A MODEL STEAM TURBINE

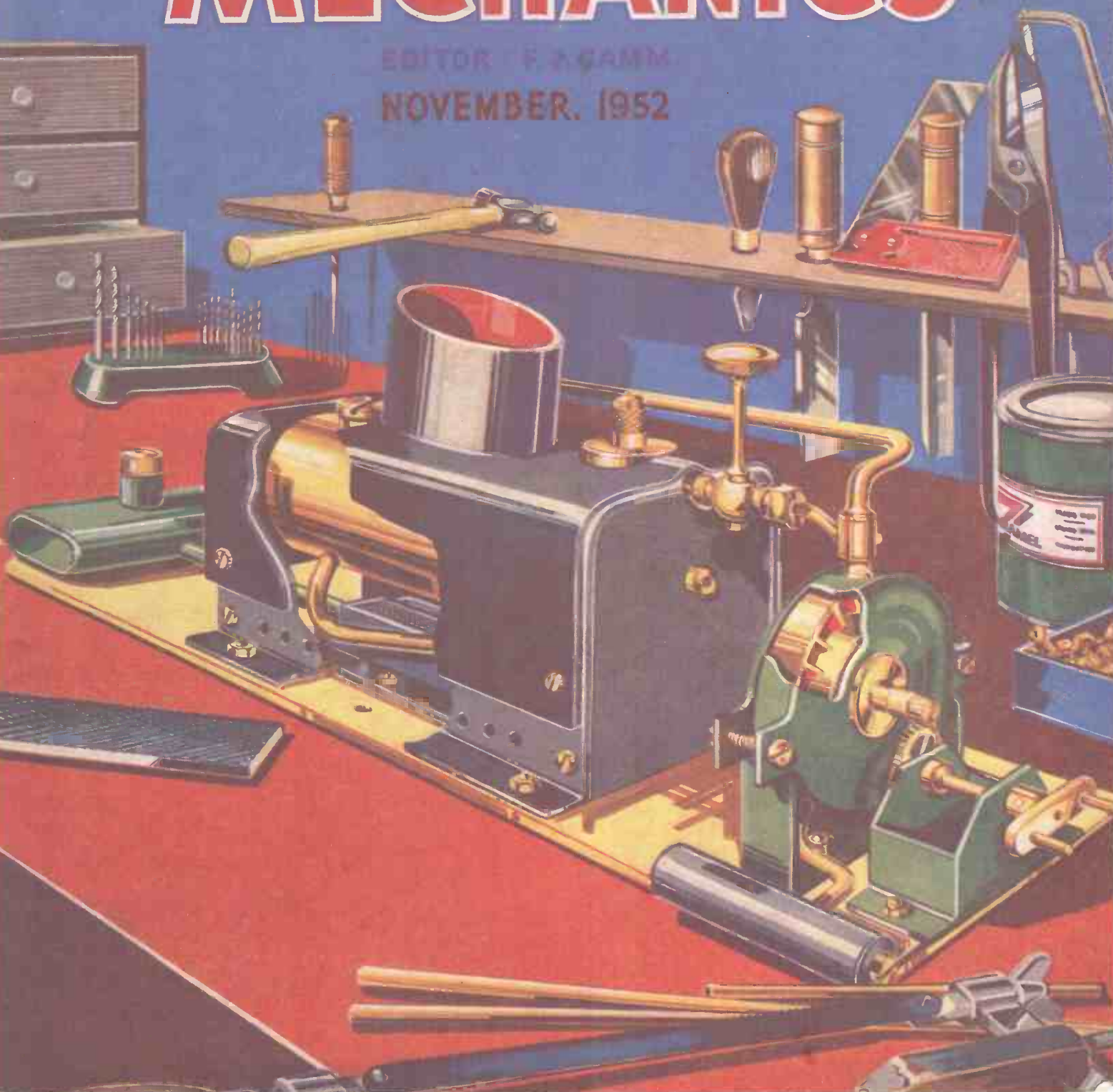
NEWNES

PRACTICAL MECHANICS

1/-

EDITOR: F. J. CAMM

NOVEMBER. 1952



"I wish I could show you ALL the clips we make at

TERRY'S"

HT5A.

You'd have a surprise—**CLIPS** in every possible shape and size, **CLIPS** in steel, bronze, stainless, plated, etc., **CLIPS** for every trade under the sun . . . and if you want a clip made to specification TERRY'S Research Department is there—ready and willing to give you the benefit of 96 years' experience.

Want to know all about springs?

Here's a book packed with spring know-how from cover to cover—the finest of its kind today. Post free 12/6.

. . . and here are three "specials"

Three really popular clips. Nos. 80 and 81 come ½" to 2" from stock. No. 300—an exceptionally good drawing board clip—costs 5/- a dozen (inc. p.t.), from stock.

Sole Makers: **HERBERT TERRY & SONS LTD., REDDITCH** · LONDON · BIRMINGHAM · MANCHESTER

NOVEMBER, 1952
VOL. XX
No. 227

PRACTICAL MECHANICS

EDITOR
F. J. CAMM

Owing to the paper shortage "The Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

FAIR COMMENT By The Editor

An Exhibition of Inventions

ON many occasions this journal has drawn attention to the need for a national effort to co-ordinate the work of inventors and we have suggested that the Government should give the lead by forming either a Ministry of Inventions or a Government Department which should concern itself entirely with examining inventions and patents and ascertain whether promising inventions should be encouraged by State support or subsidy, as is being done in some other countries. Inventiveness should be encouraged; unfortunately, in this country, it is discouraged not only by the great cost involved in taking out world patents, but by the attitude of industry and the State to inventors and inventions generally. The prosperity of a nation is entirely dependent on the creation of ideas from which flow employment and trade. Perhaps there is a national tendency to sell old lines far beyond the period when they should be relegated to the obsolete; manufacturers are resistant to change. It is often found that a new line gives a terrific fillip when trade is bad. One can almost observe new blood pulsing through the commercial veins of an organisation when a new line is introduced and is avidly absorbed by the public.

Before the war, the Institute of Patentees staged a number of exhibitions, and next February it is to re-introduce the first of the post war Exhibition of Inventions. It will take place from February 18th to 28th, inclusive, from 11 a.m. to 9.30 p.m. at the Central Hall, Westminster, under the title of "Modern Inventions and New Ideas Exhibition." It will provide manufacturers with an opportunity of inspecting under one roof inventions which come within the purview of their manufacturing facilities or which may fit in with their existing lines. They will also be able to assess by public interest whether there is likely to be a demand for a particular invention. The exhibition will provide inventors with a chance of bringing their ideas before manufacturers, instead of ploughing the lonely furrow of hawking them round individual manufacturers.

A practical demonstration of an invention by means of a working model or a full-size prototype is far more convincing than a Patent Office screed and a lifeless drawing. There is one point here we should like to stress. To invent something and to produce a model of it is not sufficient. It must be provisionally protected at least, as that is the only evidence of proprietorship in the idea. No manufacturer will buy an unprotected idea because of the risk of possible infringement.

There will be a trade section in this exhibition for marketed items, but the main theme of the exhibition will be the inventors' models, which will occupy the whole of one floor. It is open to all inventors to display approved inventions, but those who are members of the Institute will be granted reduced rates.

OUR THREE-COLOUR COVERS

OUR thanks to all those readers who have written congratulatory letters on the re-introduction of our three-colour covers and the increase in the number of pages. Our invitation to readers to submit suggestions for possible articles has met with a ready response, and many of the suggestions are in hand. It is one of the pleasantest parts of an Editor's task to read letters from his readers, whether they are laudatory or critical, but this month we have been particularly pleased with the large volume of letters we have received from readers all over the world.

SUBSCRIPTION RATES
including postage for one year

Inland - - - -	14s. per annum.
Abroad - - - -	14s. per annum.
Canada - - - -	13s. per annum.

Editorial and Advertisement Office: "Practical Mechanics," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2
'Phone: Temple Bar 4363
Telegrams: Newnes, Rand, London.
Registered at the G.P.O. for transmission by Canadian Magazine Post.

Our thanks also to those readers who remembered that we celebrated our nineteenth birthday with the October issue and wished us many happy returns. These are the sort of returns which Editors like!

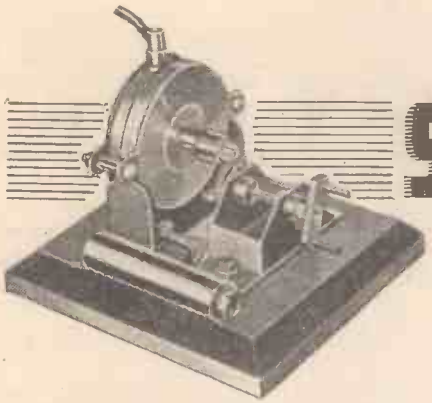
Several readers have suggested that we should re-publish in book form some of the constructional articles for which there is a continuing demand and which have appeared in issues long since out of print. We are giving consideration to this suggestion and an announcement concerning it will be made later.

PRINTED METALLIC CIRCUITS

A RECENT development of importance in all electrical devices, including radio and television receivers, is the printed electrical circuit. By this method the circuit, showing the position of every wire, is printed on to a sheet of metal attached to an insulator. The metal is then subjected to acid treatment, as in ordinary block-making, which eats away the unwanted parts of the metal, leaving those parts which form the "wire" connections. Where wires are crossed, a sheet of metal is placed on each side of the insulator to avoid short-circuits. Circuits printed by this means can afterwards be folded to any form to suit the design. By this means it is impossible to make wrong connections, and the time taken to wire up a particular circuit is but a very small fraction of that taken by the point-to-point system. It is much cheaper, too.

INDEXES

INDEXES for Volume XIX are now ready and may be obtained for 1s. 1d. by post from the Publishers of this journal, address as given on this page. Whether readers have their copies bound or not, they should obtain the index which saves an enormous amount of time when it is desired to consult an article which has appeared some time before. It also enables querists to ascertain, before they submit a query to us, whether we have dealt already with their particular problems. By purchasing the index, readers thus save themselves, as well as us, a considerable amount of time.—F. J. C.



A Model STEAM TURBINE

An Elementary Model Power Unit for the Beginner

By J. E. J.

THE construction is very simple and anybody who is handy with tools can make it with very little difficulty.

The original was made completely by hand from odds and ends of material mostly found in the junk box. Some items might perhaps be beyond the scope of the average constructor, particularly if his range of tools is not large: for example, the safety valve and steam regulator. The accuracy of the former is vitally necessary for safety's sake, whilst the latter must be completely steam tight. The mechanical details might not be easily produced by hand unless one is particularly skilled in this direction and it might be better to purchase these items in completed form.

The unit runs for approximately 20 mins. on one filling of fuel and water and the design illustrated is to fit into a small launch. It is shown actually in position, but it could also be used to drive a small generating set.

The speed of turbines is extremely high, a speed of 50,000 r.p.m. being considered a mean average for the more efficient types. This little model can average about 10,000, running free, which is quite fair for only a 24-bladed rotor. Admittedly, they have not the same "push" as the normal reciprocating engine for a model, but even so quite a good account can be rendered. Another point to remember is that turbines consume steam in large quantities; so maintain a steady volume by having a good fire under the boiler, otherwise the effect will be noticed immediately as a drop in the r.p.m. of the rotor. For working purposes a reduction gearing is a necessity, to enable the rotor to give its best without strain. These vary according to class and type, 20 to 1, or 50 to 1 being more or less general. This model has a reduction of 5 to 1, which was proved to be reasonably efficient.

The Rotor, Mounting and Retaining Plate

The rotor was made from a brass disc 2⅜in. dia., which was marked off and segmented into 24 blades as shown in Fig. 2, each blade being cupped then filed off to a chamfer at the back. The shrouding was soldered to each blade tip. The main-shaft is a short length of 3/16in. dia. silver steel firmly sweated into position.

The rotor case was made from an old boot-blacking tin, drilled centrally to receive bearings fashioned from brass tube which are fixed into position by means of brass discs sweated to the case on either side (see Fig. 1).

The mounting must be firm, so the material used was 18g. sheet iron, shaped in one piece as shown in Fig. 1. The bottom portion of the rotor "tin" is bolted to the mounting with four 5 B.A. csk. nuts and bolts.

The retaining plate is made of 20g. brass, and serves to keep the lid of the case steam tight and rigid on the body, as well as to prevent it rotating due to vibration of the fast-running rotor.

Condensation Drum, Steam Valve and Reduction Gears

Condensation is drained away from the case via a small hole drilled in the bottom. To prevent this making a mess round about, a drum, fashioned from brass tube, was fitted and connected to the hole by means of a

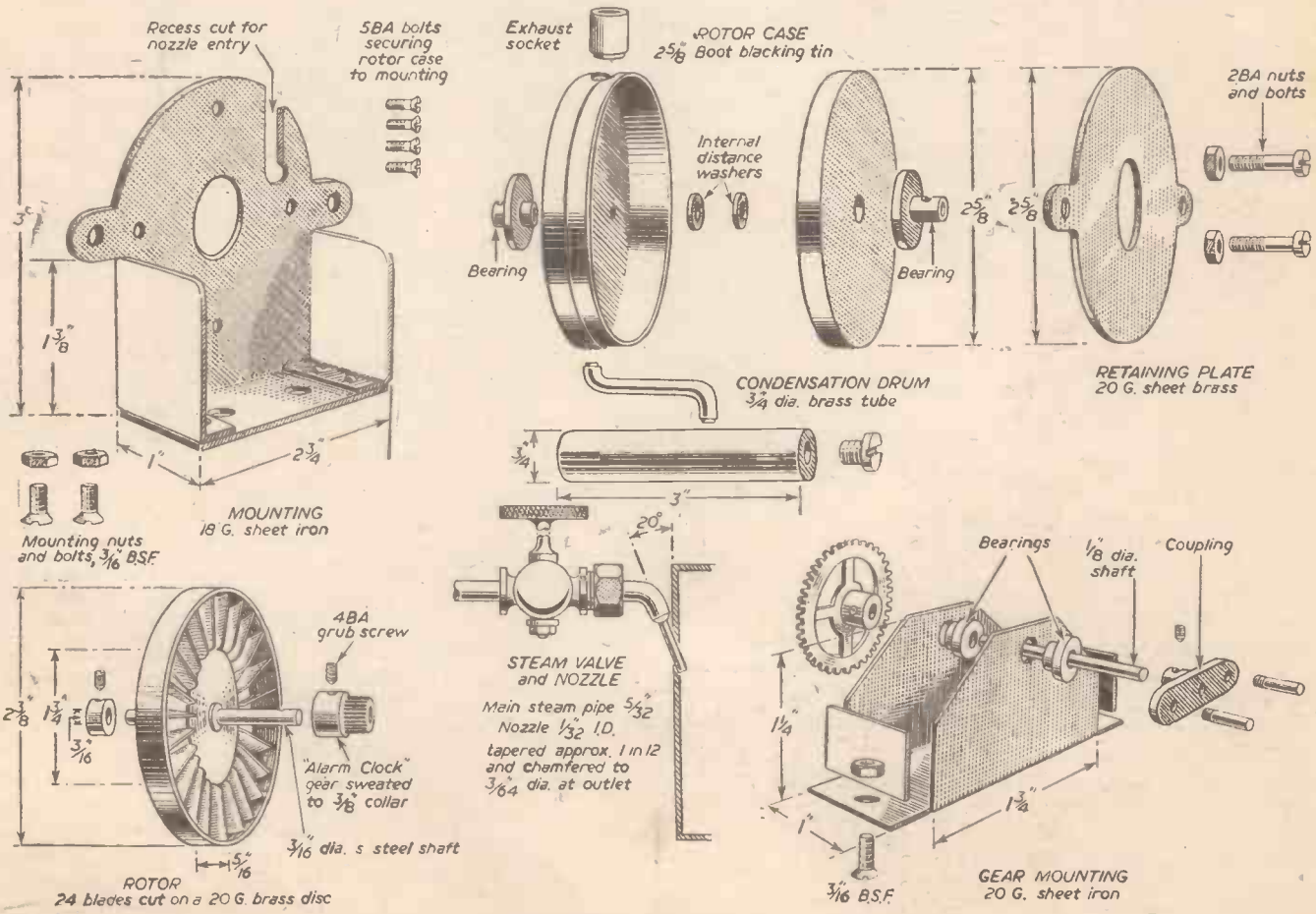


Fig. 1.—Details of the turbine and gear-case components.

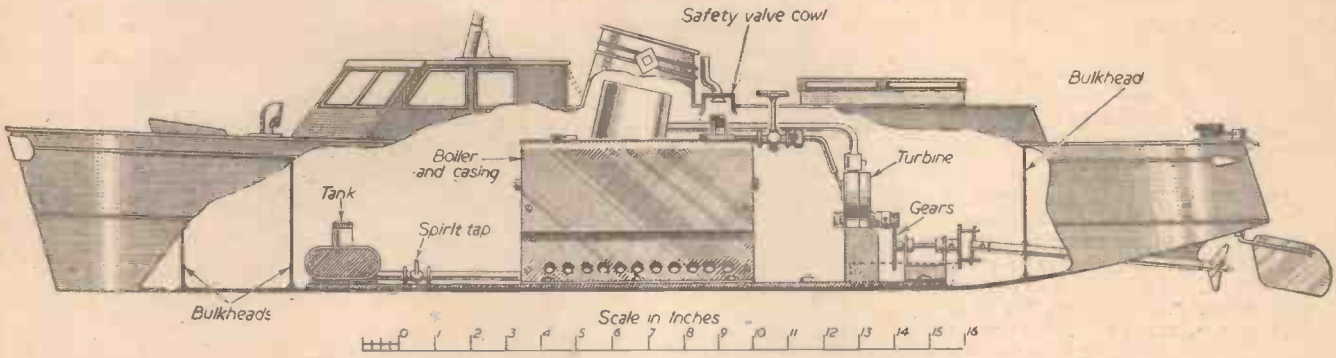


Fig. 3.—Showing the location of the turbine power unit in a model boat.

short length of ⅛in. dia. copper piping (Fig. 1). After running, it can be drained by means of a screw cap fitted at one end.

The steam valve was improvised by modifying a stop-cock to suit requirements. The requisite unions were, of course, fitted to the steam pipe first.

The gear case was made up from 20g. sheet iron. The bearings are ⅛in. dia. bushes soldered into position. The gears were taken from an old alarm clock, and adapted for use (Fig. 1).

The Boiler

The "soldered-up," large-size "cocoa tin" is an article which I have used for such purposes on some occasions in the past; but for durability's sake it would be wiser to construct something stronger.

The one shown here was made from a length of solid drawn copper tube of 24g. It is 6½in. long, by 2½in. dia. It is fitted with sunk-in end plates, two water tubes, one internal stay, filling cap, steam dome, and safety valve. All jointing is effected with silver solder, the melting point of which is, of course, well above that of soft solder, and thereby much stronger and safer, and capable of standing a high pressure (see Fig. 3). If no tube is available, and that is not unusual these days, quite a good job can be accomplished by rolling up from sheet copper. The join should be lapped and well sealed with solder. A good way of working here is to obtain a length of iron piping of a suitable diameter, fasten it in the vice, then wrap the sheet around it. The pipe can also be used as an anvil to tap down the join. One point to remember when working the sheet is that it should be well annealed first. Not only is it easier to handle, but there is less likelihood of it cracking when hammered.

The boiler, described in the September issue (page 421), is constructed in a similar manner.

The steam pipe is 5/32in. O.D. copper, whilst the nozzle is a short length of ⅛in. dia. tube, with a bore of 1/32in. The orifice is chamfered out to 3/64in. dia. to allow for steam expansion. The exhaust is carried off by means of a ¼in. dia. brass tube, via the funnel.

The Boiler Casing

This is fashioned from 22g. sheet iron, which, apart from being necessarily strong, is best for conserving heat. Ventilation is provided by means of holes drilled low down along either side. The chimney is rolled from the same material, and riveted to the casing.

Protection is afforded by having three-quarters of the casing covered with asbestos, held in position with thin aluminium sheet bolted down, as shown. The boiler is supported in the casing by means of the stay ends which protrude through the casing end plates, and are threaded to receive 5 BA nuts. These items are illustrated in Fig. 3.

The Burner

This is a wick type. It consists of a rectangular box ⅜in. high, 4in. long, by ½in. wide, resting in a tray, which, catching any overflow of spirit, prevents it from flowing over the floor of the boiler. The wick is asbestos string laid in the box. The supply of spirit is effected by means of a 3/16in. dia. brass tube connecting up to the container. It is fitted with a stop-cock to regulate the flow of spirit (Fig. 3).

A similar type of burner is illustrated in Fig. 14 of the "Model Steam Launch" article in the September issue of PRACTICAL MECHANICS.

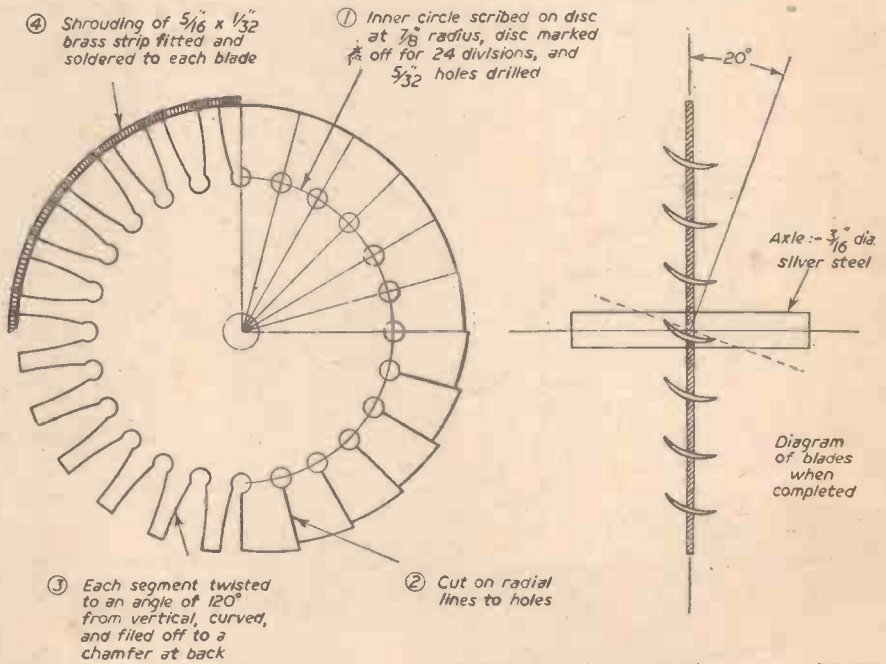


Fig. 2 (Above).—Constructional details of the turbine rotor.

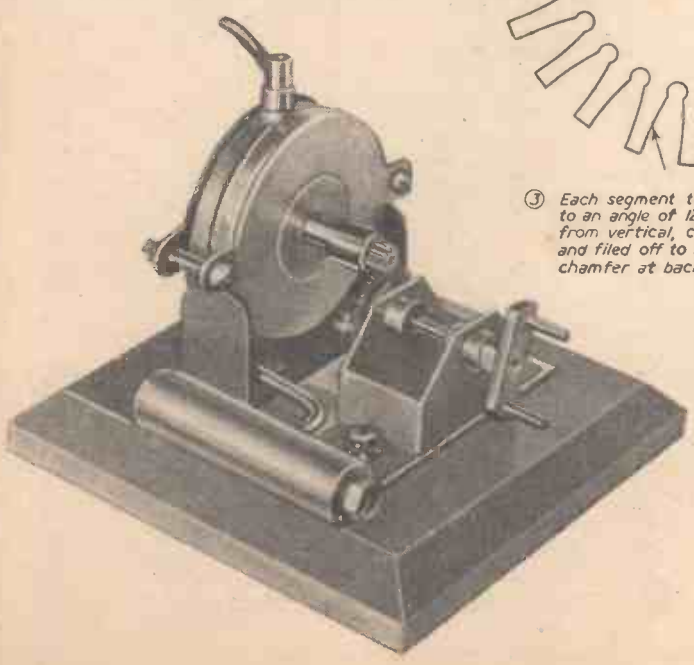


Fig. 4 (Left).—General view of the finished turbine, mounted on a small plinth.

