piloted dieholder to ensure the die runs on the thread truly.

One further point. Are you sure the B.M.S. is perfectly parallel and round? We appreciate this metal does not possess the same close tolerances as silver steel, but occasionally it can vary to quite a considerable amount. A check with a micrometer will supply this information.

You cannot produce good threads by hand methods in the way you are doing—the die will not start truly and this is the crux of the problem. Only occasionally does this happen and then you are lucky enough to cut a good thread. Expressing an opinion without actually examining the chuck, we would say the front of these jaws are worn and the only grip secured is on the back edges.

Blower for Organ

I HAVE an "Aeolian Grand" Player Organ, with 22 stops, and wish to construct a blower for air supply, instead of the built-in bellows. Can you tell me how to do it? I wish to run the blower with a ¼ h.p. motor at 1,425 r.p.m. Would coupling of motor to blower be best direct, or by belt drive?—J. C. Newton (Tasmania).

THE dimensions, operation speeds, etc., of the fan installed will depend upon the pressure and capacity requirements of the particular player organ. These are best ascertained by actual experiment under maximum operating conditions. It is suggested that no observations other than those obtained by a pitot tube and manometer will be necessary at the outlet from the built-in bellows.

A straight-bladed fan, i.e., pressure type, should meet the stated requirements; direct-coupled to the motor running at 1,425 r.p.m. From the total head and velocity observations obtained by experiment, and with the speed fixed, the design of the fan can proceed; using, for this purpose, the principles outlined in the book "Fans," by Th. Baumeister (published by McGraw-Hill Book Co.).

It should, however, be observed that noise might be experienced with the straight-bladed type of fan. Should pressure conditions permit, i.e., reasonably low operating pressures, a forward-curved multi-blade fan is best fitted. It is fairly quiet in operation, but is unsatisfactory when working against high resistance. Again, for quietness, the air velocity through the connecting ductwork should not exceed a velocity of 800-1,000ft. per minute.

Copper Stains

SOME years ago the lead hot and cold water pipes in my house were replaced with copper. Since then I have been troubled with green stains which are particularly bad in the bath. What can I do to remove them?—H. Crawford (Glasgow).

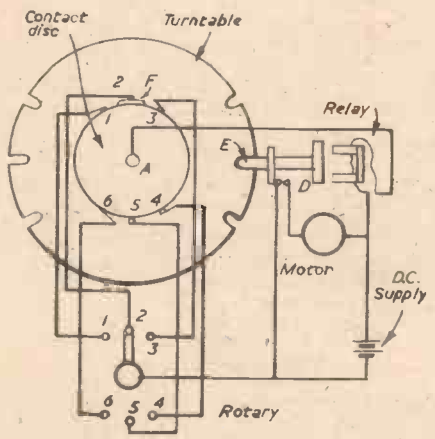
SOME domestic waters are slightly solvent to copper, and there is not much that can be done about such cases. The stain will be present at the other fittings, but will not be so noticeable because the bath has lost the high glaze which does not give much hold to the stain whereas the other fittings still retain theirs.

Experience has shown that the worst stain occurs after the water has been standing for some while, and it will be found worth while to run to waste the first small quantities of water at each point of use.

Railway Turntable

WOULD you provide me with a circuit diagram for wiring an automatic oo gauge railway turntable? I have at my disposal a gramophone turntable, complete with bearings, 24 v. A.C./D.C. motor, a 12 v. - 24 v. A.C. or D.C. supply at 3 amps., and an ex-W.D. interlock firing switch containing a pair of 250 ohm 12 volt solenoids.—J. Burlison (Barrow-in-Furness).

YOU may be able to make use of the following idea. A contact disc may be mounted on the shaft below the turntable, with six sets of light flexible fixed contacts which bear on, and make contact with this disc, except when they are raised from the disc by means of a piece of insulating material F which is fastened to the disc at one point. The six contacts 1 to 6 are connected to six



Circuit details for the railway turntable.

fixed contact studs on a rotary switch as shown in the diagram. Six notches are cut in the edge of the turntable to line up with the locking bar E of the relay in any of the six required positions.

With the rotary switch in the position 2 shown the relay coils are de-energised by the insulated piece having lifted the fixed contacts 2 from the contact disc. The spring on the relay has pushed the locking bar E into the notch in the turntable corresponding to the turntable position 2, and the contacts D are open to de-energise the motor.

Suppose the rotary switch is now turned to the position 6. The relay coils will immediately be energised through the flexible contact at position 6 on the turntable. The relay will withdraw the locking bar E. This should be arranged so that the flexible contacts D close very slightly before the locking bar is clear of the turntable slot. The contacts D will then energise the motor to turn the table. The table will continue to turn until it is close to the position 6, when the insulating piece F will open the contact to de-energise the relay coils. The end of the locking bar will then drop on to the edge of the turntable, but the contacts D will not open, and the motor will therefore continue to run, until the turntable has reached the exact position. The locking bar E will then drop into the slot in the turntable, opening contacts D to stop the motor.

Arc Welder

I HAVE an ex-aircraft D.C. generator, it is 30 volt, 200 amps., and I would like to use it as an arc welder, please tell me how? I have driven it at about 2,500 r.p.m. but obtained very little current.—J. Healy (Tubber).

IT is most likely that your difficulty is due to the generator being driven at too low a speed, although it might be due to driving the generator in the wrong direction, the brushes not making good contact with the commutator, or the shunt field circuit not being completed.

In our opinion 30 volts is rather too low for serious arc welding. It is possible that the output voltage could be increased slightly by driving the generator at a still higher speed, in which case a resistor would probably be required in the shunt field circuit to limit the shunt field current to its normal value so as to avoid overheating the field coils. If the machine has compound field windings we suggest that you try reversing the connections to these coils so that they oppose the shunt field windings to reduce the generated voltage after the arc has been struck. It is, however, most likely that you will require to connect a resistor between the dynamo terminal and the welding electrode. This should be capable of carrying the welding current without overheating and could have a resistance of 1 ohm for the highest welding currents up to about 4 ohms for 50 amps. welding current. If you have difficulty in striking the arc due to the low voltage a choke coil connected in series with the resistor would help.

Astronomical Telescopes

I WOULD be obliged if you would answer the following queries concerning astronomical telescopes:

I have seen it stated that "inch for inch, a refractor is much more powerful than a reflector." Why is this?

Is there any reason why microscope eyepieces of the Huyghenian type should not be used in conjunction with a 6in. reflector?—J. R. Millburn (Aylesbury).

INCH for inch, other things being equal, on a given focus a reflector and a refractor would have equal power. It is not on the magnifying power that the two are unequal but on the light transmitted to the eyepiece. Reflectors are given about half as much again diameter to the mirror to make up for tarnish on the silver of the mirror, which tarnish commences to form immediately—and a mirror needs resilvering every three months or according to site.

No, there is no reason, optically, why a microscope eyepiece should not be used on a 6in. reflector. Of course, accessories such as standard diagonals, micrometers etc., would not fit the instrument.

Information Sought

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

Sails for a Dinghy

CAN anybody tell me how to make sails for a dinghy of the Enterprise or Graduate type?—R. BARNETT (Manchester).

"Magola" Motor Cycle Engine

CAN you supply drawings of the above five-cylinder German engine, made about 1923 by Meixner, Gockerell & Landgraf of Munich? It was rated 10 b.h.p. at 5,500 r.p.m.—W. FARR (Swanage).

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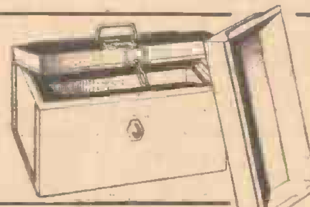

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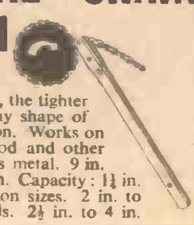

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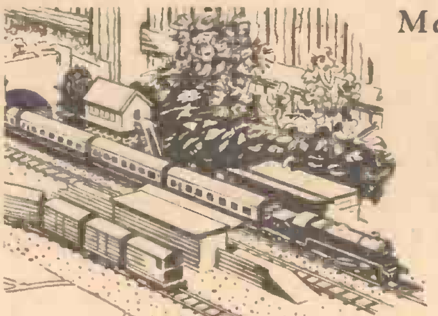