The Container

Although the one shown was actually made to specification, almost any suitable tin would serve the purpose, providing that its capacity coincided with the measure of the boiler. The burner is secured under the boiler by means of clips bolted to the bed plate, which is of aluminium, ⅛in. thick. This latter item could be of any suitable

metal, providing that it is firm and rigid, as it has to support the whole unit.

One point to note here is the fact that the whole unit is contained on the one plate, which is advantageous in many respects.

The Vertical Boiler

In Fig. 5 the turbine is shown coupled up to a vertical boiler for table work only. The size of the boiler is rather above that of the average, by reason of the necessity for ample steam. The illustration is only suggestive, and the type of boiler would be a matter of personal choice. If elaborate, the fittings could include water and steam pressure gauges, but as we are only concerned with the simpler type, such embellishments would not be necessary. The steam pressure would be taken care of by the safety valve, and the amount of water and fuel could easily be determined by means of measures. If one desired to make a little advantageous improvement, the steam pipe, shown externally on the sketch, could, instead, be fitted internally down through the boiler over the flame, to emerge through the side of the case, and thence to the turbine, thereby obtaining a simple form of super heating.

Remember that once steam is turned on the flow is constant; there is no check or cut-off as experienced with the reciprocating engine.

Points to Remember

1. If the unit is to be used in a model boat, keep the weight down (the one in the sketch is 4½lb.). For table work only, weight does not matter.
2. Do not fully open regulator; about three-quarters is sufficient.
3. See that the amount of methylated spirit is such that it burns out, leaving a little water in the boiler.
4. Fill boiler two-thirds full. *No more.*
5. Always see that the safety valve is in good order.

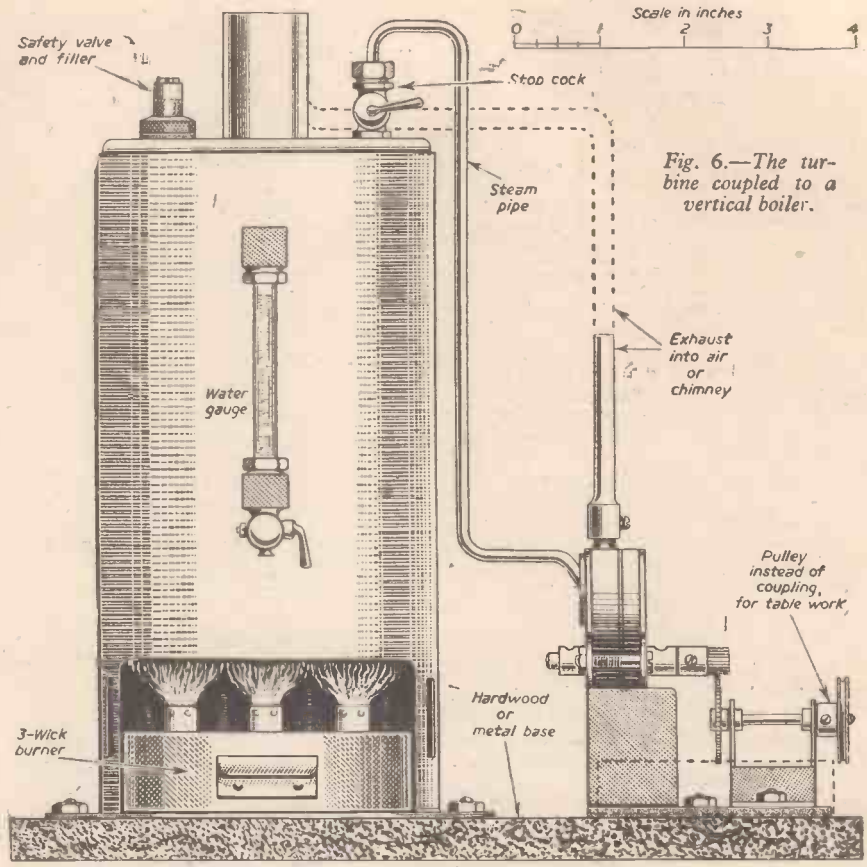


Fig. 6.—The turbine coupled to a vertical boiler.

6. Keep all bearings well oiled.
7. The 20 deg. angle of the steam nozzle, as shown in diagram, is important. There must be *no* plus or minus otherwise the steam will by-pass the blades and the main impulse will be wasted into the exhaust.
8. The closer the fit of the rotor inside the case, the better the performance. The distance pieces inside should ensure that the rotor is centralised and does not rock.

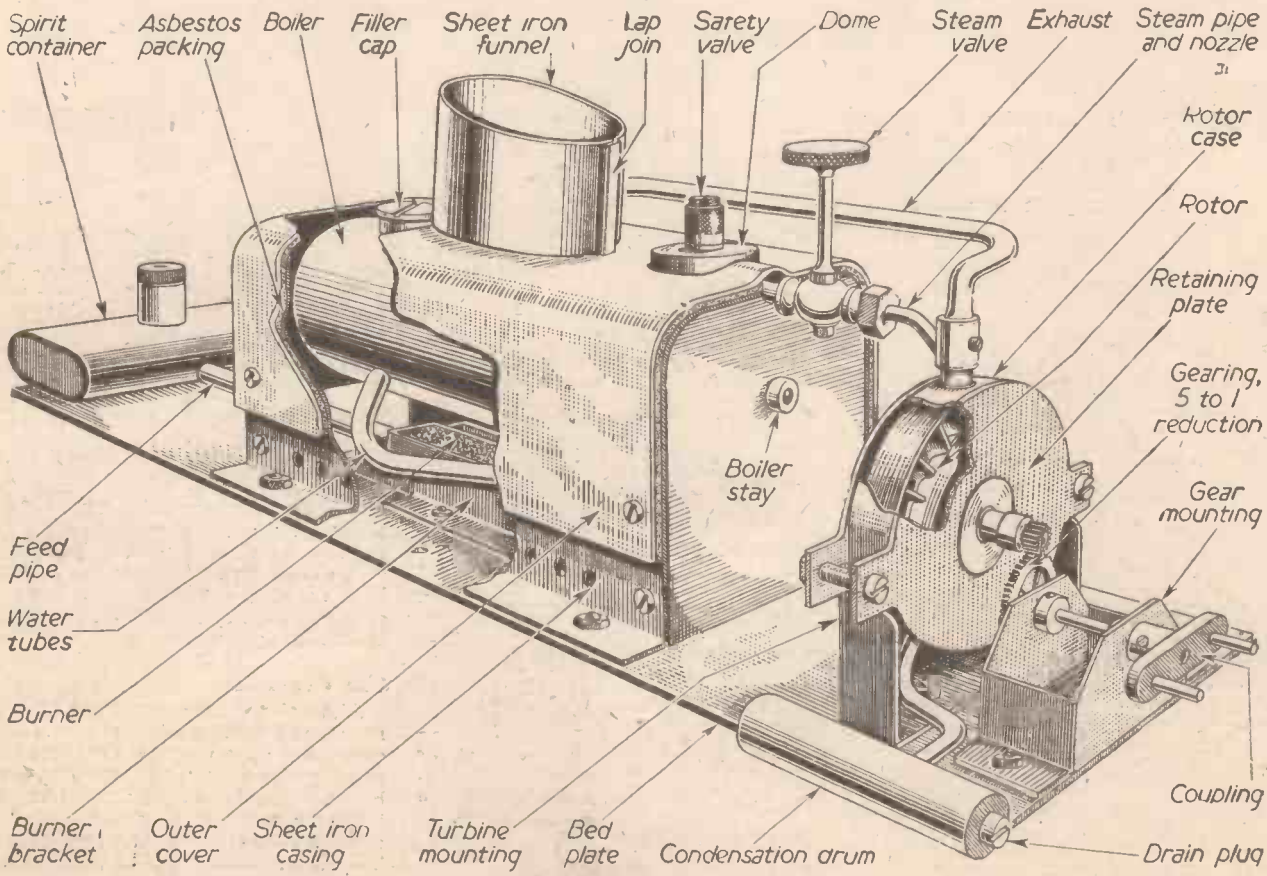
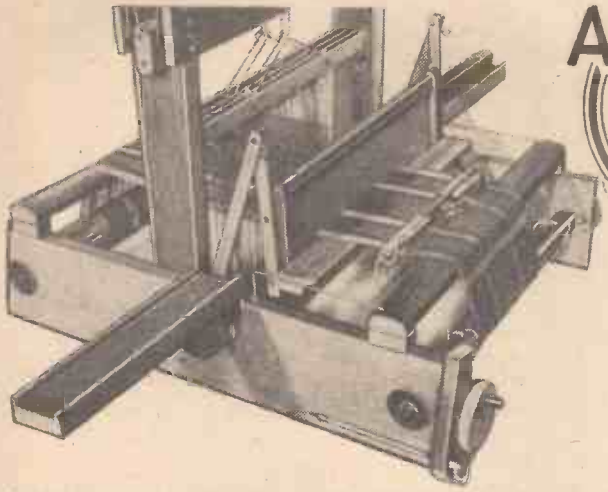


Fig. 5.—Part sectional view of the steam turbine unit for a model boat.



A 15" FOUR HEDDLE HAND LOOM

Constructional Details of an Inexpensive and Efficient Weaving Machine for Home Use

By G. G. CRAWSHAW

(*Concluded from page 19, October issue*)

IT is important that all parts of the loom and accessories which are likely to come into contact with any fabric or threads unless considerable lengths of fabric are woven at a time.

It will be noticed that many of the dimensions provide for the use of wood 1in. wide × $\frac{3}{16}$in. thick. This is because it has been found easy to purchase planed birch laths 36in. × 1in. × $\frac{3}{16}$in. made to order several times recently at the reasonable price of 3s. 6d. a dozen. If you want to purchase just one of these in the guise of a warp stick or shuttle, it will cost you at least 2s. If anyone has any difficulty in obtaining these laths, of which about two dozen may be

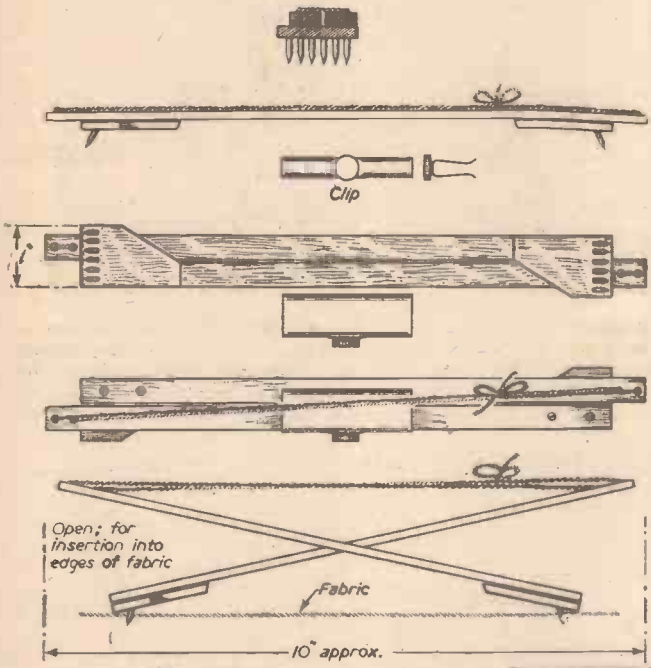
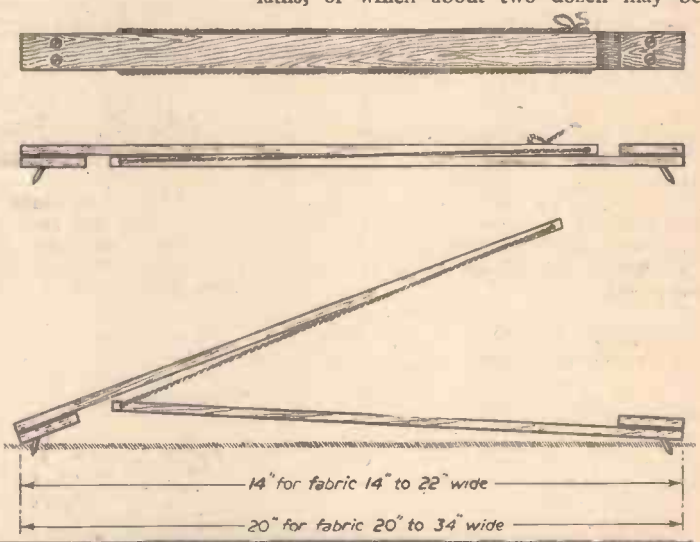


Fig. 14. Details of tenterhooks for fabric up to 15 in. wide.

Fig. 15. Tenterhooks for fabrics over 15 in. wide.

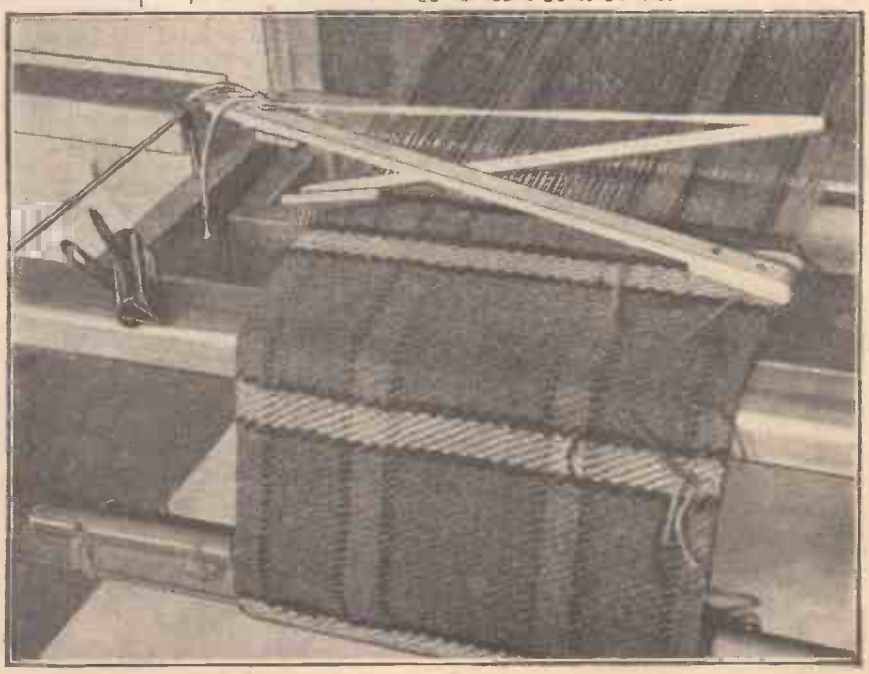


should be made quite smooth with fine sandpaper.

The ratchets for use on the rollers may be obtained from " Weavemaster " Looms (G. R. Wood and Co., Ltd., Church Street, Kensington) for approximately 6s. a pair. The heald wires should be obtained from "Atlas " Handicrafts, Manchester, as the measurements are designed to match these, and they are, incidentally, very cheap; 400 at 4s. 6d. a 100 will make a reasonable stock for this loom.

Shed Sticks

Other items required will be a pair of shed sticks, merely two laths with rounded ends and edges, about 17in. × 1in. × $\frac{3}{16}$in., with a $\frac{1}{4}$in. hole drilled close to each end, and a number of warp sticks which are wound on which the warp threads on to the roller in order to keep them from sinking into each other and thus becoming uneven in tension. Dimensions are similar to the shed sticks and a dozen or so will suffice for some time



Showing how the tenterhooks are inserted in the edges of the work. Note. The spring paper clip is used for keeping tenterhooks folded flat.

needed, they are referred to the well known firm of Messrs. Hopton and Sons, Market Harborough. Please note that it is no use trying to use deal laths. Beech or birch are suitable woods.

Tenterhooks are not supplied with hand looms as a matter of course, as is some form of shuttle, but they are an essential part of the actual weaving equipment, and are therefore here described and illustrated in Figs. 14 and 15. As the weaving progresses there is a very strong tendency for it to pull in at the sides, and the tenterhooks are designed to force the cloth out to its correct width and retain it there. They consist of a pair of adjustable strips of wood which have at each end a row of teeth which are inserted in the cloth close to the edge. As the tenterhooks have to be removed and replaced close to the line of weaving after every 2in. or so, it is not only necessary that they should be capable of being set for continuous use at any given width of cloth, but that they should also be readily undone and folded back again into the working position. For this purpose they have been hinged together "toggle" fashion, with a piece of thin cord.

When in the closed down, or operating position, they are held in place by means of some simple form of flat spring clip. (A small spring-jawed paper clip has proved quite satisfactory.) The adjustment is effected by tying the cord in the appropriate position with a bow, so that it can be easily undone for further alteration if required. The teeth consist of about half a dozen gramophone needles inserted at a slight angle in the outer end of each piece of wood, it being essential to drill suitable holes which will ensure a tight fit when they are driven in, otherwise they will fall out again if the holes are too large, or the wood will split if the holes are too small.

It will be noticed from the illustrations Figs. 14 and 15 that two somewhat different types have been made to provide for cloth either below or above 15in. wide. The smaller pair is suitable for cloth down to 2in. or 3in. wide.

The minor details of construction, which are not very precise, are clearly shown in the illustrations and require no further description.

A Simple Vertical Enlarger

An Inexpensive Appliance for the Amateur Photographer

By R. J. FINCH

THE purpose of this article is to give an idea to the amateur photographer who wishes to make his own enlarger, without getting too involved in intricate designs. As can be seen from the illustrations, there is no machining or indeed any parts requiring accurate dimension.

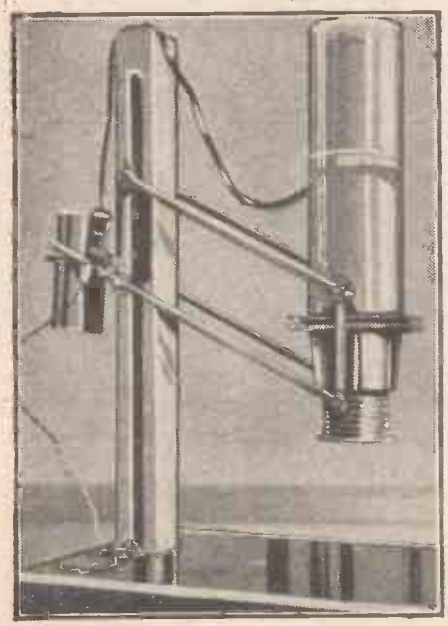


Fig. 1.—Side view of the complete enlarger.

The base consists of five-ply board, 19in. x 24in. x ½in., fitted with battens secured underneath to raise the baseboard two inches. This provides a convenient space for the stowage of paper whilst the enlarger light is on.

The column is formed of two battens, 36in. x 2½in. x ½in., separated at the top and bottom by pieces of wood, 2½in. x 2½in. x ½in. The column protrudes through the baseboard and is screwed to one of the base battens.

A piece of smooth wood, 4in. x 2½in. x ½in. having on its edges two pieces of three-ply, 4in. x 1½in. x 3/16in., which act as guides is all that is needed to form the sliding block. It is inserted within the column and the rearmost fixed members of the parallelogram are screwed to it with distance pieces. (See Fig. 1.) It is not necessary for the block to slide as the lamphouse movement is sufficient for most degrees of enlargement.

Lamphouse Details

Two National Milk tins, telescoped about ½in. and cold soldered, form the housing, the bulb holder being an ordinary domestic one and held in position by its screwed ring in a hole cut to size with a pair of scissors. A plano convex lens from a R.A.F. reflector gunsight can be used as a condenser. The lamphouse is seated in a lid screwed to a piece of three-ply, the hole in the lid being cut a trifle smaller than the diameter of the condenser lens, which is sandwiched between the lid and the top of the negative slide. Admittedly, this is only half a condenser but it serves very well.

For the negative slide two pieces of three-ply, 6in. x 6in., had holes 2½in. x 2½in. cut in the centre and were separated by two strips of three ply so as to leave a tunnel for the negative carrier. My negative carrier is two pieces of thin photographic plate glass, 2½in. x 7in., which are held together by leaf springs in the negative slide; strips of velvet or similar material act as light traps.

Focusing Mount

I tried using cameras and also making focusing mounts of a simple nature, but all of them suffered from defects; most cameras used by the amateur have insufficient lens movement to be of any use as a focusing mount. For the sum of thirty-two shillings I bought a spiral focusing mount from a dealer and it solved all difficulties. Being soundly made of brass it serves to take part of the load on the bracket.

The bracket is provided with a parallelogram movement which ensures that opposite sides are always parallel, no matter what the angle between adjacent sides. It is in the construction of this framework that care is required to ensure that opposite sides are of the same length. The one illustrated was made of the remains of two angle poise lamps found on the local scrap heap. The illustration shows enough of the construction to make description unnecessary.

A counter balance weight is necessary to balance the projector, and is hung on pivots from extensions of the two bottom members of the frame. A butterfly nut at the top corner is sufficient to hold all firm when the correct position is decided. Friction pads of fibre riveted to washers are useful to check any tendency to swing.

Fig. 2.—Enlarged view of the spiral focusing mount.

It is essential to remember that this enlarger is the outcome of a desire for simplicity, and only enough information is given so that constructors may improve on it or keep it simple as required. The writer's is giving very satisfactory service with a six inch lens.

HAMMERED METALWORK

Notes on Advanced Technique

By H. C. PIGGIN

IN previous articles on this subject guidance was offered on the production of bowl-shapes by means of a fairly simple technique known as "hollowing"; that is, beating down the metal into depressions or moulds cut in wooden blocks.

However, by this method it is practically impossible to turn out very deep work where the depth is equal to, or greater than, the breadth, such as a jug or coffee-pot or cylindrical shape. In such cases the difficulty may be overcome by the adoption of one of the two methods to be described in this article, either by raising, or by fabrication.

Raising

In raising, the whole job is made from the flat disc (this applies mainly to round work, of course), and is often the continuation of the deepening process after maximum depth is obtained on the hollowing-block. Pencil guide-rings are put on the annealed work, which is held at a steep angle, against the edge of a raising-stake, as shown in Fig. 1. A wedge-ended mallet, or a raising-hammer (Fig. 2), is then used to force the metal over the stake so as to form a step around the base-line. The work is then brought forward on to the next guide-ring and, by repeating the hammering, the step is forced further on to the stake.

Progression is made by similar hammering around each guide-line in turn.

Skilled workers find the hammer quicker than the mallet, but as it can leave some nasty nicks which are difficult to planish out the beginner to the technique would do best to use the mallet.

Annealing is necessary after each complete "course" over the whole work, and the deepening can go on almost indefinitely so as to produce extremely long thin vases, etc.

Raised work is very satisfying to produce, and those who do not know how it is done are frequently puzzled by the absence of any seams or joins!

Fig. 2.—Blocking-and raising-hammer heads.

Fabrication

On the other hand, fabrication is the building-up of the required depth by using various parts joined on to the basic shape. Most deep articles can be reduced to a basic shape such as a cylinder or cone (Fig. 3). This is made first by simply bending a suitable flat "development," and joining the two ends by a strong silver-soldered lap-seam. The basic shape may be now hammered into the required contour of shape, using a raising-hammer, or a blocking-hammer which has a long thin ball-peen that can reach well inside the work.

After the main shaping is done, the work is rough-planished, and the ends are levelled. The bottom is then soldered into place, using an easier-running silver solder than that for the main seam, and the whole work is carefully planished again, including all the seams, as if the article had been made from one piece.

Fabrication is slightly easier and a good

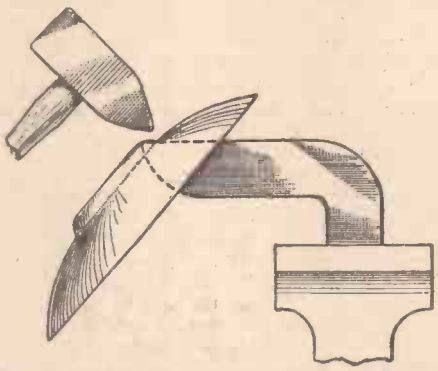


Fig. 1—Forming a step on the first guide-line.

deal quicker for the beginner than raising, but it requires access to a means of silver-soldering for large work, and the long seams require great care to make neatly, and are inclined to split under the hammer if much shaping has to be done.

Of course, a job such as a tea-pot has

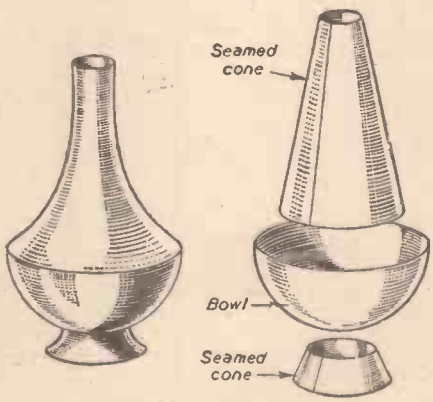


Fig. 3.—Fabricated cone shapes.

to be made by using both methods. The main body of the pot may be raised, and such parts as the spout, handle, etc., must be added afterwards.

Decoration

Finally, a few words on the subject of decoration on the bowl or jug you have made and its mounting. There is little need to remind craftworkers that simplicity is the key to good taste in these matters. Bear in mind that copper and brass are at their best and are more lustrous when unlacquered, but they must be kept clean.

Occasionally the top edge of a bowl may need strengthening by adding a narrow rim of twisted or decoratively punched wire. This is put on after the work is trued up, and may be held in place during soldering by means of small iron clips and wires. Both decoration and the foot are best if silver-soldered to the work, but whether silver or lead is used, it is best applied sparingly in the form of tiny snippets every half-inch or so along the join, the heat being direct from a small flame.

Elaborate mountings such as are frequently seen on old work such as goblets, trophies, etc., are quite often cast, and so are best avoided. However, where absolutely necessary to the design of the job, they *can* be fabricated. Usually a simple mounting, such as a plain or very slightly curved ring, looks best.

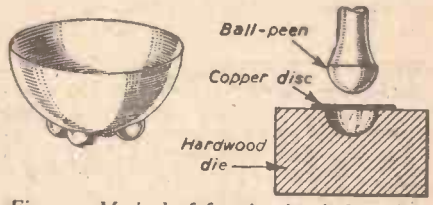


Fig. 4.—Method of forming hemisphere feet.

A simply-made alternative that is quite effective on nicely rounded bowls consists of three small hemispheres. These may be made from small circles of scrap metal, annealed and punched into "dies" cut in a block of hard wood (Fig. 4). The ball-peen of a hammer makes a good substitute for a round punch. It is a good plan to drill in each hemisphere a tiny hole from which the air may escape during soldering.

Model of Trevithick's Steam Engine

Constructional Details of a Scale Model of an Early High Pressure Direct-acting Power Unit

By E. W. TWINING

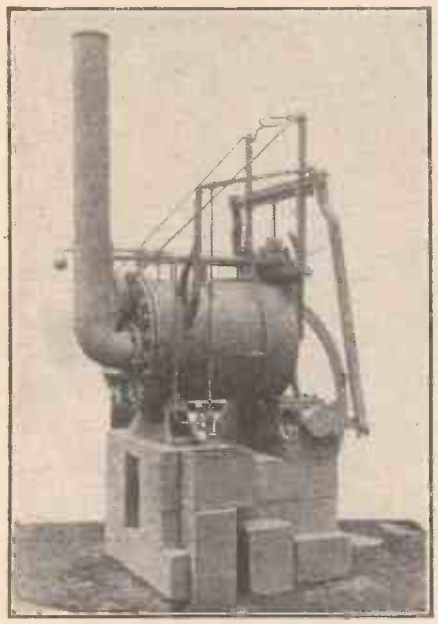


Fig. 1.—Trevithick engine and boiler. The direct-acting high pressure steam engine, patented by Trevithick in 1802 for stationary and locomotive use, eventually superseded the beam engine. This engine, found at Hereford in 1882, was made about 1805 and probably developed 7 h.p. with steam at 50lb. per sq. in.

A HUNDRED AND FIFTY years ago, that is to say at the end of the eighteenth century, steam pressures of more than a few pounds above that of the atmosphere were unknown in engineering practice. The ponderous engines of Boulton and Watt, employed in mines and mills, were fitted with cylinders having pistons of enormous superficial areas, each square inch of which was pressed by steam at no more than from 3 to 5lb. But in order to increase the effective pressure on the piston the steam, on every exhaust stroke, was condensed, thereby adding something approaching fourteen more pounds to the boiler-steam stroke. The boilers were simple affairs of wagon-top shape, having flat sides and ends with a fire underneath, and some early ones, so it has been said, were made partly of wood, presumably with staves and hoops, like a barrel.

Even as late as the year 1800 many atmospheric engines of the Newcomen type were still in use. In these the steam was admitted to the underside only of the piston, in an open-topped cylinder, at practically no pressure, and when the piston had reached the top of its stroke this steam was condensed by cold water injected into the cylinder itself. A vacuum was thus created and the descent of the piston, the power stroke, was performed by the pressure of the atmosphere alone.

No one knows how long these great, unwieldy and inefficient machines of Newcomen and of Watt would have gone on supplying the only source of mechanical power that industrial works had available had not Richard Trevithick been born at Carn Brea, in the parish of Illogan, Cornwall, on the 13th of April, 1771; just six years before James Watt's patent engine was introduced into the county. Watt was utterly opposed to any suggestion for using steam of more than a few pounds pressure to the inch.

Pioneer Work

At the age of 19 we find Trevithick—following in the footsteps of his father—employed as a responsible engineer in certain tin mines and reporting on engines operating in others. In 1798 he invented the water-pressure pumping engine and the plunger pump, and in the same year made a high pressure steam engine and applied it to winding and other work in a mine.

It was in 1800 that the Boulton and Watt patent expired and the firm ceased to install their engines in Cornwall. This gave Trevithick his opportunity and he, together with his cousin, Andrew Vivian, in 1802, took out patents for various forms of high pressure engines designed for a number of different purposes.

Besides engines Trevithick devoted much thought and energy to boiler work. His small boilers were usually of cast iron and worked at from 40 to 50lb. per sq. in., but others were built up of wrought iron plates and, in a few cases of large boilers, the pressure was as high as 145lb. to the sq. in.

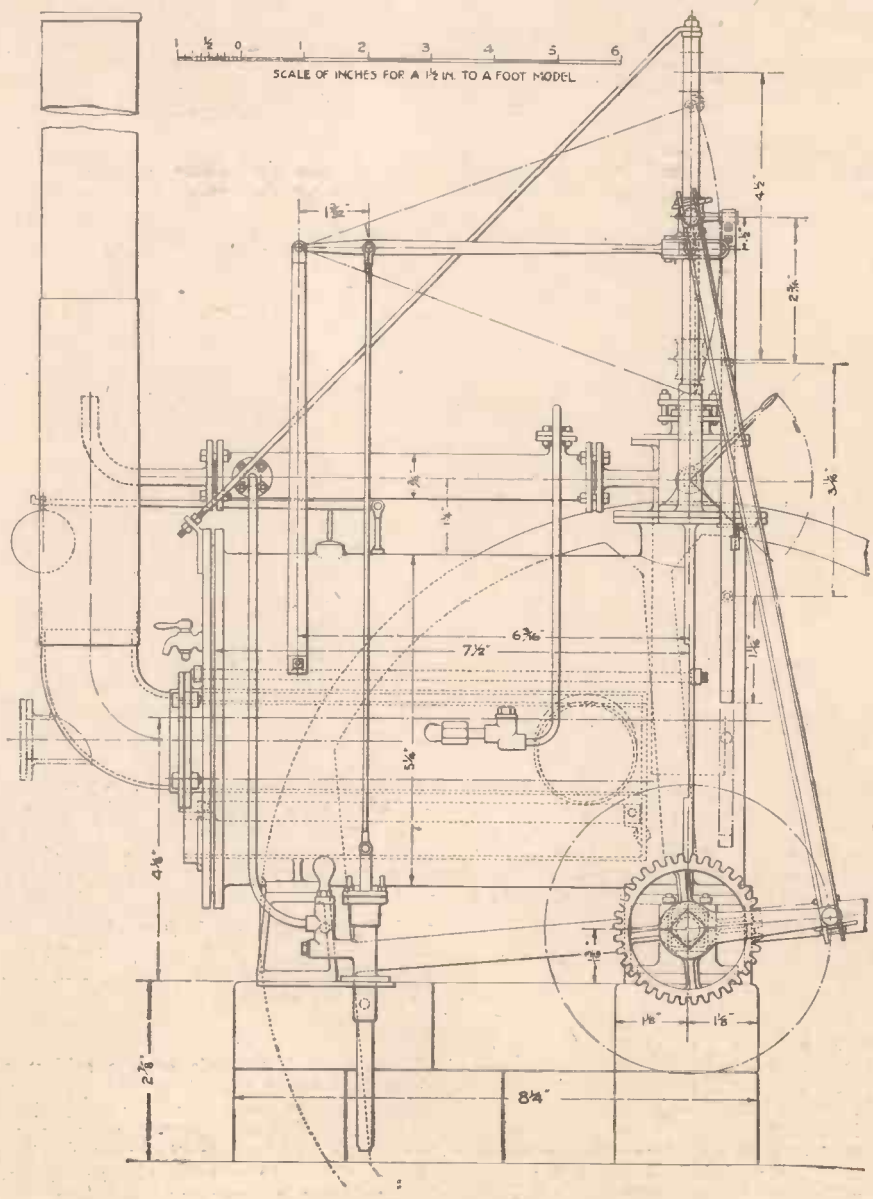


Fig. 2.—Side elevation of the Trevithick model.

It was Trevithick who designed and developed the steam generator which, in time, became known as the "Cornish Boiler," from which the Galloway type was evolved.

In a very little while after the patents were filed Trevithick's small power-combined engines and boilers were being manufactured, under licence, by engineering firms and foundries up and down the country and were being sold, for performing almost every kind of industrial work, at about £12 per horse-power for patent royalties. There is one of these engines, made by Hazeldine & Co., of Bridgnorth, Salop, of date about 1805, in the Science Museum, South Kensington. This is a perfect and typical example and is illustrated in Fig. 1. It developed about 7 horse-power with a pressure of about 50lb. in the boiler, the cylinder having a stroke of 30.5in. and bore of 6.37in.

It was such an engine as this that Trevithick, in several cases, fitted with wheels to run on rails. The most famous of these, since it was the first of all railway locomotives, was built in 1803 and ran in 1804. The cylinder, in this case, was fixed in the end of the boiler horizontally.

In addition to originating and putting into practical form the high-pressure engine, Trevithick was the first engineer to turn exhaust steam up the chimney and by so doing obtain a blast effect; the first to arrange valves to give an early cut-off with the object of using steam expansively, and he was the first to realise the advantage of, and put into practice, the superheating of steam and the heating of boiler feed water.

The type of engine which has been chosen to form the subject of this article was applied by Trevithick, not only to the driving of machinery and pumps and to rail and road locomotion, but to the propulsion of steam boats and the operation of dredgers on the Thames near the Port of London Docks.

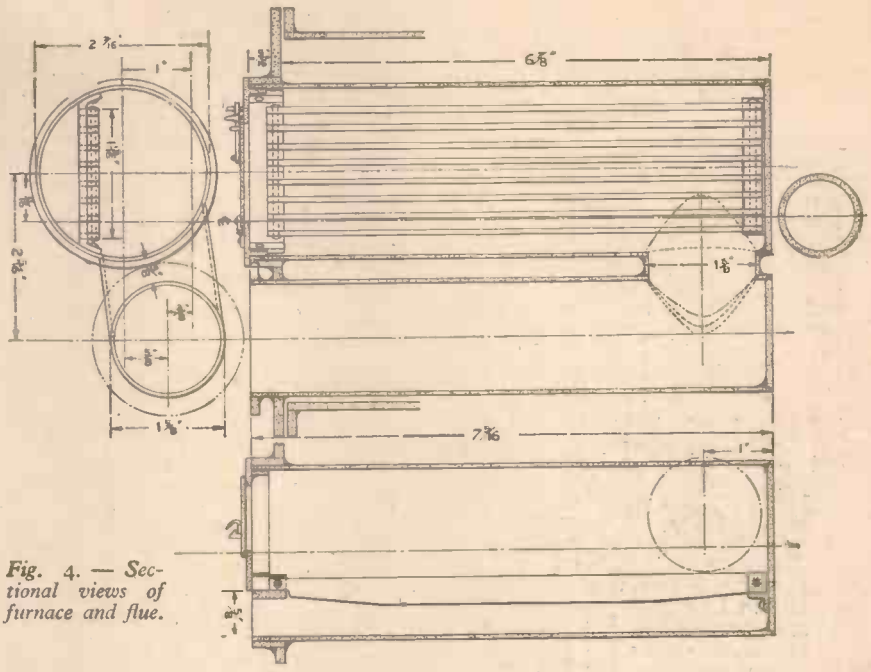


Fig. 4. — Sectional views of furnace and flue.

Models of the Trevithick Engine

I understand that there is in existence only one model of these semi-portable combined engines and boilers, such as the one at South Kensington, and knowledge of this one has only been brought to my notice through the courtesy of the S.K. Museum authorities. The debt that England, and the whole industrial world, owes to Trevithick is beyond calculation.

Model engineers have a special opportunity of honouring his memory in a practical manner, by reproducing in miniature one of those early nineteenth century power units which were the outcome of Trevithick's genius.

The set of drawings given are amply sufficient to enable the work to be carried out.

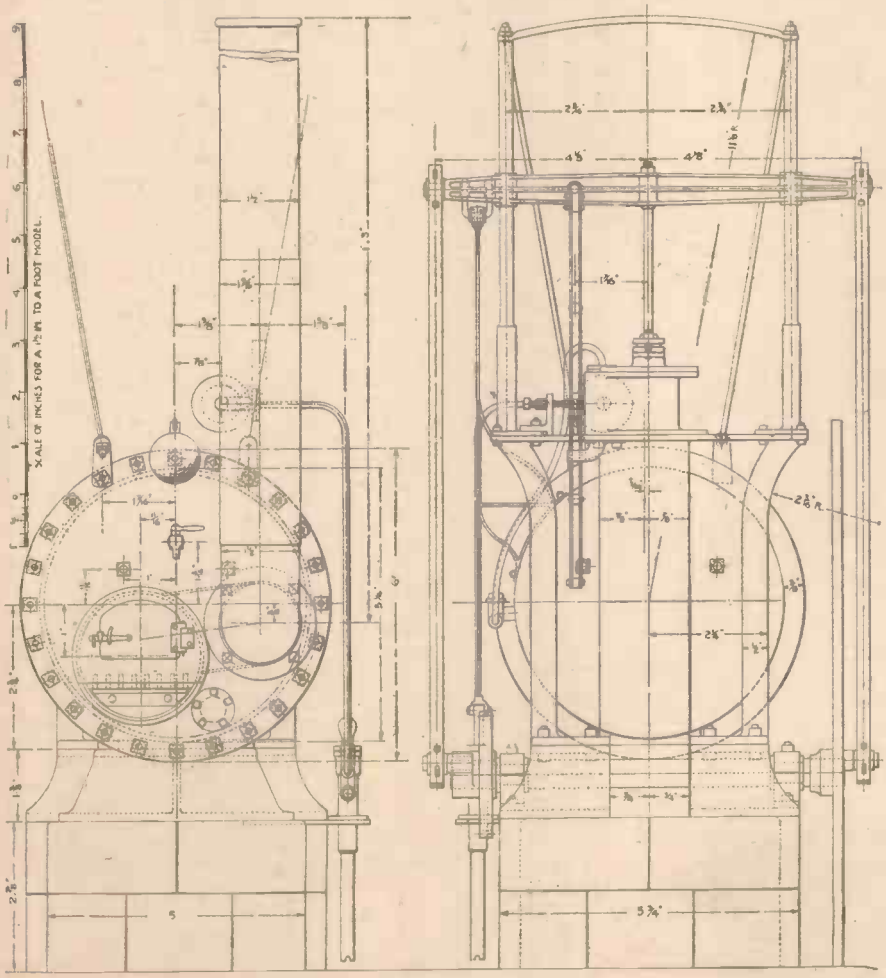


Fig. 3.—Front and rear elevations.

Constructional Details

From the side elevation, Fig. 2, it may be seen, by comparison with Fig. 1, that the model is a copy, except for a few details, of the engine at South Kensington. This drawing, together with the end views, Fig. 3, will show that the principal departures are in respect of the long connecting rods, which have been made straight instead of cranked, and the cross-tie between the tops of the slide bars. These straight rods and the plain arched tie bar have been taken from an old drawing, published in Rees's Cyclopedia, 1819, of another and similar but larger engine. Just what the loop in the middle of the tie bar was for on the South Kensington engine, the writer does not know; it is evidently not the original bar and was possibly fitted to hold an oil lamp of the kind which was, at one time, used for lighting railway carriages.

Scale and Materials

The scale of the model to a Trevithick prototype, if made to the measurements figured in all the acompanying drawings, will be 1½in. to 1ft. This is for a full-size engine having a cylinder 8in. diameter by 3ft. stroke, developing about 12 h.p.; a fairly standard size, as standards went. If the ultimate destination of the model is a museum, then 1½in. is somewhat small, and all dimensions might very well be doubled.. Even if the model is going to be kept, and worked, by its maker, then the much larger firebox will be found a great advantage in starting up and maintaining a good fire.

A 3in.-scale model will cost very much

more for materials and will call for greater silver-soldering equipment, for the boiler—at any rate in the 1½in.-scale size—is to be built up and silver-soldered or brazed together. The barrel must be a piece of seamless copper tubing with a flange of brass added at one end and at the other a flat end having a vertical central strip cut away, the space filled in with a semi-cylindrical piece to form the jacket for the cylinder.

There will be two stays passing through the boiler to support the flat ends; these should be of hard, drawn brass rod.

The chimney and firebox end of the boiler is a disc of brass plate, bolted on to the beforementioned flange. In this plate the farthest removed from the valve, terminates in the opening in plate "Y," where it is again marked "S." This opening is in direct communication with the steam space in the boiler and so it is through this port that the steam is supplied to, and distributed by, the valve to either the top or the bottom of the cylinder, according to the rotary position of the valve.

Steam Distribution

On the square shaft of the valve there is a lever by which the movements of the valve are controlled, and this lever lies between two strips, or bars, which are attached to the crosshead. On two pins passing through

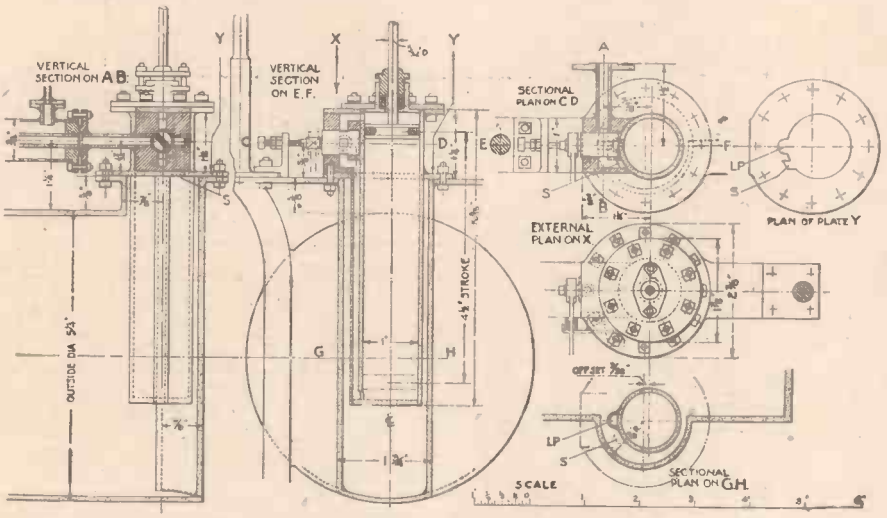


Fig. 5.—Details of the cylinder, valve and piston.

furnace and flue tubes are silver-soldered, all as shown in Fig. 4.

The Valve and Ports

The cylinder is shown in complete detail in Fig. 5. It is made entirely of brass tube and plate, with the exception of the piston rod, which can be of either German silver or steel.

To most model makers the valve will appear peculiar; it is of the double-ported, two-way plug cock pattern, which Trevithick used almost exclusively in his smaller engines. The valve itself is shown in an enlarged view, Fig. 6. It is made from a piece of brass rod, with a tubular brass sleeve soldered over it. This sleeve has four square holes cut, as shown. The valve must be lapped in the hole, drilled to receive it, in the brass block on one side of the top of the cylinder. In this block four ports are drilled and then filed square; the vertical ones to the top and bottom of the cylinder will be obvious, and so will the one leading to the exhaust pipe, but the one marked "S" in Fig. 5 is not so easy to follow. It has two right-angle bends in it and at its end, and across the bars are small rollers. As the crosshead is moved up and down by the piston rod, the bars move vertically with it; the rollers engage with and move the lever from one of its quarter-rotary positions to the other. Thus, on each stroke of the piston, steam is suddenly cut off when it has nearly completed its travel, and just as it reaches the top, or bottom, of the cylinder the exhaust port is opened and, at the same time, live steam is admitted for the opposite stroke. The diagram, Fig. 7, will make the action clear.

It will be obvious that whilst the piston is making the major portion of its stroke the lever will be stationary and is capable of being moved by hand; this, combined with the fact that the faces in the valve, between the ports, have a greater width than the ports, enables the engine to be stopped by placing the lever in a central, or horizontal, position, as shown in the right-hand sketch in Fig. 7. But it will probably be found necessary, in order to bring the flywheel to rest and overcome the expansion of the steam in the working stroke, to first move the lever over to the opposite position and then bring it back to the horizontal.

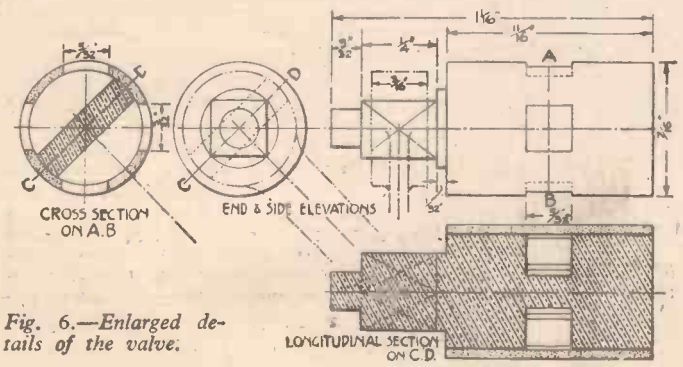


Fig. 6.—Enlarged details of the valve.