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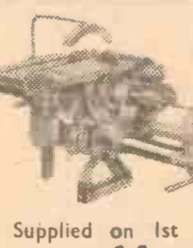

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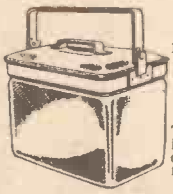
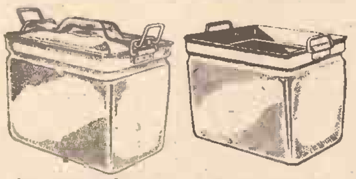


Capacity 6 gallons
Size: 16 x 11 x 11" deep.
Grade 1 condition

57/6 each, carr. paid.

This container is despatched covered with a film of protective grease.

PATTERN B



Complete with lids. With lids removed

Capacity 6 gallons — Size 16 x 11 x 11" deep.
Brand New and Unused—75/- each carr. paid.
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STAINLESS STEEL VATS
Open tops, 28 x 8, depth 32,
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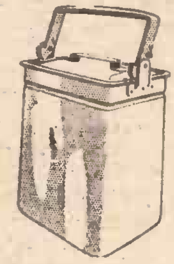

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VOL. XXVII JUNE, 1959 No. 443

COMMENTS OF THE MONTH

The Channel Tunnel And What It Could Mean To Cyclists

THE bed of the English Channel is being drilled to obtain rock specimens some 200ft. down and the object of this survey work is to confirm a geophysical survey made by an American company last year and one carried out by a French company during the last century. The results obtained from both these earlier surveys were much the same and if the present one is also in agreement, there is a strong possibility that construction of a tunnel will commence without further delay. The route it is thought will be along the line of the lowest of three layers of chalk. The boring operations now going on will show where the chalk is free from faults and thick enough to accommodate the tunnel. The original work on the tunnel was carried out in 1880 and a mile of the tunnel was built out from Dover and from Sangatte on the French side, but since then political and military considerations have prevented the work from being continued.

Type of Tunnel

It is not known at present whether the tunnel will be a road tunnel, a rail tunnel or a combination of both, but if a road tunnel is built and it is on the lines of the Mersey Tunnel at Liverpool, cyclists will be able to use it. Cycling to France! This opens a wide field of speculation to all cyclists, especially those living in the Home Counties and the South of England.

One of the immediate possibilities is that of a week-end tour across the Channel. Riders would be able to pass through the tunnel either late on Friday evening or early Saturday morning, spend the best part of two days on French soil and then return late on Sunday evening to England, riding every inch of the way! Cyclists living within easy reach of Dover could even ride across for the Sunday club run and spend the day in Northern France or just across the border in Belgium.

Racing Opportunities

The racing man's opportunities would be enormously increased. Whereas, at present, only the best English riders ever have the chance of crossing the Channel and riding as representatives of Great Britain, the tunnel would make the cost of the journey negligible and liaisons between French and English clubs would enable clubmen to become internationals with the greatest of ease.

Not only, of course, would English riders be crossing over to France, but French and Belgian riders would be visiting England and entering into club and open events over here. One result of this could be that the British public, attracted by the International flavour of events would become much more interested in cycle racing, especially if coach loads of enthusiastic French and Belgian race fans came across to support their riders, as they could well do. The Channel Tunnel would make it as easy as visiting the next town on their own side of the Channel.

Another aspect would be that British riders would be able to gain experience of Continental roads and Continental races very much easier and it is the lack of this experience which has held British riders back from full participation in the Continental cycle racing classics in the past.

The picturesque Suffolk wool town of Lavenham. "The Swan" in the middle distance dates from the 14th century.