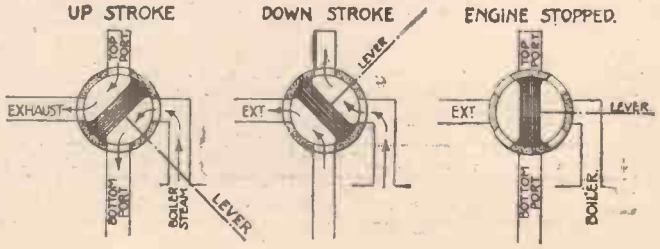


Fig. 7.—Diagram showing the port openings controlled by the valve.

The reader will realise that, with such a valve and tappet gear as are shown in the drawings, it is possible to make the initial movement of the starting lever in such a way that the engine will run in either direction, without any other reversing mechanism.

To those who wish to build to 3in. to 1ft. scale it is suggested that this may be done more cheaply by building the boiler shell, including the cylinder jacket, in steel, using tube and plate of about 5/32in. thick and getting a skilled welder to oxy-acetylene weld all the parts together. To make a neat finish to the fillets in the angles, careful grinding on a thin, round-edged carborundum wheel would have to be resorted to, unless it is found that it can be done with rat-tail files. The flywheel, too, 27in. dia., could very well have a bent, forged rim, and have the arms, hub and balance weight welded in.

Other Details and Finish

For a 1½in. scale model the flywheel is 13½in. diameter and is, preferably, cast in gunmetal; it has a crank pin in one of its arms and opposite that arm there must be a balance weight forming a part of the rim. This balance is indicated by dotted lines in Fig. 2. The wheel will have a square hub and will be secured on a squared end to the crankshaft. This shaft is square throughout, except at the journals which run in the bearings.

The gear wheel, drawn in Figs. 2 and 3, is of the kind which Trevithick usually provided for driving machinery; obviously it meshed with another wheel on the machine being driven. There is evidence that occasionally the drive was by means of an endless rope passing over a groove on the rim of the flywheel. The nature of the drive depended upon the kind of machine to be driven and the work to be done.

Heating of the boiler feed-water was provided and one end of the heater is shown in section in Fig. 5. The portion of the exhaust pipe through the heater is combined with the heater-tube by the flanges at each end. The heater is therefore a self-contained unit. In the model, as in the South Kensington engine, the feed water taken up by the pump is drawn from a small tank placed beside the plinth.

With regard to the material for the plinth: it is recommended that it shall be moulded, in a wooden box, made to the correct size, using a mixture of one part Portland cement to two parts of clean sand and that, before the cement has set hard, holes shall be drilled to receive plugs, in which the holding-down bolts, through the pedestals on the engine, shall be screwed.

For finishing: the concrete plinth should be left its natural colour and the engine sprayed all over with an egg-shell, or semi-gloss, cellulose black lacquer: there must be no parts left as bright metal, except, of course, the working parts of piston rod and slide bars. If desired, certain items such as the flywheel, connecting rods and crosshead could then be picked out in, say, a bright green oil paint, though it would probably be more correct to leave all black.

Concrete Slabs for the Garden

How to Make and Lay Slabs Made of Concrete

By W. P. MATTHEW

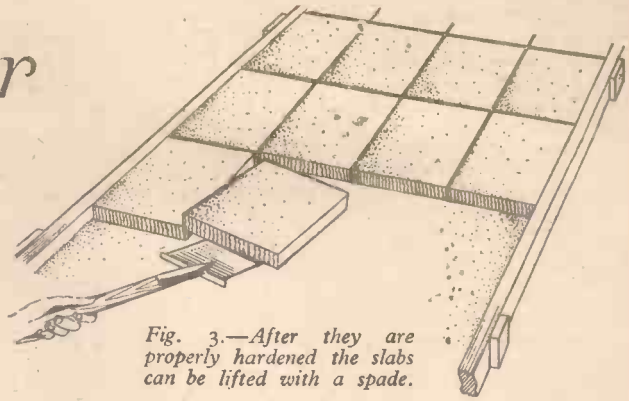


Fig. 3.—After they are properly hardened the slabs can be lifted with a spade.

IN the previous article, published in the October issue, the preparation and laying of a straightforward concrete path were discussed. This time we shall consider slabbing in concrete for use in paths and other garden features. There is nothing very complicated in the methods, and as no more material is used than in making and laying concrete, it will be seen that the little extra effort is well worth while.

Slabs Cut in Situ

This is the simplest method of making slabs. An area of concrete is laid between simple formwork, exactly as described in the previous article. The concrete mix in most cases, as for all slab work, is three parts sand to one part cement.

The ground being levelled, the formwork is laid in place and secured to pegs driven in the ground. It is suggested that the timber for the formwork be 2in. thick. Before the concrete is placed, a layer of sand ½in. thick is laid and raked level with a garden rake. The concrete is then placed on this and levelled with a wood screed. The screed is a length of board about 6in. longer than the width of the formwork, and it is used first with a chopping action and then backwards and forwards like a saw. The result is a slab 1½in. in thickness, the underside of which will have an attractive sanded finish. When the slabs are used this undersurface becomes the face side.

After one to three hours, depending on temperature conditions, the concrete may be cut into slabs. For this a trowel and straightedge are used, as shown in Fig. 1. This also shows the formwork and pegs. The concrete is cut through to its full depth, and one foot holds the straightedge steady, as shown.

The size of the slabs will depend upon personal preference, and the use to which they are to be put. Fig. 2 shows alternative arrangements for slabs used for paving, using slabs of one, two and three different sizes. The sizes will, of course, be determined before the formwork is laid, so that its width and length will produce an exact number of slabs.

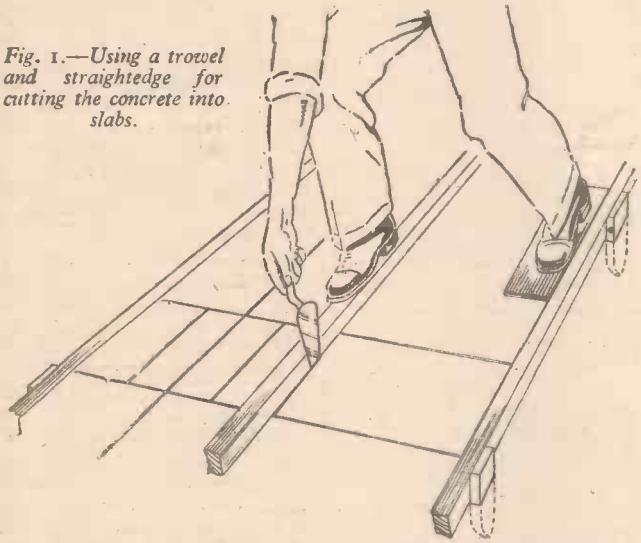


Fig. 1.—Using a trowel and straightedge for cutting the concrete into slabs.

Lifting the Slabs

The slabs are left for four or five days to harden and are then lifted with a spade, as shown in Fig. 3. During this four or five days they should be protected from the effects of sun and drying winds so that they harden gradually. Wet sacks are ideal for protection, but if this is impractical, frequent sprinklings with a watering can will help. After lifting, the slabs are stacked on edge to mature until required, and the longer the time that can be allowed at this stage the better.

Before the laying of the path is dealt with, another method of achieving something of the appearance of a paved path can be described. The concrete is laid on the site and to the exact size of the proposed path, and after an hour or two it is grooved with the straightedge and trowel to the appropriate pattern. The marks are made in parallel lines ½in. deep and ½in. apart. When the whole slab has set the concrete between the lines is removed. Paths of this kind should be provided with expansion joints formed of ½in.-thick battens laid across the formwork at intervals no greater than 8 ft. The appearance produced is similar to actual paving at first glance, though the little extra trouble of making the slabs might be considered as worth while, especially if, as suggested later, coloured concrete is used.

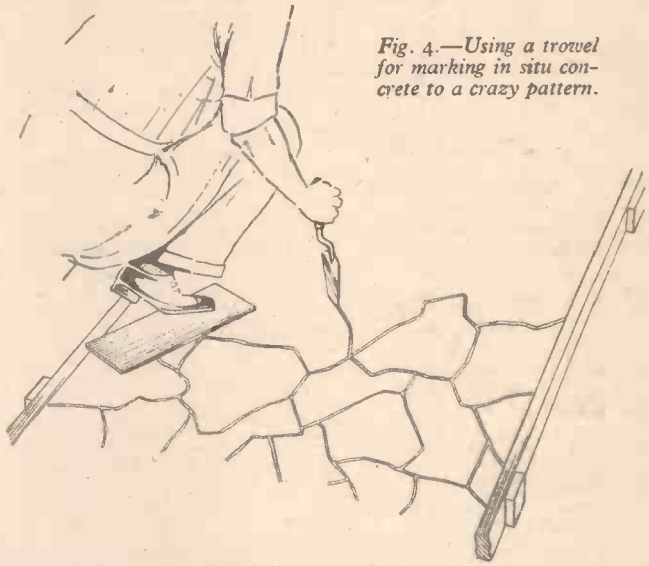


Fig. 4.—Using a trowel for marking in situ concrete to a crazy pattern.

Laying the Slabs

The top soil is removed from the site of the path and the site levelled. A bedding mixture of one part cement to four parts sand is then spread. This bedding may be mixed with very little water to make a granular crumbly concrete, or it may be laid completely dry. In the latter case the slabs are soaked in water just before laying and

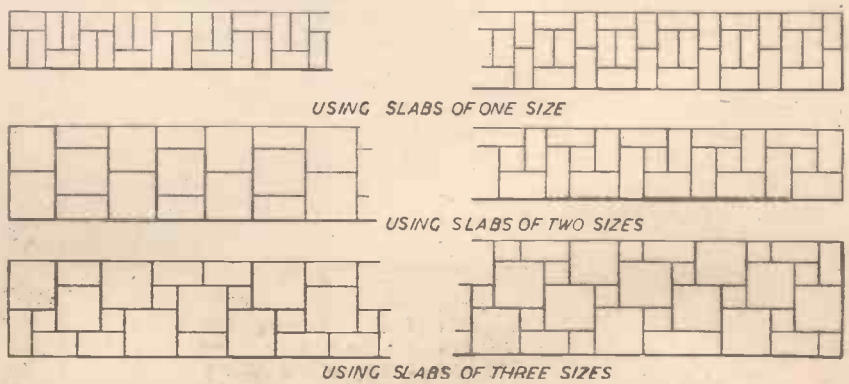


Fig. 2.—Alternative patterns for laying slabs used for paving.

sprinkled generously after laying, thus providing enough moisture to set the bedding. Each slab is gently tapped down on the bedding until it is level and there is no rocking. A wooden mallet or block of wood is used for this.

The slabs may be kept ½in. apart, or butted close together. If joints are left, they may be filled with a contrasting coloured mortar, or filled with soil for the reception of low-growing plants.

Coloured Concrete

Concrete may be coloured by the addition of ordinary dry colours bought from an oil and colourman, but it is best to buy the specially-made colouring powders. These have a high degree of penetration and staining qualities, and are non-fading. They are added to the cement when dry and before the sand is mixed in, at the rate of ten pounds of colouring powder to one cwt. of cement. They are sold in a number of colours, and these are intermixable. It is possible, therefore, to vary the mix slightly so as to produce different coloured slabs and a very attractive path.

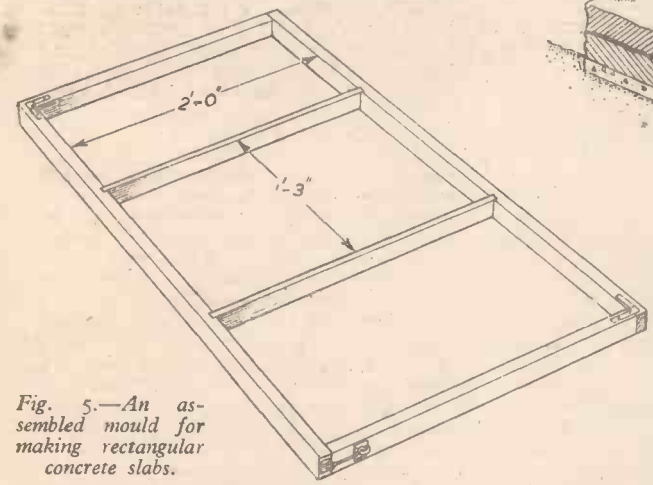


Fig. 5.—An assembled mould for making rectangular concrete slabs.

Crazy Paving from Concrete

This is produced in exactly the same way as rectangular slabs, and Fig. 4 shows the concrete being cut to its full depth. Crazy paving is bedded and laid as described above, the straight-sided pieces being used at the side of the path. *In situ* concrete can also be marked with the trowel in a crazy pattern.

Concrete Slabs Made in Moulds

This method has certain advantages as the slabs may be made in the garden shed in wet weather, and also the colour variations can be made more definite in succeeding batches of slabs. Fig. 5 shows an assembled mould for three slabs. The frame of this mould is of 1½in. x 1½in. timber, and the divisions of 1½in. by ½in. wood. Two diagonal corners are secured with 3in. angle brackets, and the other two corners with cabin hooks and eyes. The mould may thus be dismantled about one hour after the concrete is placed, and then reassembled and another batch of slabs cast. You will, however, need another pair of divisions as it is not advisable to remove these for some hours.

The mould is assembled on two or three thicknesses of newspaper laid on the floor of the shed or on a bench; this makes dismantling of the mould easier. The concrete is placed first round the sides of the mould, taking care thoroughly to fill the corners and edges. It is then filled and levelled off with a wood float or flat piece of wood. Moulds can, of course, be made to produce any size of slab, both in area and thickness, but in the case of slabs of a thickness of 1in. or less, the mix should be made in the proportions of one part cement to 2½ parts sand.

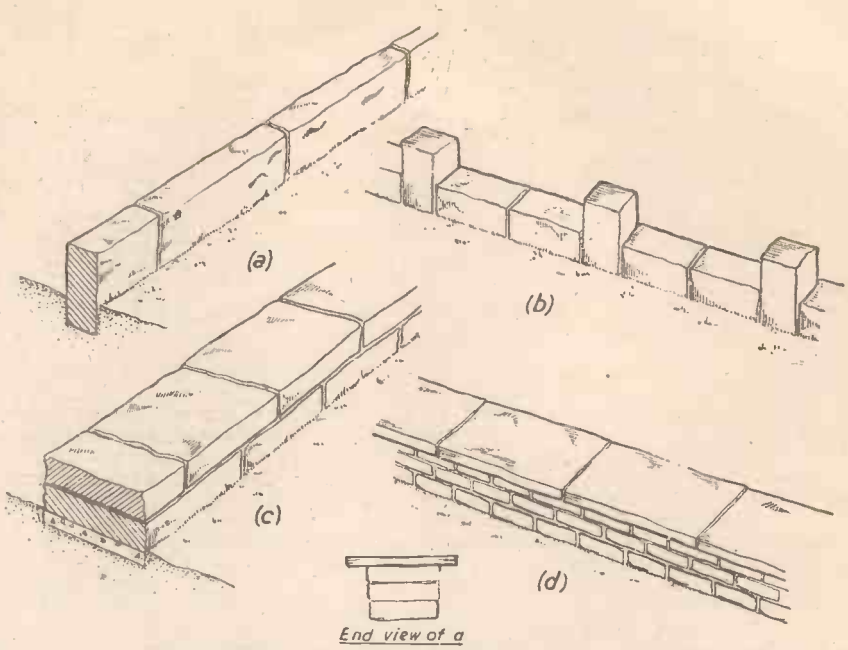


Fig. 6. Showing how small concrete slabs can be used for garden edgings.

Fig. 6 (a, b, c and d) shows how small slabs may be used to form attractive garden edgings. Two very simple forms are shown at a and b. The slabs are about 8in. wide and are set in the ground to a depth of 2in., the ground being first consolidated by ramming. The joints between the slabs are bonded by mortar made of one part cement to four parts sand.

A two-course edging is shown at b. The ground is rammed solid and a 1in.-thick bedding of one part cement to four parts sand laid and allowed to harden. The slabs are laid on this with the joints staggered as shown.

A more elaborate form of edging for higher beds is indicated at d. The coping slabs are of greater width and slightly thinner section than those used for the walling.

Radio Relay Tower

One of the many steel radio-relay towers used for the new coast-to-coast TV and telephone service in the United States. The system is already transmitting network TV shows as far west as Omaha, Nebraska.

The P.M. Tape Recorder

IN the list of components on page 11, of our October issue, certain references and values became transposed. The R and C. numbers mentioned below, therefore, should be changed as indicated, values, and references on the wiring diagrams remaining unaltered.

For R7	read R8	For C1	read C2
8	7	2	3
27	31	3	1
28	30	18	17
30	28	19	18
31	27	21	19
34	36	23	21
36	34	24	23
40	41	25	24
41	44	26	25
42	40	27	26
43	42	28	27
44	45	29	28
45	43		

With reference to the valve types, these are as follows:

V1—EF40	V5—EF40
V2—6SL7	V6—EF37A
V3—6J5	V7—6V6
V4—6SN7	V8—5Z4G

B.R. New 2-6-2 Locomotive

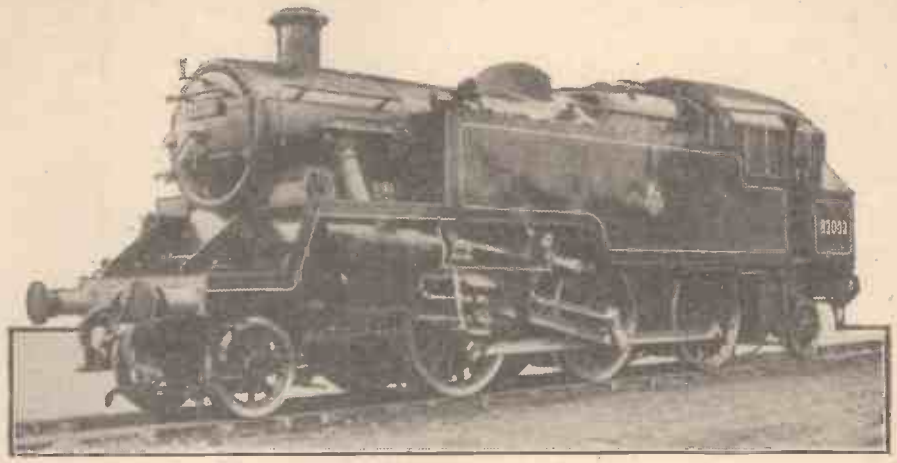
Brief Description of the Chief Constructional Features

THE building of the first of a new standard Class "3," 2-6-2 tank engine was recently completed at the Swindon works of the Western Region. It will be remembered that the first standard type of tank engine for British Railways was the Class "4," 2-6-4, built at Brighton. The tractive effort of the new type is 21,490lb. as compared with 25,100lb. for the Class "4."

Of the 20 locomotives of the Class "3," 2-6-2, to be built in 1952, the first 10 are allocated to the Western Region and the rest to the Southern Region. They are numbered 82000 to 82019, and have been designed and built under the direction of Mr. R. A. Riddles, Member for Mechanical and Electrical Engineering, Railway Executive. The parent office for the design was Swindon, while certain sections were designed at Brighton, Derby and Doncaster.

Like the Class "4," both tender and tank types, the Class "3" has almost universal availability over main and secondary lines throughout Britain. The leading dimensions are as follows:

Cylinders, diam. and stroke	17½in. by 26in.
Wheels, coupled, diam.	5ft. 3in.
Wheels, pony trucks, diam.	3ft. 0in.
Wheelbase, coupled	15ft. 4in.
Wheelbase, total	32ft. 7in.
Heating surface:	
Tubes	932.9 sq. ft.
Firebox	118.4 sq. ft.
Total evaporative	1051.3 sq. ft.
Superheater	190.0 sq. ft.
Grate area	20.35 sq. ft.
Boiler pressure	200lb. per sq. in.
Tractive effort	21,940lb.
Adhesion factor	5.08
Weight of engine in working order	74 tons 1 cwt.



The new B.R. standard 2-6-2 tank locomotive.

Boiler Details

The boiler follows closely the design of the ex-G.W. Standard "2" used on the 5100, 6100, 8100 and 5600 classes. The steel and copper flanged plates for the firebox are common to both designs, but the barrel is 5 13/16 in. shorter. This consists of two rings, the second of which is tapered, the outside diameter being 4ft. 5in. at the front and 5ft. 0⅛in. at the firebox end. Both barrel rings are made from high tensile steel plate, ⅛in. thick. The smokebox tubeplate is of the drumhead type ⅝in. thick, and there are 18 large flue tubes 5⅛in. diam. outside, 7 S.W.G. thick, and 145 small tubes 1⅝in. diam. outside, 12 S.W.G. thick. The length between tubeplates is 10ft. 10⅛in.

The firebox is of the Belpaire type, 7ft. 0in. long at the bottom, with an outside width of 4ft. 0in., giving a grate area of 20.35 sq. ft.

A rocking grate and self-emptying ashpan are fitted, as many details as possible and the controls being similar to those on other classes of standard locomotives. The boiler mountings, regulator, clack valves and manifold are similar in design to those used on Classes "4" and "5" standard locomotives. The smokebox self-cleaning arrangement also follows closely these two classes. The blast pipe has a plain circular cap 4⅛in. diameter, and this contains the four nozzles of the Cardew blower. A single-note whistle is fitted.

Frame Design

The engine frame, as on existing B.R. standard locomotives, is adequately stayed both horizontally and vertically, whilst boiler securing and springing arrangements and the method of staying axlebox guides are also rather similar to those obtaining on the other classes. The coupled wheelbase is 15ft. 4in., as on the Class "4," 2-6-4 tank engine, and the driving wheel divides it in the same proportion on both classes.

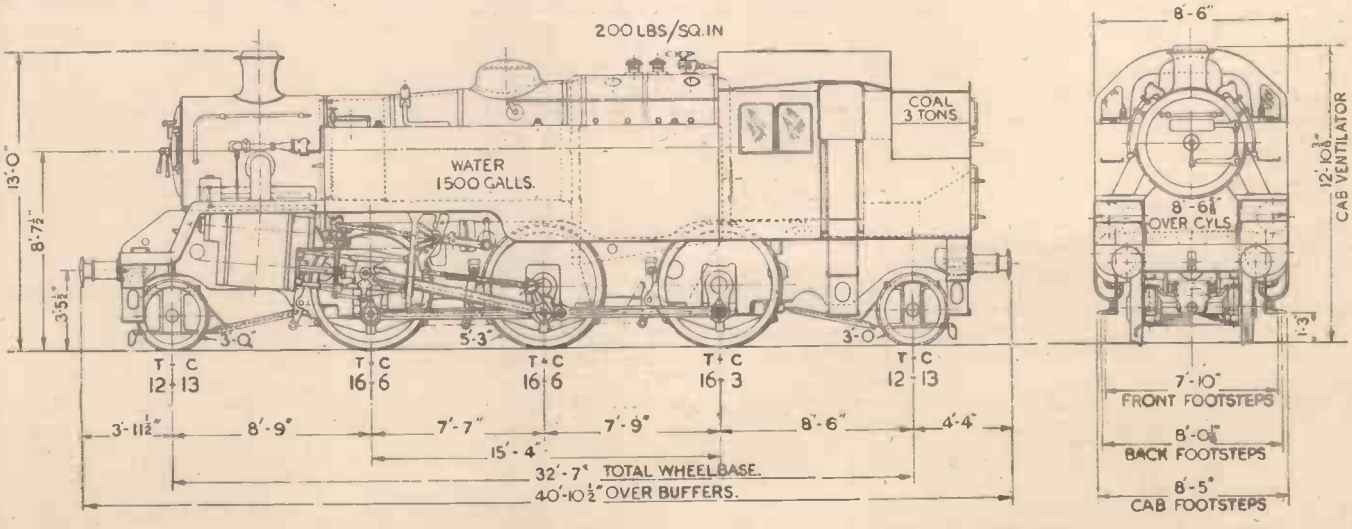
Cylinders and Valve Gear

The two cylinders, which carry cast iron liners, are cast in steel from the pattern used for the ex.-L.M.S. Class "4F," 2-6-0 locomotives. They are 17½in. diam. × 26in. stroke and are placed outside the frames. Nominal 10in. diam. piston valves are provided, the rear head being 9⅝in. diam. for ease of insertion and removal. They are operated by Walschaerts valve gear, giving a full gear travel of 6.29/64in. corresponding to a cut-off of 75 per cent. with a steam lap of 1⅛in. and lead of ⅛in. The motion has more in common with the Class "4" tank engine than with other B.R. standard locomotives as both have the two-bar "crocodile" type of crosshead, and the same method of reversing using a sliding block in a slotted extension to the radius rod behind the motion plate.

Pony Truck

The leading pony truck is similar in all respects to that fitted to the Class "4" tank engine, the sideplay being controlled mainly by double helical springs, while the trailing truck is of the swing link type.

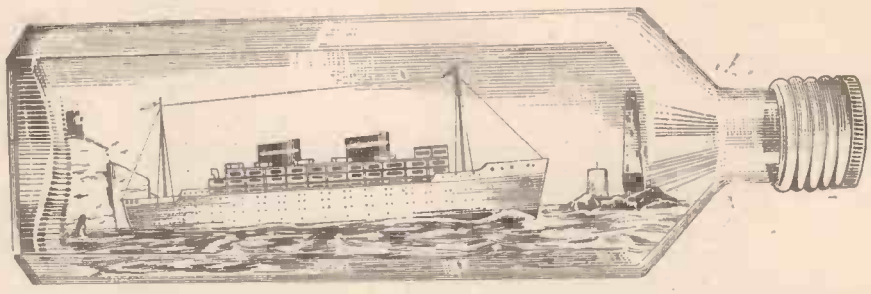
The tanks and bunker are of welded construction throughout, the former being carried at the leading end on the outside slide-bar bracket and at the trailing end on a frame bracket. Unlike the Class "4" tank engine, no water is carried under the bunker. The tanks have a water capacity of 1,500 gallons and the bunker a coal capacity of 3 tons.



Side and front elevations of the new locomotive, giving some of the leading dimensions.

Model Ships in Bottles

Although it Appears Impossible to Build a Model of a Ship Inside a Bottle, this Article Tells You How Simple it Really is



A MODEL of a ship in a bottle often puzzles, yet always appeals to everyone. It takes very little time to make, costs but a few pence, yet if made for sale will sell readily at a good price. The materials required are as follows: several lengths of stout wire, some odd scraps of wood, putty, quick-drying enamel or paint, and a bottle either of the round or square variety. If possible, a square bottle should be used, owing to the shorter neck. The parts are passed into the bottle by means of a length of wire with a needle firmly attached to it. Another length of wire with a ½in. of end bent is used to form the rake which pulls the parts into position when they are in the bottle. At least two lengths are required for the brushes; tufts from an old clothes-brush answer very well, being secured firmly with thread. The ship consists of the following parts: the hull, the body, the top, and masts.

Fig. 1

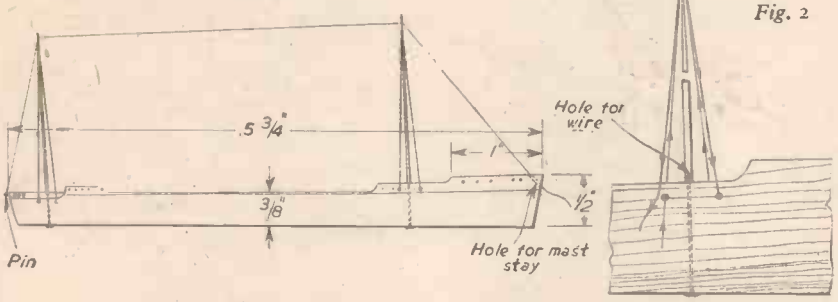


Fig. 2

Figs. 1 and 2.—Details of the hull, masts and rigging.

The length of the hull is 5¾in. by ½in. square. The raised fo'c'sle and stern are shaped from the solid hull. A glance at Fig. 1 should make its construction quite clear. Holes are drilled through for the rigging, and two holes are bored from the top to the bottom so that the foot of the mast can be secured with wire.

A hole is also bored at the bows to take the mast stay. Two masts are now required, each being 1¾in. by ⅛in. diameter. Two holes are then bored in each, the upper being for the rigging and the lower for securing them to the hull. Secure the masts to the hull with wire as shown in Fig. 2, and pass a length of cotton through the left-hand hole of the hull through the mast from the back to the front, down through the right-hand hole in the hull, up again, through the back to the front of the mast, down to the starting place and draw taut and knot.

The Mast Stay

Having wired on and rigged the masts, the next step is to put on the mast stay, which consists of thread or silk cotton. This is done as shown in Fig. 1 and the masts can now be raised or lowered, the rigging remaining taut. Care must be taken that the mast stay is sufficiently long enough to grip on the outside of the bottle. If the mast does not lie flat a piece can be cut from the hull, which can afterwards be covered by a thin piece of wood.

The body is made from three strips of wood 3in. by 5/16in. by 3/16in. and four strips of very thin cardboard 3in. by ½in.; these are glued together with the cardboard at the top and bottom and the remaining pieces of cardboard dividing the wood as shown (Fig. 3). (The edges of the cardboard overlapping the piece of wood may be sewn if desired, though it is not essential.) If sewn the cotton becomes stiff after painting and appears like rails. Dots may be added to give the effect of the portholes.

The Top and Funnels

The top is made from a strip of cardboard the same size as the body, and to this is fitted the bridge, boats, ventilators and funnels. These are all glued on to the top, excepting the funnels, which are placed separately in position in the bottle. Matchsticks are suitable for the boats, while pieces of dowel rod will do for the funnels, the length of which are ¼in.

Small hatches, etc., may be added if desired.

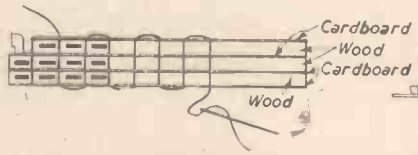


Fig. 3.—How the body of the ship is formed.

Fig. 4.—Details of the bridge, funnels and boats.

Preparing the Bottle

Obtain a square bottle if possible, thoroughly clean and dry, and paint the bottom and end blue. The land is painted green, great care being taken that the brush does not touch the front of the bottle nor the front half of the top, as the whole view is obtained here, the remainder being the background. Unless the bottle is painted the putty will show white underneath when the bottle is turned over. When dry, the putty should be put in piece by piece and spread over the bottom with the rake, spreading out very thinly and making a sloping design to represent the land. As soon as the putty is in, paint the sea blue; a few dabs of white added give a good effect. The land can then be painted green. After painting, a few red-top houses about a ¼in. square may be added, as these show up well and look quite large from outside the bottle. As each part of the ship is finished it should be painted, as it is impossible to paint the ship once it is inside the bottle.

The hull of the ship should be painted black except ⅛in. from the bottom, which should be painted red. The body, edges of pieces, and top are painted white, and the funnels are red, with black tops.

Inserting the Model

With the ship and the bottle ready it is quite easy to get the ship fitted up inside. Lay the masts down towards the stern and push the hull into the bottle stern first. As soon as the bow is clear of the neck, hold it down with the rake and pull gently on the mast stay. As soon as the masts are upright, push the hull further in, and then press down firmly with the rake. A spot of glue placed on the end of a wire, dropped into the hole at the bows, will secure the mast stay. Allow a few minutes to dry, and then cut off as close as possible to the end of stay, twirling the remainder round with a wire and burying it out of sight on the land side of ship.

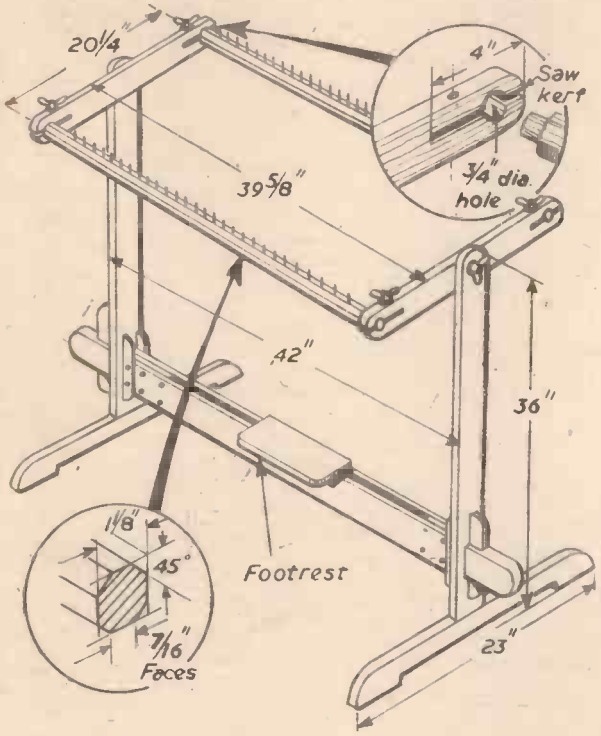
The next piece to be passed in is the body, which is glued in place. The same operation applies to the top, funnels, and bridge piece.

A Rug Frame

This Appliance, Submitted by Mr. W. Bodak, was Awarded First Prize in Section 3 of our Recent Free-for-all £200 Competition

THE appliance shown in the accompanying illustrations is a frame for rug-making. It is labour-saving, and owing to its special construction it can easily be taken apart for storage when not in use, so that it is particularly handy in small homes.

The completed rug frame in use.



(Left) Constructional details of the rug frame.

Construction

There are two main parts (1) the frame top and (2) the stand and foot rest. The entire frame and stand, with the exception of the two rollers, is made from soft pine. The rollers are of hardwood to ensure the necessary rigidity.

In the design I have incorporated various features from several frames which have come to my notice from time to time, and the result is a very serviceable frame, which is both light and sturdy, and easily adjustable.

The photograph and sketch clearly show the details of construction. The two inserts show enlarged views of a section of one of the rollers, and a detail of the shouldered down end of a roller, and the slotted end of one of the side frame members. The total cost of materials and labour should not exceed £3.

LIST OF PARTS

No. req.	NAME	SIZE
2	Foot	1⅛" x 2¾" x 23"
1	Stretcher	2⅛" x 3" x 50"
2	Upright	1⅛" x 2¾" x 36⅝"
2	Frame side	1 3/16" x 1¾" x 22"
2	Frame roller	1⅛" x 1⅛" x 39⅝"
2	Carriage bolt	
	and wing nut	⅜" dia. x 2½"
4	Carriage bolt	
	with wing nut	⅜" dia x 2"
8	Washer	⅜" dia.
2	Wedge	3/16" x 2" x 10"
60	Brad	No 18 x 1"
1	Footrest	¾" x 4" x 12"

Pocket Razor-blade Strop

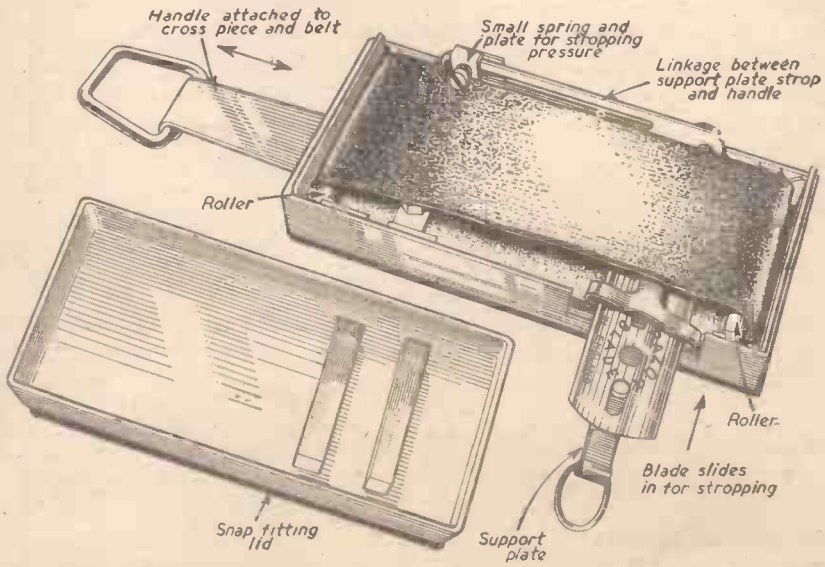
This Device, by Mr. L. A. Neale, won a Prize in our Recent Competition

THE simple appliance shown in the accompanying illustrations is a pocket size razor blade re-sharpening device which will keep a blade sharp for an indefinite time and will always ensure the owner has a keen blade ready for use. It is very cheap to manufacture, the plastic case being moulded in two halves and cemented together.

The stropping device is arranged in a plastic case which carries two parallel spaced rollers supporting a leather strop similar to an endless belt. Set in between the strop is a tiltable support plate connected by a link to the protruding handle, which is also connected to the strop. The handle is moved in a push-and-pull movement, and when the handle is pushed the blade is tilted to bring the two adjacent sides of the blade in contact with the strop, the necessary pressure being automatically exerted on the blade edges as the handle is pushed towards its full stroke. The spring-loaded plate attached to the link and handle slides up the slot provided in the link keeping an even pressure on the blade edges as the strop passes over them. When the handle is reciprocated in the opposite direction the blade is tilted on the two opposite adjacent sides of the blade and follows the same action as explained above.

Inserting the Blade

The blade is loaded into the device by means of a small plate with two upstanding studs to locate the blade, and is simply pushed on to the tiltable support plate, access being provided by the slot in the side of the machine. It is so designed that the strop is always travelling away from the blade edges, therefore eliminating the risk of the blade cutting the strop. Both edges of the blade are stropped in one operation.



A view of the pocket razor-strop with half of the casing removed showing the interior mechanism.

An Improvised Wringer Stand

This Device was Entered in Our Recent Competition by Mr. A. Warne

THE wringer stand described below is intended for use in a flat, where the housewife is rather cramped for room on her washday.

A glance at the drawings will convey to the reader the idea without much explanation. The woodwork is of oak, or any other hardwood, one inch thick, and all measurements except one (see Fig. 2) are omitted, as sizes of baths and machines vary in different houses.

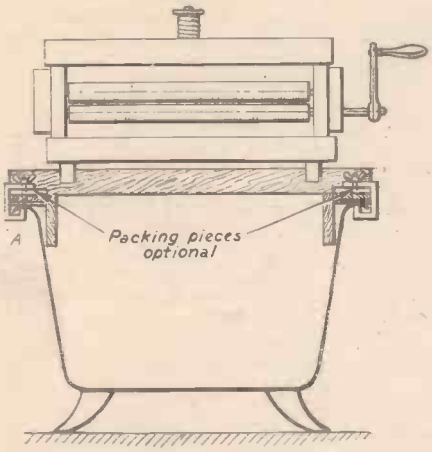


Fig. 1.—Showing the wringer in position on a bath.

In Fig. 1 the wringer is shown in skeleton form, set up on the bath, the latter being shown in section. As most baths are fixed close to a wall in the bathroom, the clamp, or clamps, marked A, can be omitted with no ill effect.

Construction

Fig. 2 is a perspective view of the woodwork and gives a clear idea of how the platform is made together with the cross-piece which holds the wringer. The platform

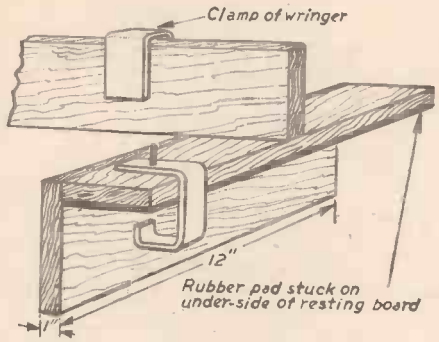


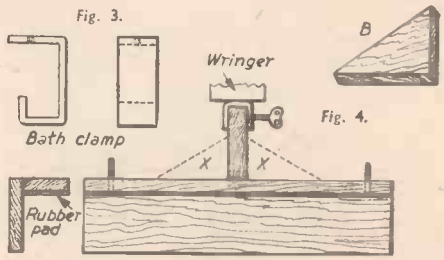
Fig. 2.—Perspective view of wooden base.

should have secured on its underside a piece of thick rubber which not only gives a firm grip to the whole, but also prevents scratching the bath. The vertical pieces dipping into the bath may also be lined with rubber, although this is not necessary.

Fig. 3 shows one of the clamps for securing the platform to the bath. Two only are required in the case of a bath fixed close to a wall. These clamps are made from some 1/16in. to ¼in. thick soft iron bent to shape, and with a hole drilled through the top to take a bolt, fixed through platform before the rubber has been stuck on. All that is now necessary, as the case may be, are two or four winged nuts to clamp down.

It would be advisable to cover the lower ends of the clamps with rubber to avoid scratching the undersides of the bath at the bends.

With regard to Fig. 4, which shows an elevation and end view of the base, four



Figs. 3 and 4.—Details of bath clamp, and side elevation of base.

triangular-shaped blocks marked X, and shown in detail at B, could be added with advantage, as they would give extra strength to the upright member holding the wringer.

When assembling the wooden parts, stout countersunk screws should be used.

When using the wringer all water from wet articles will simply drain away down the waste pipe of the bath.

Ball-valve Adjustment

This Simple Fitment was Entered in Our Recent Competition by Mr. A. J. Bacon

CONVENTIONAL ball-valves as used in cisterns and flush tanks consist of a hollow sphere or ball attached to the end of a lever arm which opens or shuts a plunger valve at the end of the water pipe and regulates the supply of water.

The ball floating in the water of a tank rises and falls with it, shutting off the flow when the water has reached a certain level and letting it flow when it falls below this level.

After a period of use it frequently occurs that, due to various causes, the proper level of the water is not maintained. With the flush tank the level often becomes too low, in which case a forceful tug of the handle and chain is necessitated to start the syphonic action, making much undesired noise.

With this device installed, as shown in Fig. 1, a few turns of a wing-nut in a clockwise direction will raise the ball, allowing the water to rise to a higher level. It will then flush with just an easy pull of the chain, the improvement being very pronounced.

There are occasions where the ball-valve arrangement allows too much water to flow so that it runs through the overflow pipe. In this case a turn of the wing-nut in an

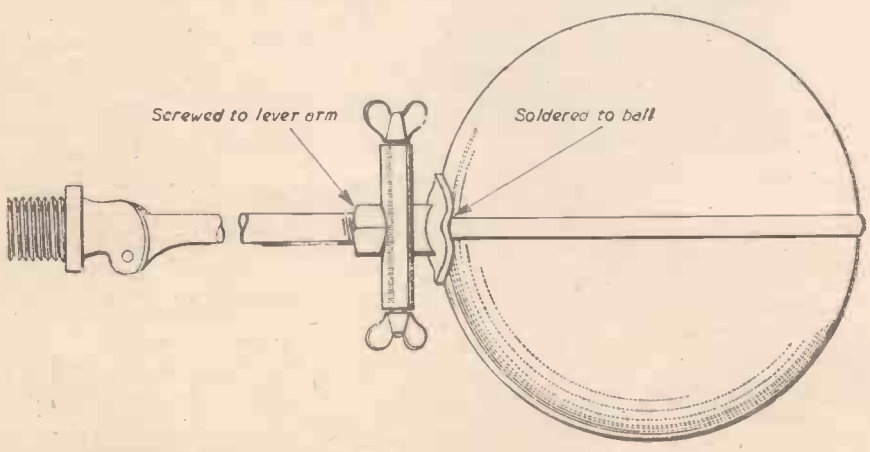


Fig. 1.—Showing how the fitment is attached to the ball valve and the end of lever arm.

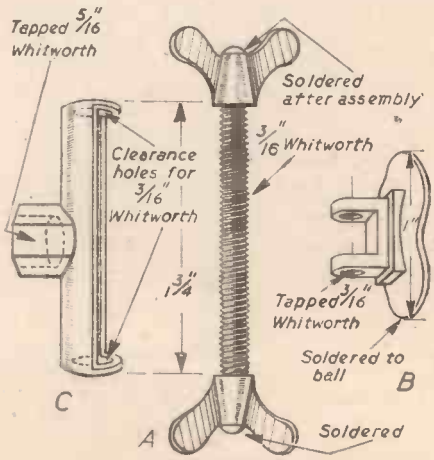


Fig. 2.—Details of the ball-valve adjustment device.

anti-clockwise direction will cause a shut-off at a lower level.

Adjustment in the past has been accomplished by bending the lever arm, which is a very crude and difficult method, and indeed exasperating when the ball breaks off!

Construction

The device comprises two members secured respectively to the ball and to the end of the lever arm, as in Fig. 1, such members being adjustable relatively to each other in a vertical direction by operation of a screw.

The screw is provided with a wing-nut at each end (A, Fig. 2). The wing-nut that comes uppermost when screwing the assembly on to the lever arm will be easy of access when the ball-cock is installed in the tank.

The first member is in the form of a plate shaped so as to be easily soldered to the curved surface of the ball, and it is provided with a couple of lugs having screw-threaded holes (B, Fig. 2). These lugs are so shaped as to be a sliding fit in a guide channel which forms part of the second member of the adjustment device (C, Fig. 2).

Positioned within the guide channel and running the length thereof is the screw, the ends of which pass through clearance holes in the ends of the channel and terminate in wing-nuts. The latter are fixed to the screw by soldering, so that nuts and screw turn as one piece.

The screw engages with the two lugs of the first member, and rotation of the screw by means of a wing-nut causes the lugs to move along the channel, the lugs being prevented from rotating by abutment with the sides of the channel.

Projecting from the other side of the guide channel is a boss provided with a screw-threaded socket adapted to receive the end of the lever arm of the ball-cock.

The whole may be made of brass. The dimensions are, of course, approximate, but a 5/16in. Whitworth thread on the end of lever arms seems to be standard.

Steering Gear of Model Ships

A Model-maker's Guide to Old-time Steering Systems

By R. K. BATTSON

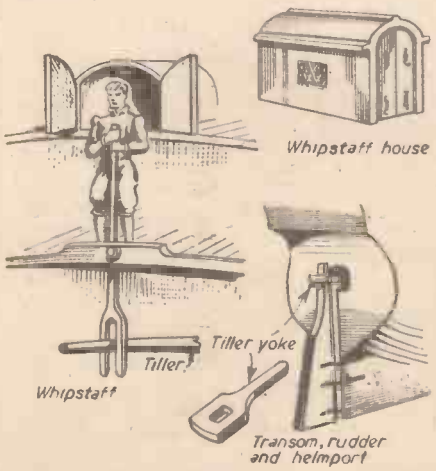
MAKERS of old-time models lacking a really authentic plan should note that prior to about 1700 (the exact date of its introduction is unknown) the steering wheel was non-existent.

Indeed, the stern rudder itself, hung on a sternpost in gudgeons and pintles, was not introduced until about the middle of the 13th century; before then, steering was effected by a steering-oar, or quarter-rudder. This was lashed or pivoted to the quarter on the starboard (right-hand) side of the ship—"starboard" being only a corruption of "steerboard"—and controlled by a small thwartship tiller extension. This is illustrated in Fig. 1.

The Whipstaff

In the succeeding centuries, steering was attained in small ships by a normal tiller and, in larger vessels, by a whipstaff; the latter was a rather inefficient device, giving only a very limited degree of helm, and was used principally to keep the ship on her course, the actual steering being effected by working the sails.

The helmsman stood with the whipstaff between his hands and his head and shoulders protruding into the small whipstaff house, usually on the half-deck. The whipstaff was pivoted across a slot in the deck on which he stood, and a forked extension of it engaged with the tiller proper, to which, in heavy weather, relieving tackles were rigged to assist the steersman. Fig. 2 shows the whipstaff.