Riding Through the Tunnel

The possibilities for speculation are endless and while it is very pleasant to dwell upon some of the effects that the Channel Tunnel might have on the world of cycling, it might be worth while to think a moment on what it would be like to ride through it. The walls and roof would probably form a half circle and the tunnel would be lit by electric lights above the centre of the roadway. The tunnel would not necessarily be straight, as it would have to follow the most suitable path through the strata under the sea bed, but even so, it is hard to see how the engineers could avoid monotony. It is probable that this monotony is going to be one of the unavoidable and unpleasant features that motorist or cyclist who makes the Channel crossing by tunnel will have to accept. Another aspect that the cyclist may have to consider will be that of extra clothing, as the air is almost bound to strike chill. These disadvantages can be easily disregarded when considering a tunnel only a couple of miles in length, but things are rather different when the length of the tunnel is increased to something over 20 miles.

Customs

A further snag which will undoubtedly have to be considered is that of the customs at the English end of the tunnel. Anyone who has crossed the Channel by sea cannot fail to have noticed that, whiie the customs shed on the English side is crowded with long queues of people all being subjected to a solemn ritual questioning and ponderous search, those on the French side are often occupied by a single official who nonchalantly scribbles on passengers baggage with a piece of chalk as they walk past him.

A system similar to that on the borders of France and Italy or Italy and Switzerland will have to be introduced at Dover and if the volume of traffic is in any way comparable to that normally encountered at the weekends on English coast roads, a stop of more than a couple of seconds for each vehicle would cause impossible queues and end inevitably in utter chaos. The most the customs officers could do in these circumstances would be to check passports, and take an occasional car on to a layby for search. But no doubt the solution to this problem and others will be found if the tunnel comes into being.

There is no doubt that the effect of a Channel Tunnel through which cyclists could ride would be considerable so far as cyclists in the South of England are concerned, but what the long term effects will be can only be decided by the tunnel becoming actual fact, and the first step towards this is in progress now.

Cycle Sales Decline

GRAVE fears have been expressed recently by a spokesman of the British Cycle and Motorcycle Industries Association regarding the future of the cycle industry. During the past four years, the sale of bicycles has declined sharply, as can be seen by the following figures:

1955	3,564,000
1956	2,875,000
1957	2,548,000
1958	2,156,000

There were hopes that the budget in April would have provided some help in the form of a reduction in purchase tax, which at the present rate is considered a great deterrent to sales. This, of course, would help the industry to restore the volume of home market trade back to prewar figures.

The British Cycle and Motorcycle Industries Association consists of members of the bicycle, motor cycle and components industries and tyre manufacturers, factors and exporters. Its work is to promote the sales of British machines and components.

Photography for the Cyclist

By C. J. J.

A Few Hints and Tips

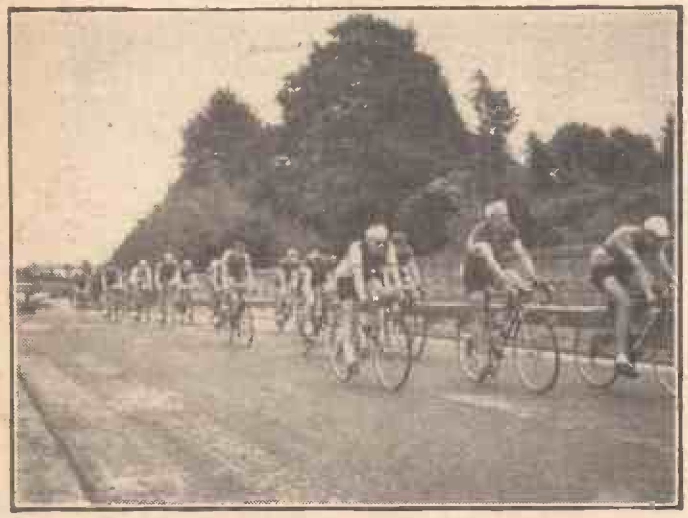

Fig. 1.—The field in a typical road race.

THE hobby that merges with cycling best is photography. If your interest is primarily photography, the cycle is a handy way of getting about and reaching points of photographic interest; if your main interest is cycling, photography enables you to make a permanent record of your riding.

An expensive camera is not necessary, but it is an advantage if the camera is not too bulky. There is no need to carry a large number of extra equipment, but a lens hood, 2x yellow filter, exposure meter and perhaps a range-finder will be found very useful.