Figs. 2 and 3.—Details of the whipstaff, tiller yoke and helmport.

The Whipstaff House

For the modelmaker, the only visible parts of this gear are the whipstaff house (the half-doors of which must always be open if the ship is shown under sail), and, in the transom, the yoke of the tiller fitting

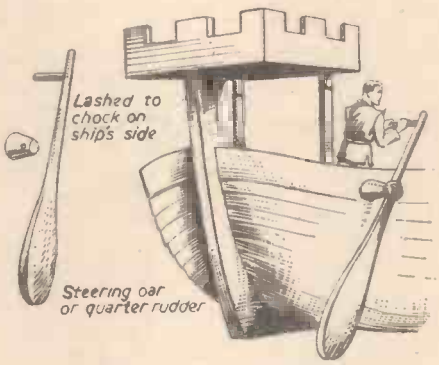


Fig. 1.—The steering-oar.

over the rudder head and vanishing into the helmport. With a built-up, and therefore hollow, hull the whole gear can be modelled in working form; but the writer's experience is all against small working details such as these. Every ham-fisted admirer seizes the part in question, and waggles it with frightful violence; and apologies for breakage, however abject, are a poor compensation for the ruin of hours of patient work.

The house itself can be made from 1mm. plywood, which will bend easily to the curvature and is stiffened internally with glued stripwood. Side windows are glazed with celluloid, and the whole decorated in keeping with the period. The little half-doors can be glued in place, or hinged with strips of fabric, dummy "metal" hinges being worked up in card strip (Fig. 2).

The helmport can be drilled a short distance into the transom (assuming a block hull) and squared with a mortising chisel; the tiller yoke is cut from ply, to fit over the rudderhead, and glued in place, the end vanishing into the mortise.

For the rudder, dummy pintles and gudgeons can be made in card strip, and the rudder itself pinned quite uncompromisingly in place (see Fig. 3).

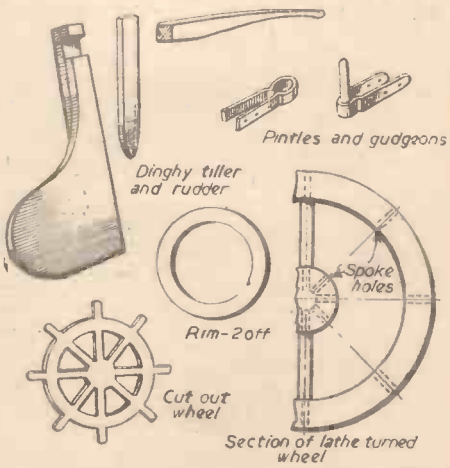
For an ordinary removable tiller, such as for a dinghy, a neat and strong method of making is to cut the rudder blade, and two separate cheekpieces; glue one cheek to the blade and, when set, cut a short section of the head right out. Shape a tiller to fit the slot thus obtained, and then glue the remaining cheek in place, sanding all smooth and pinning through when dry. The rudder should be properly hung on pintles and gudgeons worked up from brass strip, with short lengths of brass wire soldered in place, the strip being drilled and pinned to the hull and rudder.

Steering Wheels

These (especially the large double wheels of the 19th century) are, for the amateur, about as difficult a piece of modelling as there is, in small scale. The usual solution, a clockwheel with all but a few teeth filed off, always looks depressingly like a clockwheel.

If a small lathe is available the whole wheel should be turned, preferably from boxwood, the "spoke" area being dished in the process. Then mark off carefully the position of the spokes on rim and boss, blind-drill through the rim, and, with the finest grade of fretsaw, carefully cut out the dished portion. Be very delicate with the rim, or it will break across the short grain. Now drill the boss opposite the marks already made, and spoke the whole affair with brass wire, a push-fit for the holes, the handle portion being rounded off with a rat-tail file. A small brass drawing-pin pushed into the boss centre will complete a very realistic little wheel; details are given in Fig. 5.

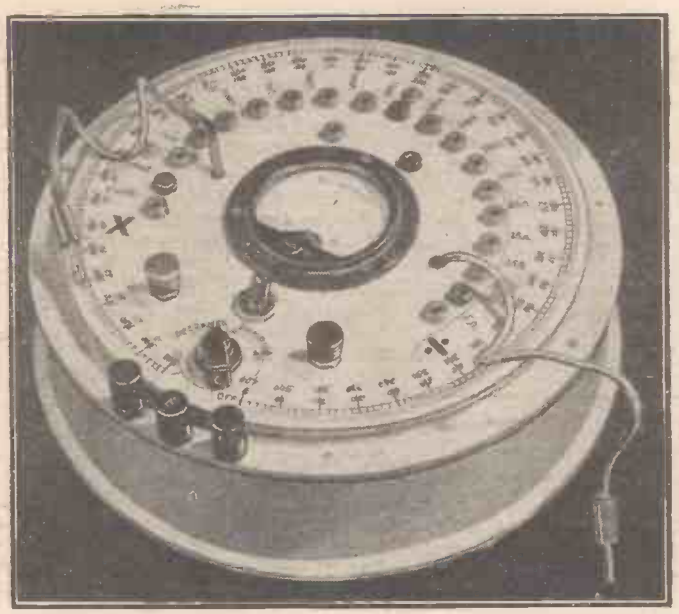
An easier, though rather less effective, method is to cut with a fine saw, from thin ply, the whole outline of the wheel, spokes, handles and all, and two rims. Glue a rim each side, clean up and shape with files and sandpaper, and glue a slice of dowel rod each side to form the boss.



Figs. 4 and 5.—Dinghy tiller and details of steering wheels.

A Wheatsto
Testing In

Constructional Details of a Compact and Effic



General view of the Wheatstone bridge testing set, showing the circular slide wire beneath the dial.

THIS instrument is a type of slide-wire bridge in which, for the sake of compactness and the avoidance of large metal connections, the slide wire is curved almost into a circle, bringing the ends close together. By the use of plug and socket connections the network can be split up into its component parts, and in this manner the instrument can be used for several different purposes.

The diagram, Fig. 1, shows the arrangement. The slide-wire coil is 25in. long and forms the ratio arm. The resistance-box consists of 18 non-inductive resistance coils, each connected between two sockets. This is brought into circuit by means of the two blue leads and the total resistance in circuit is the *sum of all the values between the two blue leads*. If a definite value of resistance is required in circuit, it may be necessary to short-circuit some of the intermediate values in order to obtain the correct total value. This is done by plugging-in the black lead and then the sum of the resistances shorted out *between the black plugs* must be deducted from the value of the resistances included between the two blue leads.

When neither of the blue leads are plugged into the resistance box the latter has no connection whatsoever to the slide-wire.

The centre zero milliammeter is used as the galvo. It has an internal resistance of 5 *ohms* and gives a full scale deflection right or left when the P.D. across the meter terminals is 0.05 *volts*. A fuse is inserted between the meter and the *red socket* and a variable wire-wound resistance of 200 ohms total value is connected between the meter and the centre black terminal post. This rheostat has an "off" position so that the meter, also, can be cut out of the bridge circuit.

The instrument has an internal battery of two 1.5 volt dry cells connected in *parallel*. This battery is cut out of circuit by throwing over a two-way switch. With the internal battery switched off, an external battery of any voltage up to, say, 30 volts may be connected between the two outside black terminals, Nos. 1 and 3. This is required when unknown resistances are being measured on the bridge with values in excess of about 5,000 ohms.

The two-way switch, when the internal battery is switched off from the bridge, makes both the red and black terminals on the face of the instrument alive. In this manner, the 1.5 volt battery can be made available for external use.

Construction

The drawings show the method of construction used in one particular case. There are, however, several component parts which will lend themselves to alternative forms of construction.

For the meter, any centre zero low reading milliammeter could be used, the lower the reading for full scale deflection, then,

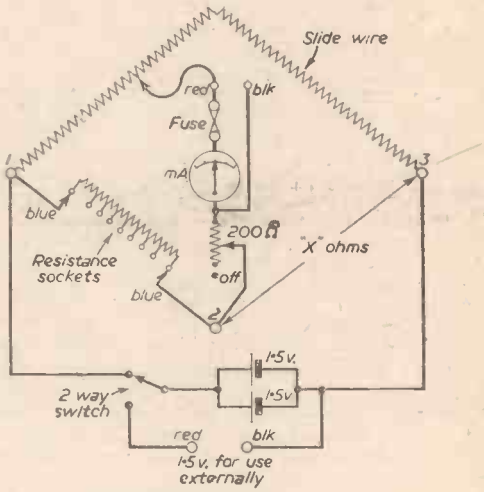


Fig. 1.—Circuit diagram.

other things being equal, the more sensitive will be the instrument. It is to be understood, however, that a more sensitive instrument will be more liable to damage by careless handling.

Resistance Units

Small wire-wound non-inductive coils were used, as they were readily available at surplus stores and their values were convenient to the purpose (Fig. 2). Low tolerance carbon resistors—say, 1 per cent. or 2 per cent. tolerance could be substituted, but they would be dearer, and low values would not be easy to obtain. The whole range of values in the resistance box could be altered to suit individual needs so long as it was kept in mind that accuracy falls off considerably when multiplying or dividing ratios are very large. The closer the ratio can be kept to unity as between the value in the resistance box and the value of unknown, then the better will be the accuracy of the result.

If carbon resistors were used, then the two resistor racks would be changed to tag boards.

Slide-wire Resistance

The unorthodox use of an ordinary heater element coil for this important part may not meet the needs of some builders—but it is

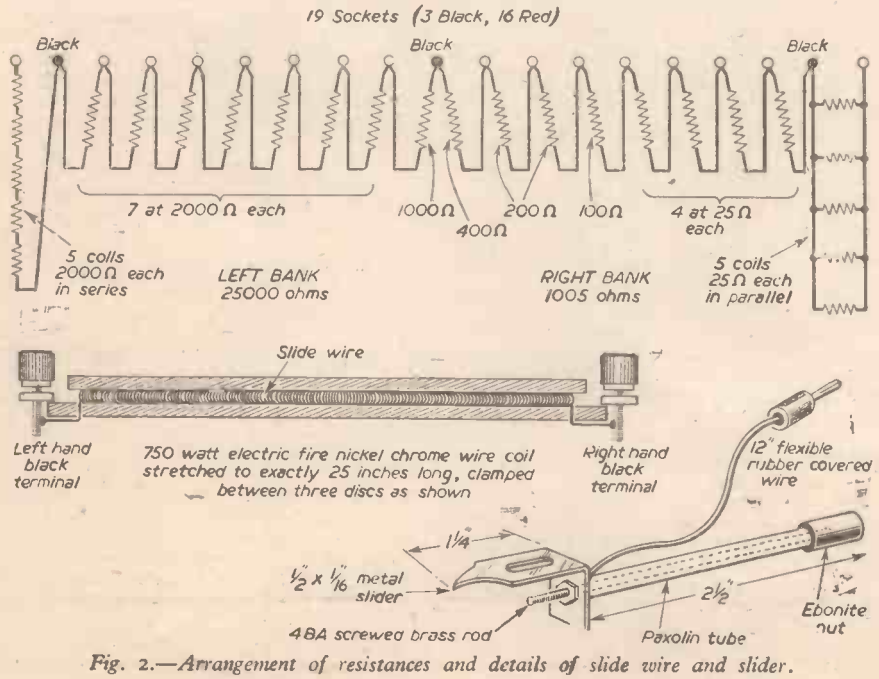


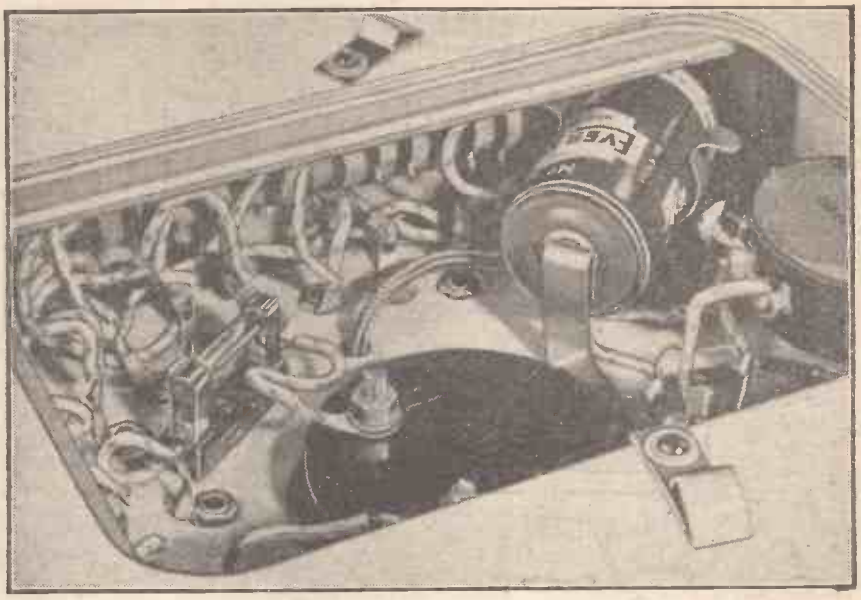
Fig. 2.—Arrangement of resistances and details of slide wire and slider.

ne Bridge strument

ent Slide-wire Unit By F. J. IRVINE

put forward on the ground that it does the job and does it at low cost.

Whatever type of resistance coil is used, the same method of fixing it must be used. *It must be evenly stretched to the required 25in.* The diameter of the top disc has been taken so that an evenly divided scale of 25in. length can easily be constructed. This is done by marking out the scale on a straight strip of thin card 25in. long. This scale is then presented to the circle on the card scale for the top disc of the instrument and the divisions taken off from the strip to the circular scale. This scale can be divided as shown (Fig. 3), or into any other even divisions to suit individual taste.



View of part of the interior of the instrument, seen through the opening in the back.

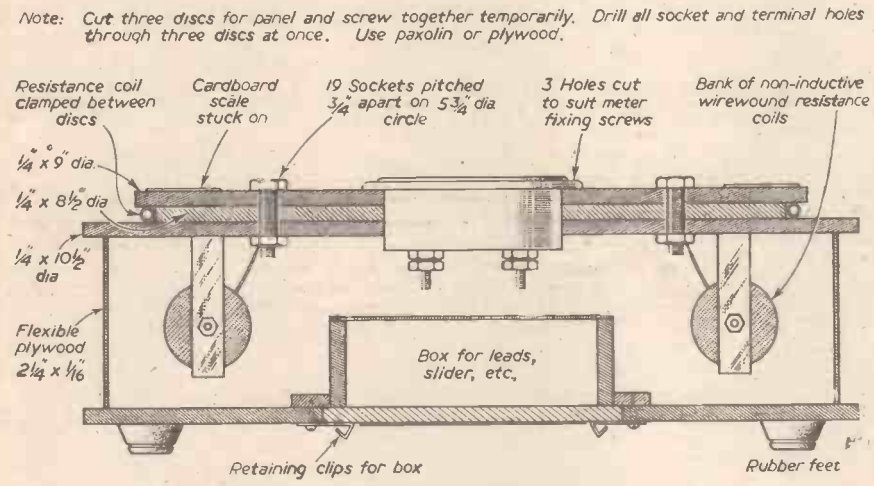


Fig. 4.—Sectional view of the testing set.

Face of Instrument

Three discs of plywood were used for this, but any material of like nature, ebonite, paxolin, etc., would be suitable. Cut the discs to the sizes shown (Fig. 4), drill two or three pilot holes through the discs and bolt together. Then, at one operation, drill every hole (correct size) that is required to go through all three discs. Separate the discs and clean up all the mating surfaces. Bolt the discs together again and if the shanks of the sockets which will be used do not project sufficiently through the lower disc, then it may be of help if the holes are countersunk on the lower face. When ready, loosen the discs slightly, put the end of the slide-wire through two small holes near the outer black terminals and then spring the coil over the top disc. Examine the turns of the coil and even out the spacing of the turns *before* tightening the screws of the discs.

Battery Clips

The clips for the two 1½ volt cells should be made to suit the available space when the rest of the components are in position. (See Figs. 5 and 6.)

Wiring

The wiring should be carried out before the back of the instrument is fitted.

All connections should be soldered to tags where possible. The wires should be laid neatly round the line of socket terminals, and care should be taken that no wire will foul the box that is fixed to the inside of the base.

Lead Box

The face of this box (Fig. 7) is cut directly out of the base by means of a fretsaw. The measurements for the depth of box sides will depend upon the projection of the meter terminal screws. A very thin back can be fitted to the box to make more room.

Plugs and Sockets

These should be the best that can be obtained, and when they are bought they should be tested to ensure that the individual plugs and sockets match and are all the same size. Failure to watch this point will cause disappointment when, after construction, very sloppy fits are found in some of the sockets. Poor connection here will upset the whole performance of the instrument.

Calibration

Slots, at the fixing positions, are left in the scale card in order that a slight degree of rotation can be obtained on the card. The card is left loose to commence and its final position is found by comparing two *nominally equal values* of resistance.

One is connected between the left-hand and centre black terminals. The other is connected between the right-hand and the centre black terminals. *The resistance-arm box* is completely disconnected.

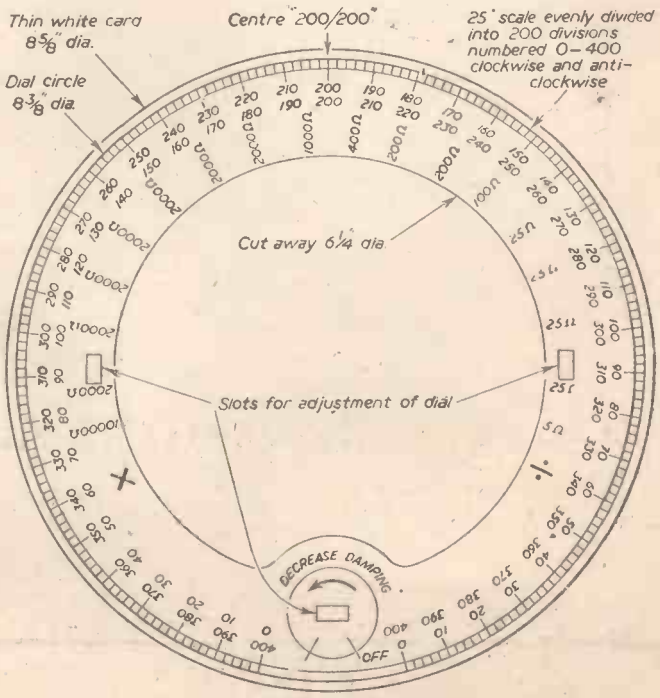


Fig. 3.—The bridge dial.

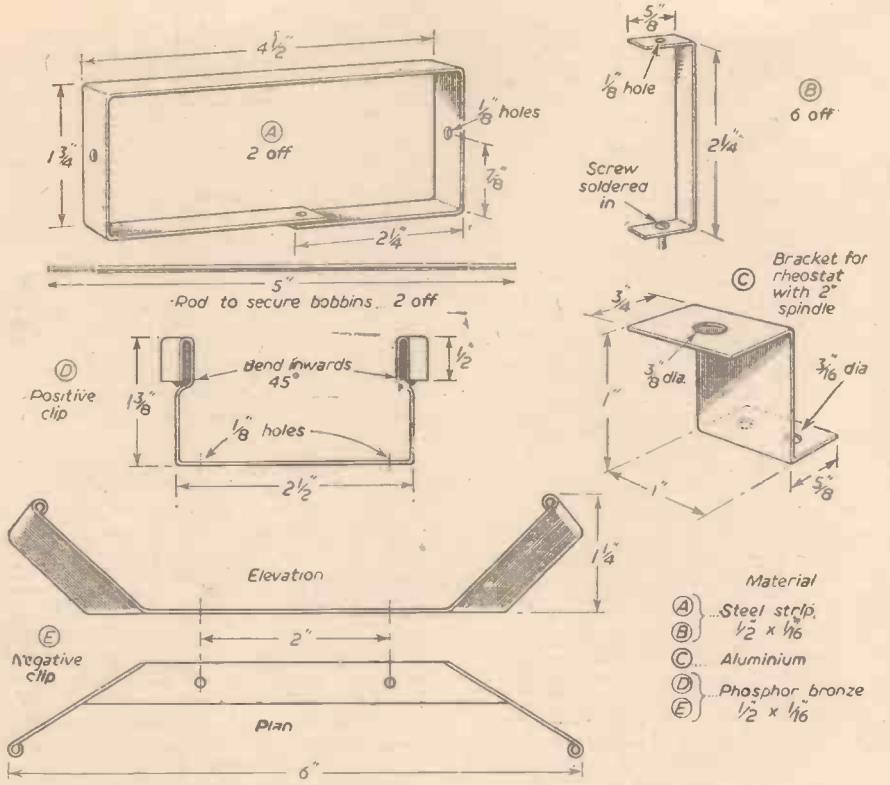


Fig. 5.—Details of the metal brackets and clips.

A trial balance is taken and a mark is made opposite this scale position on the top disc of the instrument.

The test is now repeated *with the two test resistances interchanged.* If the two resistances were equal then a balance should be obtained on *exactly the same position.* If they are not quite the same, then the second balance will be at a small distance from the first mark.

Now, as one of these resistances is taking the place of the *instrument resistance arm*, the position of balance represents the ratio of the two resistance values. In one case it is the ratio A/B and in the other case it is the ratio B/A. These two positions are equally spaced, one to the left, the other to the right, of the centre of the scale. Should there be, therefore, two marks for the tests, then the mid-position between the marks is the mid-position of the slide-wire and slide-wire scale.

Repetition of the test with other pairs of resistances will prove the degree of accuracy of the first tests. Should there be slight variation of results, then an average position for the centre of the scale must be accepted. This position for the scale card should be marked, the top disc glued, and the scale card replaced and affixed in its place.

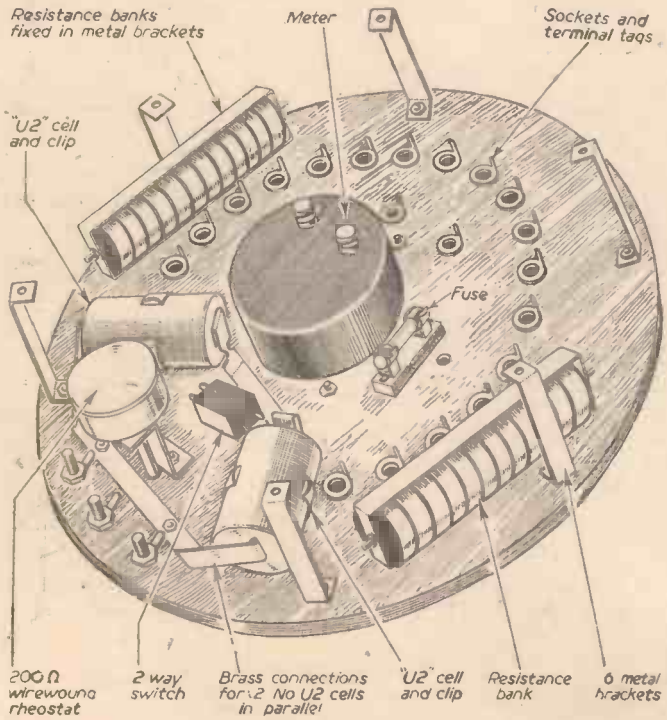


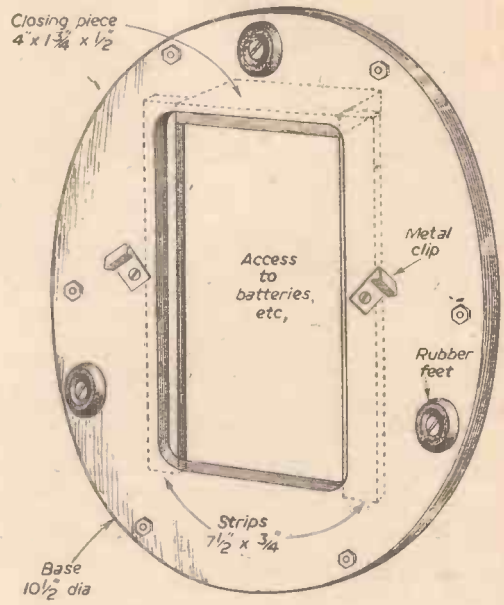
Fig. 6.—Underside view of the panel, minus the winding, showing the layout of components.

Accuracy

The limitations on the accuracy of the instrument are the tolerances of the resistors used, the uniformity of the slide-wire and the care which has been used in its construction. It is pointed out that within the working limits of the bridge circuit, the accuracy to be expected will be better than that obtainable with the more usual battery and voltmeter type of ohmmeter, provided reasonable care and workmanship has been put into it. It is not to be classed as a laboratory type instrument, but for the amateur it is a robust and compact device that has more uses than would appear at first sight.

Using the Wheatstone Bridge

(1) *To measure an unknown resistance.*



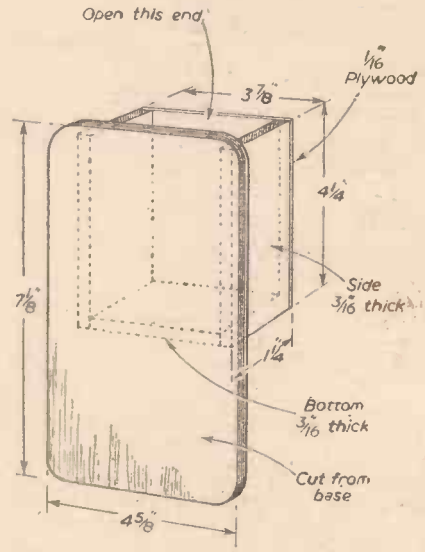


Fig. 7.—Views of the base and lead box.

Connect the resistance to be tested across the *centre and the right-hand black terminals* at the edge of the instrument.

Insert the plug of the *slider lead* in the *red meter socket.* The damper rheostat knob must be at "off" position before battery switch is thrown *towards* the meter. Now move the knob to the "All resistance in" position. Hold the slider pointer level and radial to the centre of meter. Move the slider right or left in order to reduce the galvanometer deflection. When the balance position is nearly reached, turn the damper rheostat knob to the "all resistance out" position in order to get the maximum sensitivity on the meter. Test that a balance position *has* been reached by moving the slider off balance right and left in order to see that a small deflection is obtained in any other position.

(To be concluded.)

Re-designing the Kettle

Principles of Fuel Economy Applied in the Kitchen

By A. E. PEARSON

DURING recent years the shortage of fuel has caused considerable attention to be focused on the efficiency with which all fuels are used, both industrially and domestically. On the industrial scale the science of fuel technology has been extensively applied, for a number of years, and many economies have been made. In the domestic sphere, however, it is only comparatively recently that interest has been stimulated in heating appliances of improved design and efficiency. This article is devoted to one domestic appliance, namely, the kettle, which so far appears to have escaped the closer attentions of the "efficiency designer."

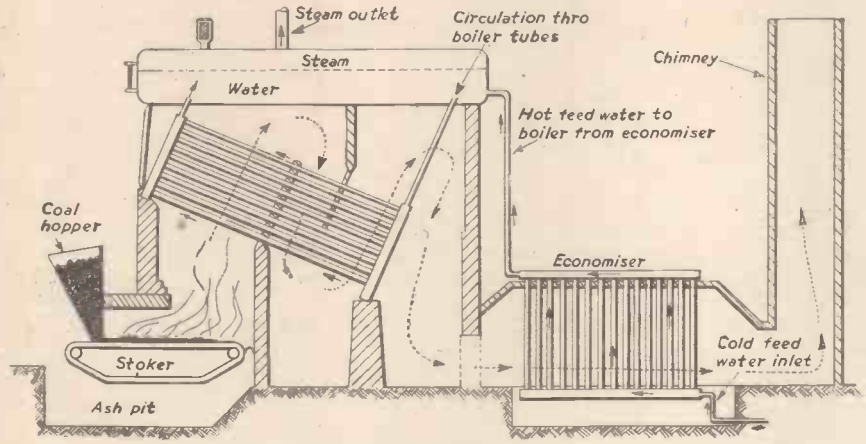


Fig. 1.—Sectional diagram of an industrial water-tube boiler.

In the electric kettle having an internal element, heat is developed within the mass of water, so that the only heat lost externally is that which is convected or radiated from the kettle walls. This heat loss is a comparatively small proportion of the total heat input so that the efficiency of heating is quite high.

In the case of a kettle heated by an external flame such as gas or oil, conditions are quite different. Heat is liberated by the fuel outside the kettle walls, and to obtain the highest possible efficiency, the maximum possible proportion of the heat in the fuel must be persuaded to pass through the walls and into the water. The traditional kettle design, while being easy (and therefore cheap) to produce, has a very low efficiency. Why is this so, and how can it be improved?

Industrial Boilers

As in many small-scale problems such as this, the principles applied to-day on an industrial scale, and which are the results of many years of research and experience, can be successfully applied on a domestic scale. Industrially, water is heated and boiled to raise steam (for power stations, large engines, etc., etc.), in immense quantities and at high efficiencies. The high efficiency boilers which raise this steam bear no resemblance in design to the domestic kettle. Consideration of the differences in construction will suggest improvements which could be made to the kettle.

Fig. 1 shows the essential features of an industrial water-tube boiler plant. The points which are of particular interest to us are as follows:

(i) Combustion of the fuel is completed before the hot gases produced by the combustion impinge on the metal parts of the boiler structure.

(ii) A very large surface area, consisting of the outer surfaces of a large number of tubes containing the water is presented to the flow of hot gases.

(iii) The hot gases are made to pass over, and are kept in contact with the tubes by a system of baffles controlling the direction of flow of the gases.

(iv) The tubes and water drums are arranged in such a way that rapid circulation of the water by convection currents is encouraged. In this way there is a continuous supply of water absorbing heat through the tube walls.

(v) In order to maintain a difference in temperature between the gases and the water (without which difference there can be no transfer of heat to the water), the gases in their passage over the boiler tubes and through the economiser meet progressively cooler water, which is flowing in the opposite direction. This "contra-flow principle" ensures the maximum degree of extraction of heat from the combustion gases and hence from the fuel. Contra-flow and its antithesis,

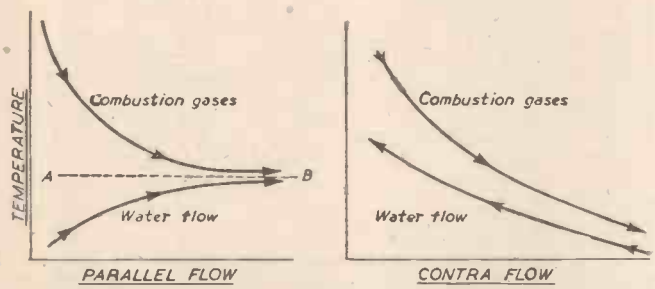


Fig. 2.—Parallel flow gives a low water temperature and high gas temperature. AB represents the theoretical limit of both. Contra-flow gives higher possible water temperature and lower gas temperature, hence higher efficiency.

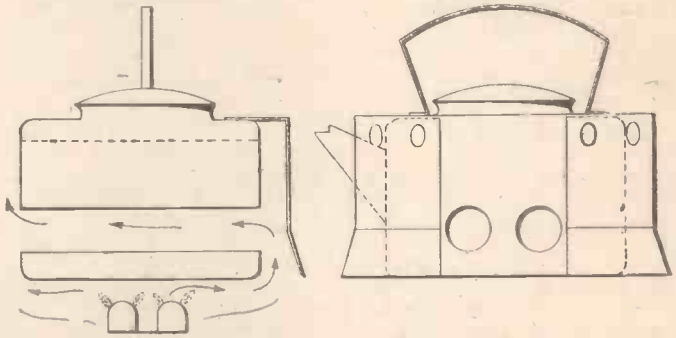


Fig. 5.—Two views of a conventional kettle with the addition of internal tubes and outer casing.

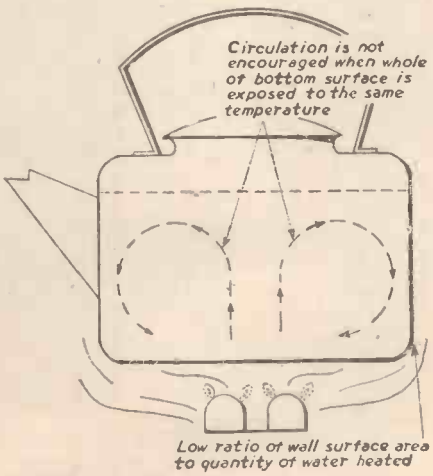


Fig. 3.—The conventional kettle.

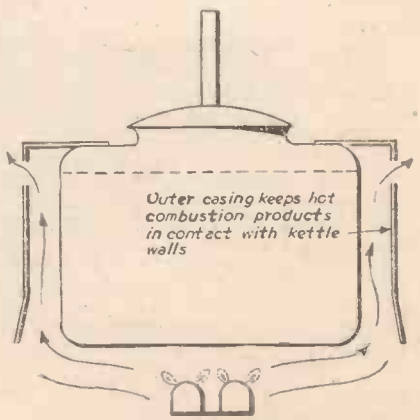


Fig. 4.—Sectional view showing cylindrical casing.

parallel flow, are illustrated graphically in Fig. 2.

High and Low Efficiency

Now let us compare the high-efficiency boiler plant with the low-efficiency kettle (Fig. 3). In the case of the kettle:

(a) With a fairly high flame, combustion of the gas is frequently completed only when the gas has lost contact with the kettle walls. Much of the heat resulting from the combustion cannot therefore pass through the walls into the water, and is completely lost to the surrounding atmosphere.

(b) The ratio of heating surface exposed to the flame to the quantity of water being heated is much lower than in the industrial boiler. It is possible, of course, for a kettle to be constructed on similar lines to a water-tube boiler, i.e., built up from tubes, but it will be obvious that such a design would be unacceptable both from the point of view of manufacturing cost and of difficulty in handling such an article in the kitchen. Some compromise must therefore be attempted between the two extremes of design.

(c) The common practice of heating a kettle by a large flame which covers the whole of the bottom of the vessel does little to encourage convection circulation in the mass of water. Circulation undoubtedly does occur, as can be seen by lifting the kettle lid while heating, but a greater concentration of heat in one spot would give greater circulation rate and better intake of heat from the combustion gases.

(d) There is little scope for adoption of the contra-flow principle, since there is no real flow of water. An approximation to this condition could be achieved, however, by making the combustion gases flow in a direction opposite to that of the convection current in the water.

Improved Kettle Designs

After this criticism of the traditional kettle design has been put forward, the question is can a utensil be designed which will combine ease of manufacture (and hence low price) with the considerable increase in thermal efficiency which could be obtained by correcting the faults enumerated above? The accompanying sketches show some suggested designs which go some way towards achieving this object.

Fig. 4 shows a simple device which could be made integral with the kettle during manufacture or which could be made at home by the average handy man from sheet metal. It consists of a cylindrical casing about 3in. larger in diameter than the kettle and sits on the horizontal part of the vessel adjacent to the lid, as shown. About six holes, of about 1in. diameter are cut near the top of the casing, and provision is made for the kettle spout. This device serves to slow down the rate of escape of combustion gases from the kettle walls, hence allowing more time for heat to pass into the water, and keeps the products of combustion in contact with the kettle for the maximum period of time.

Fig. 5 shows a further development from Fig. 4. The heating surface is increased by inserting two tubes transversely through the lower part of the kettle. The hot gases will therefore pass through the mass of water as well as round it. A section of the additional outer casing is cut away to allow the gases from the internal tubes to pass directly out to atmosphere.

Designs so far considered have incorporated improvements to some extent in respect of items (a) and (b) above, but no improvement has been made in the convection circulation or adoption of contra-flow principle.

Increasing Convection Currents

Fig. 6 shows a design, albeit a little unconventional, which is intended to stimulate convection currents by local heating along the centre of the base, the latter being curved to direct the water in the desired direction. Rapid movement of water towards and then away from the hot area encourages rapid take-away of heat from the metal of the base in the vicinity of the flame, and hence rapid transfer of heat from the flame itself.

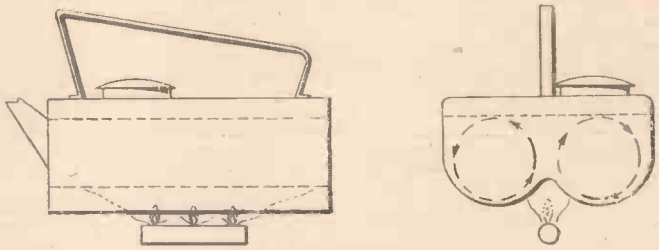


Fig. 6.—Side and rear view of a kettle shaped to stimulate convection circulation.

Fig. 7 is a design which covers all the points (a) (b) (c) (d) and is a compromise between the water-tube boiler and domestic requirements. The water is carried in a vessel which is suspended inside a casing somewhat similar to, and for the same purpose as, Fig. 4. A considerable increase in heating surface is achieved by deep corrugations in the bottom of the water chamber. Circulation is stimulated by making the vessel relatively long and narrow and heating from the forward end only, together with the shaping of the bottom to provide a rising path for the water as its temperature increases. Contra-flow is applied to a minor extent by providing a backward-flowing gas stream in opposition to a forward-flowing convection current.

Thus it would appear that some improvement is possible in the design of the kettle. If the housewife can be convinced that the reduction in her gas bill will more than offset the extra cost of the improved kettle, it may well be that the tea-maker of the future will use a utensil of a design considerably different from that which has sufficed for generations past, and in so doing, assist in conserving our dwindling resources of fuels.

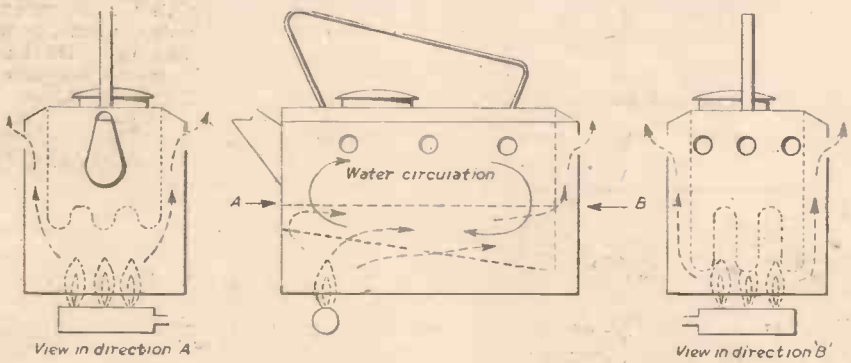
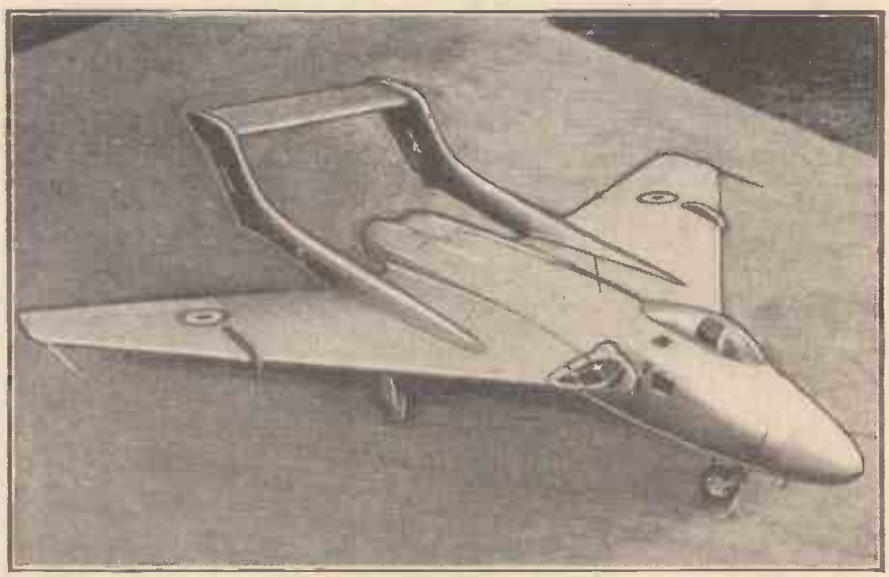


Fig. 7.—A design for a kettle giving increased heating surface area, completed combustion, contra-flow and stimulated circulation.

The Ill-fated D.H.110



The D.H.110 fighter 'plane, which is powered by two Rolls-Royce Avon jet engines, combines the well known de Havilland twin-boom construction with swept-back wings. It was in this machine that the test pilot, John Derry, lost his life when flying through the sound barrier, at Farnborough, in September.

The "World of MODELS"

By "MOTILUS"

An Interesting Gauge "0" Coach : Model High-velocity Boiler

ONE of my German correspondents, Mr. W. Richter, of Leipzig, who has sent me many photographs of his 00 gauge model railway, has now extended his interest to building a second railway layout in gauge 0. I believe Mr. Richter has his track ready for the new layout, but I do not know what his general plans are for locomotives and rolling stock.

Meanwhile, Mr. Richter has evidently started building rolling stock as he has recently sent me a photograph of his new gauge 0 coach in course of construction (Fig. 1). I find this very interesting because he has chosen an unusual prototype: a composite brake coach of the old South Eastern and Chatham Railway. The model is made to scale, from tin and pasteboard, and the bogies are also home-made. The photograph reproduced here shows the model when it was nearly complete, with only a few more details to be added. It is painted in the correct colours, purple lake, with fine gold lining.

The coach Mr. Richter has modelled is one of a set of three, the prototype of which was built round about the year 1900, having a body length of 46ft. and tare weight 25 tons. Accommodation comprised two second class, two first and two third class compartments, and a small van with "bird-cage" look-out. "Perhaps," writes Mr. Richter, "this is the only model of its kind on the Continent!"

Show Case Model Liner

The Union-Castle Mail Steamship Co., Ltd., have adopted a most attractive new form of display for publicity ship models. The one illustrated here is a waterline model, to a scale of 32ft. to 1in., of the new Union-Castle Line passenger ship, s.s. *Rhodesia Castle*. The prototype is a turbine-driven one-class vessel of 17,041 tons.

The model is in a perspex case, backed with a coloured photograph of Table Bay, showing Cape Town with the famous Table Mountain towering behind. This impressive background sets off the beauty of the ship model very effectively (Fig. 2).

Model High-velocity Boiler

Models of industrial plant are much in demand nowadays for publicity and demonstration purposes, both at home and overseas. Earlier this year a model of an Edwin Danks patent high-velocity economic-type boiler was made to the order of Messrs. Babcock & Wilcox, Ltd., for exhibitions in New Zealand, where it created considerable interest.

The construction and functions of this particular plant are very difficult to publicise as the prototypes are normally enclosed in structural work, and being of such large proportions the three-dimensional model is the only satisfactory way of bringing the project into focus.

In this particular instance, part of the boiler shell on the model was cut away to reveal the boiler tubes and the Oldbury chain grate stoker, the latter being a particularly intricate part of the model. The turnover of the chain grate has been modelled in full detail with some three thousand links.

The makers' specification for the boiler gives evaporation from eleven to twelve thousand pounds an hour, from 60 deg. Fahrenheit. Boilers can be supplied in pressures from one hundred to two hundred and fifty pounds per square inch.

The model illustrated (Fig. 3) was to a scale of 1½in. to 1ft.

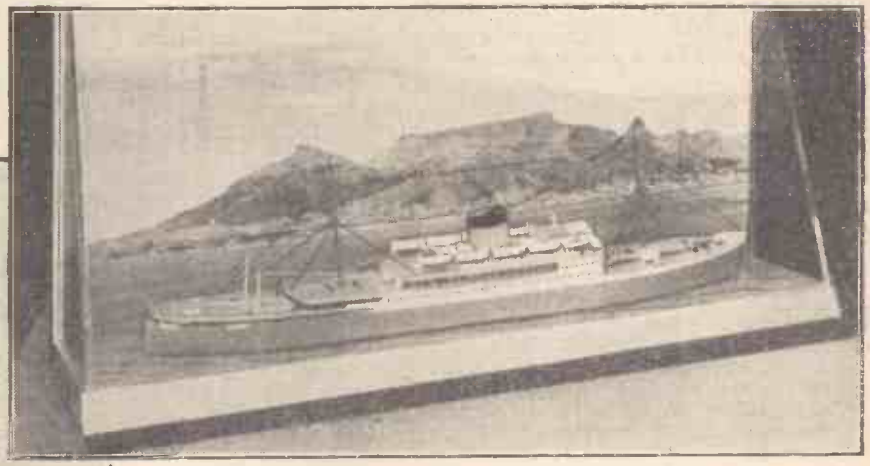


Fig. 2 (Above).—An attractively displayed waterline model of the Union-Castle liner, s.s. "Rhodesia Castle." Scale, 32 ft. to 1 in.

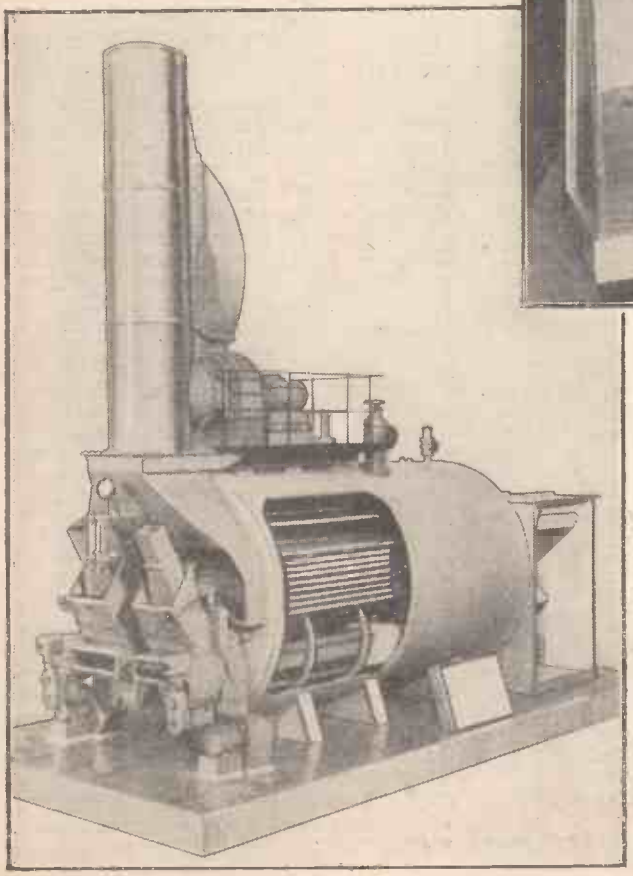


Fig. 3.—A model of Edwin Danks patent high-velocity economic-type boiler, to a scale of 1½ in. to 1 ft. Part of the boiler shell is cut away to reveal the interior.