Snap Photography

When it is possible to take your photographs in a leisurely fashion—when recording a view for example—all the accessories may be used; when, however, the photograph must be taken quickly, all these items can be dispensed with and all the exposure and distance factors estimated to save time. It is a good idea to have the camera set up as nearly ready for action as possible. The film can be wound on, the shutter can be set for, say, 1/100 sec. which is fast enough to record most normal subjects and the aperture can be set according to the prevailing lighting conditions, i.e., roughly whether it is sunny or dull. The focusing scale can also be pre-set, using the two triangles

Fig. 2.—Include the ferry in your tour photographs.

marked on the focusing scale. When all these factors have been pre-set, taking a photograph is only a matter of opening the camera, loading the shutter and pressing the release.

Carrying the Equipment

The camera, of course, must be carried in its leather or canvas case, preferably one of the "ever-ready" variety. Most of the accessories, too, can be housed in leather cases, threaded on to the carrying strap of the camera case. If the camera is to be carried on the back it is advisable to shorten the strap as much as possible, so that the weight of the camera does not swing it round the body to hit the cyclists' knees. It is possible, too, to purchase special leather patches, lined with studded rubber, which fit over the carrying strap and make a friction grip on the rider's shoulder.

Fig. 3.—Gymnastics on the beach.

If the camera is carried in the saddlebag, wrap it up in a jersey or something similar and carry it in the main part of the saddlebag. In this way it is better protected from accidental damage than it would be in an outside pocket.

On Tour

Points of interest and views seen on the road are obvious subjects and most tourists photograph the youth hostel, guest house or hotel in which they spend the night. When looking back at a tour long after it has been finished it is often the small day-by-day incidents which are recalled with most pleasure and photographs, showing the informal roadside picnic or the time you searched for a puncture, using water from a nearby horse trough, are good reminders. The moment of panic recalled by a photograph showing your cycle in company with many others being swung from the hold of the cross channel ferry will help to give a different aspect to your foreign tour record.

Fig. 4.—Make your group look casual.

This is an example of an "interest" photograph. You could include the ferry, too (Fig. 2).

When recording ordinary week-end club runs, it is again the unusual incident photograph which livens up the album. An impromptu football match or gymnastics on the beach (Fig. 3) will often give the photographer just the opportunity he needs.

Groups often take a prominent place in the photographer's album and very rightly so. But it is not necessary to pose all the club members in line. Why not catch the club at table (Fig. 4) or sprawled by the roadside resting? It is just as easy to count the faces and you have made a much more interesting picture.

Racing Photographs

Many of the present day cycling clubs are participants in racing of one form or another and photographs of events (Fig. 1) are of great interest to club members and their friends. Here is an opportunity for the cycling photographer, even if is camera is only a modest one. Riders being pushed off at the start of a time trial can provide photographs with an authentic racing atmosphere and the turn can often provide an opportunity for the owner of a camera with only slow speeds.

Fast shutter speeds are not even necessary to photograph moving riders, provided the camera user is skilful enough in "panning."

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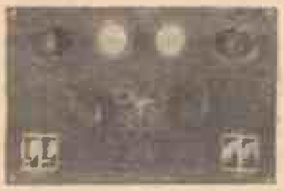

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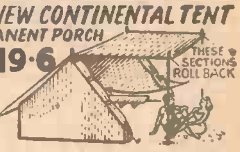

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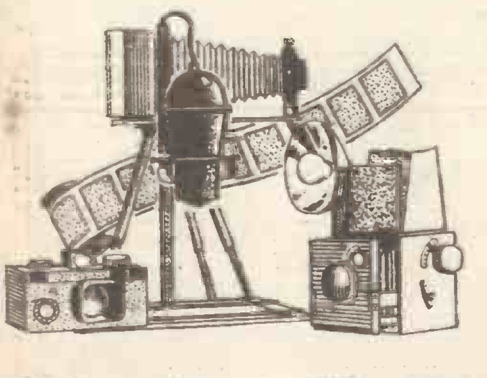

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