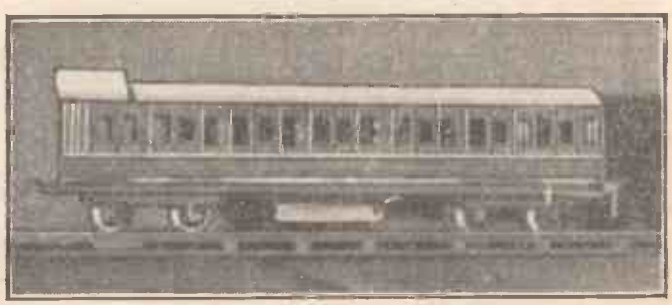
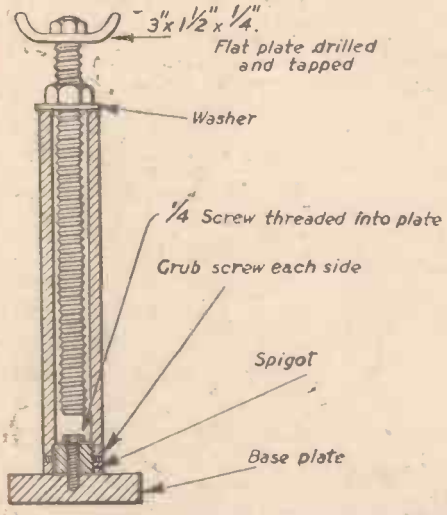


Fig. 1.—Mr. Richter's home-made gauge 0 composite brake coach, modelled on a prototype of the old South Eastern and Chatham Railway.

Simple Motor-car Jack

SIR,—The following idea for a simple motor jack might be of some use to other readers of PRACTICAL MECHANICS.

The first requirement is a piece of stout iron barrel, 9in. long with a ¾in. clearance hole in the centre. Next, a ¾in. bolt threaded all the way up, a 4in. square base plate,



The completely assembled motor-car jack.

a 1in. x ¾in. spigot, and a piece of ⅜in. x 1½in. x ¼in. flat iron are required. The various parts are assembled as shown in the accompanying sketch. The end of the barrel can be welded to the base plate, or screwed in place as shown.

To use, place the jack in position, turn the nut clockwise, and it will raise the car.

I have been using a pair of these jacks on a 15-cwt. lorry for some time, but I used a 1in. Whitworth bolt. The base plate and top plate were welded on.—C. A. AKERS (Canvey Island).

Braille Printing

SIR,—With reference to the letter from L. Mortimore (Pinhoe), in your July issue, concerning Braille printing, I have endeavoured to obtain some information for him, and also to devise some means whereby a limited number of copies could be printed by means of using plaster dies, suitably hardened, and cast from a master copy made in the usual way on a Stainsby machine.

However, I am given to understand that one firm which manufactures ordinary duplicating machines (Gestetner) are experimenting, and it is suggested that your correspondent gets in touch with the National Institute for the Blind, 224, Great Portland Street, London, W.1.—JOHN H. BAKER (Golders Green).

Centripetal Force

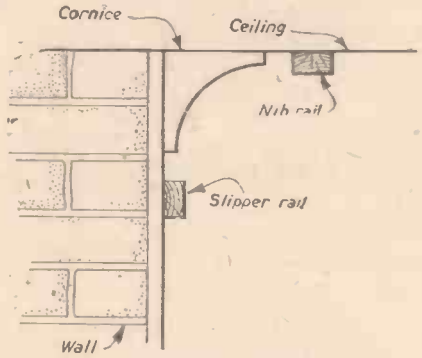
SIR,—I should like to point out a mistake made by Mr. R. Hine, of Cardiff, in his letter entitled "Centripetal Force" which appeared in the June issue.

He said that the only force acting on a body which is describing a horizontal circle is the centripetal force, and that centrifugal force does not exist. The first statement is true, but the second is false.

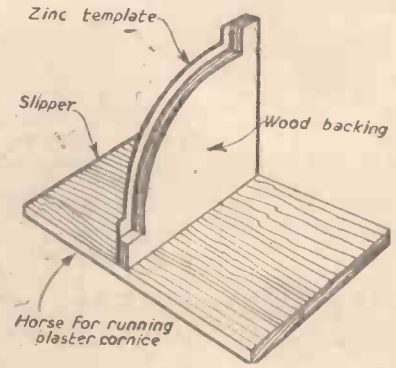
When a body is constrained to move in a horizontal circle with uniform velocity, the body exerts an outward force on its constraint which is called the centrifugal (centre-fleeing) force; and the constraint (string, cylinder, etc.) exerts an equal and opposite force on the body which is called the centripetal (centre-seeking) force. Hence the centripetal *is* the only force *acting on the body*, but obviously there cannot be a centripetal force without equal and opposite centrifugal force, as he suggests.—C. FOX (Wellington).

Making a Plaster Cornice

SIR,—The reply given to N. J. Wilson about making a plaster cornice might lead him into trouble; the plaster used should be putty lime punched through fine gauge and mixed with 10 per cent. of plaster of Paris. The way to mix it is to form a ring on a board with the putty lime, pour in a small amount of water and sprinkle in the plaster of Paris and quickly mix together. The plaster is dabbed on with the hands and run into position with a plasterer's horse. This tool is shown in the accompanying sketch, which more or less explains its use. The slipper and nib rails are nailed to the wall and ceiling respectively to form guide rails.—J. HEELAS (Grimsby).



How slipper and nib rails are used as guides.

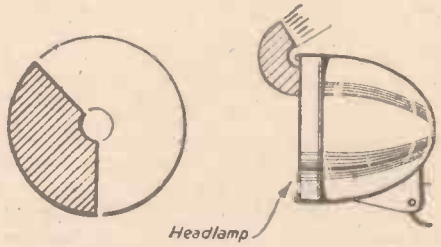


Plasterer's horse for running plaster into position.

A Dynohub Reflector

SIR,—I have noticed how a lot of users of dynohub lighting systems (including myself) forget to turn their lights off. So I devised an improvement which can be of general use, for telling when any light is on when the front of the light cannot be seen. The device consists of a Perspex reflector.

All that is required is a piece of Perspex, about 1¾in. dia., and ⅛in. to 5/16in. thick, with a 5/16in. hole in the centre. Cut out the shaded section shown in the sketch and then file up and polish. Stick the piece to



The formation and fitting of the Perspex reflector.

the glass of the head lamp, as shown; and a good reflector will be formed. Perspex can be stuck to glass with "Durafix."—E. WILLIAMS (Beddington).

Weather Vane Details Required

SIR,—I would like to make a weather vane, and would be pleased to know whether constructional details of one have ever appeared in PRACTICAL MECHANICS.—H. G. ROBERTS (Oswestry).

[*We have not published constructional details for a weather vane in* PRACTICAL MECHANICS, *and invite readers to submit sketches of one.*—EDITOR.]

Sodium Silicate

SIR,—On page 358 of the July issue of PRACTICAL MECHANICS (Queries and Enquiries Page) in answer to a query about sodium silicate and its uses with sand and other inert materials, it is stated that "the cement-like product has little strength and tenacity."

I have found that sodium silicate mixed with ordinary clay is excellent for repairing ends of motor car silencers, and cracks in old kitchen ranges and fire grates, and that it will hold on well and last well. The test on our car silencer was very severe as much vibration from the road was imparted to it. If a mixture of sodium silicate and clay is put on whilst the silencer or grate is hot, and allowed to cool down, on the next heating it will be found to be dead hard, and also to have a great affection for metal.

I hope this information will be of some assistance to other readers.

With appreciations of your excellent journal. Nothing like it published here.—R. LOFTUS (Takapuna, Auckland, New Zealand.)

The Steam Car

SIR,—I noticed in the August issue a letter from one of your Australian readers Mr. E. W. Chambers of Victoria, Australia, on the subject of "The Steam Car" (page 389). I should like to pass on the following information to Mr. Chambers.

(*Continued on page* 81)

LETTERS FROM READERS

(*Continued from page 78*)

There is in existence in Australia a society known as the "Steam Power Unit Development Society of Australia"; unfortunately I cannot supply him the society's address but —and here your British readers may be interested to learn—there is a steam car society in Britain; and they will no doubt be only too pleased to put Mr. Chambers in touch with the Australian society. I give the address below for his information, and any other reader who may be interested.

Hon. Secretary: M. Harman Lewis, British Light Steam Power Society, 39, Arundel Avenue, Ewell, Surrey.

I have been a member of this society for several years and certainly think that there is a great future for steam cars, even in this country, but owing to steel shortages, etc., their future is severely handicapped. But the society does help those interested in steam cars to keep their interest alive and up to date with the most recent developments in design.— K. L. PROCTOR (Hexham).

The Steam Car

SIR,—I have read with interest the articles and letters published during the last few months, on the subject of steam cars. Many readers must have been surprised to find that interest in the subject is so widespread. However, many of us, fortunate enough to belong to Steam Power Societies, are by no means surprised, for we are in touch with hundreds of steam-car enthusiasts throughout the world. Possibly your readers would be interested to know of the existence of one or two of these clubs.

The one with which I am most familiar is the Steam Power Unit Development Society of which the President is Mr. Sidney Clement, of 22, Goodrich Avenue, Kingsford, Sydney. Formed in 1946 this club has hundreds of members throughout Australia, the South Seas, Britain and America. S.P.U.D.S. as it is known, is building as club projects, steam cars in Sydney, and a solid-fuel fired steam truck in Melbourne—entirely distinct from the private steam car construction carried on by members. The S.P.U.D.S. Bulletin is distributed every two months.

In Britain, Bolsover Brothers of Whitby, Yorks, for many years published a magazine called "Steam Car Developments and Steam Aviation" (more recently entitled "Steam Car Developments and Steam Marine Motors"). On the formation of the British Light Steam Power Society recently, this was taken over and, since April 1949, has appeared as the official organ of that society, under the title of "Light Steam Power." Your contributor, Mr. Harman Lewis is I believe, a member. The Editor of "Light Steam Power" is Mr. J. N. Walton, of Craig View, Cannan Avenue, Kirkmichael, Isle of Man.

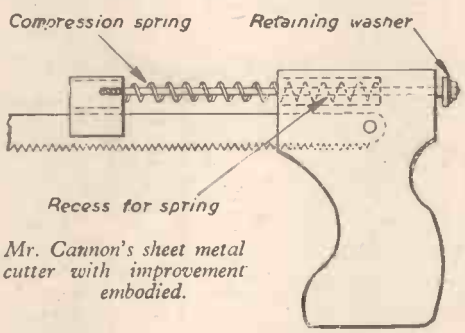
Interest in steam cars in America is both extensive and intensive, too. Mr. Fred Marriott (the man who drove a Stanley racer at 127 m.p.h. in 1906, and crashed at over 180 m.p.h. in 1907) still operates the only garage nowadays specialising in work on Stanley steamers. Until his passing recently, Mr. Thomas Dear of the American Steam Automobile Co., was building modern steam cars.

Incidentally, whilst many up-to-date steamers have been produced in the U.S.A., it is interesting to note that many ancient steamers are being resurrected. The cult of the antique car is a sizeable industry in the States, but it is significant that the Stanley and White steamers dominate the field being prized far above their I.C.-engined rivals. This is partly due to their novelty and greater interest, but mainly because they can be restored to give a performance equal to that of the I.C. car of to-day—something utterly impossible with the early petrol cars! Mr. Robert E. Ostwald of Box 351, Staten Island, 1, New York, is in touch with hundreds of steam car fans in the U.S.A. and circulates a journal amongst them.

Undoubtedly others closer at hand will already have written to forward similar information.—CHRIS H. BROWN (Victoria, Australia).

Sheet Metal Cutter

SIR,—With reference to the novel sheet metal cutter by Mr. W. E. Cannon, in the July issue of PRACTICAL MECHANICS, may I offer the following suggested improvement? By dispensing with the coil spring at the top of the body, and substituting a compression spring round the 4 B.A. rod, as in accompanying sketch, and counterbored into the body, the tool is somewhat neater and, mechanically, the line of action of the spring is correct, instead of tending to cause the rod to bind on the side of the hole.—A. S. FRASER (Tottenham).



Mr. Cannon's sheet metal cutter with improvement embodied.

Interplanetary Space Travel

SIR,—I found H. H. Porritt's letter, "Interplanetary Space Travel," May issue, very interesting. Yet I should like to comment upon that part which says that a small thrust from rocket motors would gradually build up any desired speed.

If my understanding of space has not led me astray, any self-propelling vehicle needs something to push against or something to pull against; it needs at least a medium through which to progress. However, as I see it, these two "somethings" do not exist in space.

Calculating as I must from the works of others, but taking a new line of thought, I find that space is devoid of all matter. This being so, space is devoid of light and heat —a state of unbelievable coldness and blackness. Yet the new line of thought which I have followed leads me to a very strong belief that space does at least possess one thing—namely, "speed of motion," which appears to be outwards in all directions.

What I mean is that if a rocket enters space, the very molecules of the matter of which the rocket is made would separate one from the other outwards from the common centre of the whole; disintegration would be taking place.

Assuming that a piloted space ship entered space, I doubt very much if any bearings at all could be taken, there being no medium through which one could see.

We hear the theoretical side of space travel where the occupants of the ship may observe other planets. Here I think we are taking too much for granted. I mean that we see other planets because we are bathed in atmosphere, we look through atmospheres; thus we see through or across the intervening space; but *to be* in space would mean that nothing at all could be seen.

I agree with scientific investigation, yet I believe that if our knowledge of space was as great as our knowledge of matter we would be getting somewhere.

To pick up a piece of matter and begin an investigation is, I think, considered to be quite a simple task, for we have a foundation upon which to start, but to pick up a piece of space is a task indeed.

As an added interest I should like to point out that for some time now I have been working upon a theory which points very close indeed to something new; that is, that there must exist a single body of matter in the form of a sphere (hollow sphere) so large as to defy calculation, one condition of its existence being that it must be in a state of shrinking—shrinking at a terrific pace.

If and when the existence of this gigantic sphere becomes fact, what I have already said about speed of motion being in space will be better understood.—V. A. MILBURN (Milton).

Model Power Boats in Barrow-in-Furness

FOLLOWING a successful "Parade" in aid of a local charity, the Model Power Boat Club of Barrow-in-Furness gave a demonstration of their model power boats in action. Hundreds of spectators watched the little boats going through their performance on the park lake.

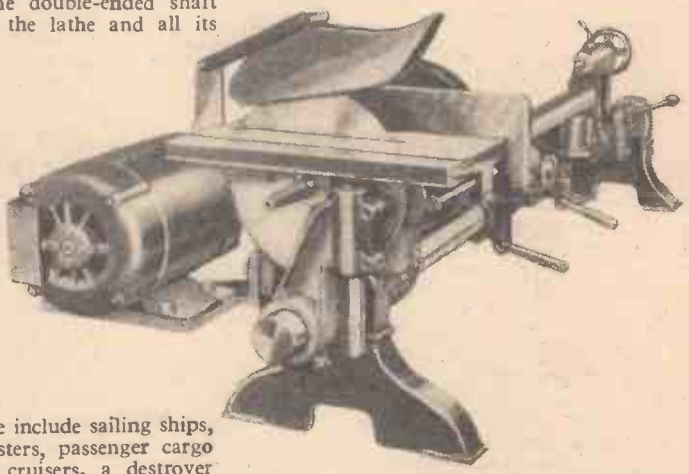
Our illustration shows the *Sea Wolf* under way, this model being radio-controlled. The owner is seen operating the radio-control gear, the boat being on the right of the transmitting aerial. The demonstration took place in the late afternoon, in bright sunshine; a light breeze rippled the surface of the lake, but despite the disturbed surface, all boats behaved very well.

The radio-controlled "Sea Wolf" is shown here being demonstrated by its owner.

Trade Notes

Coronet "Major" Lathe

THIS machine, marketed by Slough Estates (London) Limited, 16, Berkeley Street, London, W.1, is a universal combination wood-working, metal-turning and spinning lathe. Height of centres is 4½in. and length of bed 4ft. Fitted with a swivelling-type head the lathe can turn work on the faceplate to over 2ft. diameter. It is adaptable for flexible drive equipment for all classes of work, and attachments are supplied with the lathe for circular sawing, using an 8in. blade; band sawing, belt sanding, disc sanding; buffing, planing and rebating; tool sharpening, and side- and end-mortising. The headstock, which is highest grade cast-iron, can be swivelled to any angle, and the tailstock, which is also of high grade cast-iron, is accurately machined and fitted with a large sliding barrel, bored No. 1 Morse taper, and operated by a machined handwheel. The whole unit is plunger-located, and can be locked in any position of the bed by means of a well-shaped ball-handle. The two tool-rests are mounted on two separate carriages which may be used together or independently. The circular saw attachment is provided with a rise and fall table of ample dimensions and is fitted with right- and left-hand fences which enable the operator to end-up extra-long work. A Brook motor of the double-ended shaft type is used to drive the lathe and all its attachments. Further particulars can be obtained from the address given above.



The Coronet "Major" Universal Lathe

Scottish Modelcraft 1952 Handbook

ISSUED by Bellwood Bros., 7, St. Mary's Street, Dumfries, Scotland, this handbook, which runs to 30 pages, contains drawings and short particulars of various types of ships of special interest to the model-maker. These include sailing ships, steam tugs, motor coasters, passenger cargo boats, trawlers, cabin cruisers, a destroyer and an aircraft carrier. The handbook is divided into eight sections, dealing respectively with: "Scomod" plan sets and constructional kits; plans and drawings; fittings; books and magazines; tools and equipment; power units; timber; and hull making service. Included with the handbook are two loose sheets, one being a price list of the various timbers used in model ship building, the other dealing with glues, cements, priming and painting materials. The handbook is priced at 1/6.

Club Reports

Beaufoy Model Engineering Society

MEMBERS of the above society meet every Monday, Tuesday, Wednesday and Thursday at the Beaufoy Institute, 39, Black Prince Road, S.E.11. An extensive workshop is available for all members at a nominal charge. Patterns and castings are made on the premises, and a welding and brazing plant is available. Machine tools comprise 20 lathes, 4 milling machines (horizontal and vertical), 3 shapers, B. & S. surface grinder, B. & S. horizontal grinder, besides drilling machines and the usual small tools.

New members and beginners are cordially invited to make use of these facilities, and members of other clubs might find some use for the extensive workshops.

Instructor-in-charge: S. T. HUNT, Beaufoy Institute, 39, Black Prince Road, S.E.11.

Harrow and Wembley Society of Model Engineers

THE remaining events in the autumn, 1952, fixture list of this society are as follow: Wednesday, November 5th, committee meeting; Wednesday, November 12th, lantern talk, "Techniques of Model Making," by Mr. G. H. C. Jones, Foreman of Works, The Science Museum, South Kensington; Thursday, November 13th, dinner at Headstone Hotel; Wednesday, November 19th, locomotive section evening; Wednesday, November 26th, film night; Wednesday, December 3rd, committee meeting.

Hon. Secretary: C. E. SALMON, 11, Brook Drive, Harrow.

The Tyneside Society of Model and Experimental Engineers

THIS society held its annual exhibition from October 20th to November 1st, inclusive, at the Chronicle Hall, Pudding Chare, Newcastle-upon-Tyne.

In addition to a large display of models, including steam and electric locomotives and rolling stock, cars, ships, stationary engines, tools and workshop equipment and experimental apparatus, there was a miniature Grand Prix car racing track, and a "00" gauge railway layout in operation, and cinema shows were given each evening.

Hon. Secretary: L. JAMIESON, 34, Dorcas Avenue, Pendower, Newcastle-upon-Tyne, 5.

Aylesbury and District Society of Model Engineers

THE September meeting of this society was devoted to the Luton S.M.E. Mr. Gower, one of their members, gave a talk on cutting loco parts from the solid. To illustrate his talk he showed us parts of the very excellent L.M.S. Class 5XP he is making in 2½in. gauge. There were some lively exchanges between Mr. Gower and Mr. Fraser, another visitor and an old friend of Aylesbury. Mr. Fraser is an advocate of the built-up, silver-soldered method of construction. A very lively evening! At this meeting a collection was made for the widow of the late Charles Rowell, one of our founder members, which realised £7 5s.

E. H. SMITH (Hon. Secretary), Mulberry Tree Cottage, Devenshire Avenue, Amersham, Bucks.

BOOKS REVIEWED

Teach Yourself Motor Cycling. By Dudley Noble. Published by English Universities Press, Ltd. 166 pages. Price 6s. net.

THIS book, in addition to teaching the beginner how to ride a motor-cycle, also indicates to the prospective motor-cyclist the manner in which he should make his mount behave under present road and traffic conditions.

The book is divided into six chapters, dealing respectively with Riding the Machine, How the Engine Works, Care of the Machine, Roadside Repairs, The Autocycle, and On the Road. The text is illustrated by numerous line diagrams.

Modern Buses and Coaches. By C. B. Morrissey. Published by Temple Press, Ltd. 86 pages. Price 9s. 6d. net.

THIS volume is one of the "Boys' Power and Speed Library" series and deals very fully with its subject. The first chapter is devoted to a short history of buses in Britain and ranges from the sixteenth century stage wagon through the fascinating story of steam buses and horse-drawn trams to the present day double-decker bus. The principles of the I.C. engine and the diesel engine are explained and the working of trolleybuses and trams is gone into. There is a chapter about the makers of buses, one on the operation of bus services, and another on the organisation of road passenger transport. There are numerous illustrations. The drawings and half-tone photographs in conjunction with descriptions of mechanical, constructional and operational details and details of foreign bus services help the author to achieve his purpose in answering the sort of question likely to be asked by the interested boy of almost any age.

Engines for Power and Speed. By F. E. Dean. Published by Temple Press, Ltd. 81 pages. Price 9s. 6d. net.

ALSO one of the "Boys' Power and Speed Library" series, the book is arranged chronologically, commencing in the first chapter with some notes on the use of natural resources as prime movers and some of the early inventions introduced to harness them and concluding with chapters on gas turbines and atomic energy. Clear but comprehensive descriptions, illustrated with photographs and line drawings, give the reader an insight into the working of steam engines and turbines, gas, petrol and diesel engines, and in separate chapters water power and fuels are dealt with. The book is in simple language and should appeal to the mechanically minded boy of to-day.

GALPIN'S

ELECTRICAL STORES

408, HIGH ST., LEWISHAM, LONDON, S.E.13

Tel : Lee Green 0309. Near Lewisham Hospital

TERMS: CASH WITH ORDER. NO C.O.D.

All goods sent on 7 days' approval against cash.

EARLY CLOSING DAY THURSDAY

MAINS TRANSFORMERS (By well-known makers). Input 100 and 230 volts, output 6 volts 1½ amps twice, price 7/6 each, post 1/-; another 200/250 input, output 25 volts 4 amps C.T., 25/- each, carriage 1/6.

RECTIFIERS, input 75 volts, output 50 volts 1 amp, 10/- each, post 2/-. Condensers 10 M.F.D. 250 volt wkg., 3/6 each: 8 M.F.D. at 1,000 v/wkg., 7/6 each; 8 M.F.D. 2,500 v/test, 10/- each.

EX-U.S.A. W.D. ROTARY TRANSFORMERS, 12 volts D.C input, 500 volts, 50 m/amps, 275 volts 100 m/amps D.C. output. Complete with smoothing switches, fuses, etc., as new, 17/6 each, carriage 2/6. Can be run on 6 volts giving half the stated output.

MAINS TRANSFORMERS (NEW), 200/250 volts input in steps of 10 volts, outputs 0, 6, 12, 24 volts 6 amps, 42/6 each, post 1/6; another, as above but 10-12 amps, 55/- each, post 1/6; another, as above but 25/30 amps, 75/- each, carriage 3/6; another, input as above, output 0/18/30/36 volts, 6 amps, 47/6 each, post 1/6.

EX-NAVAL ROTARY CONVERTERS, 110 volts D.C. input, output 230 volts A.C. 50 cycles, 1 phase, 250 watts, capable of 50% overload, weight 100 lb., price £10/10/- each, carriage forward.

ROTARY CONVERTERS, 24-28 volts D.C. input, 1,200 volts 70 m/amps D.C. output, 10/- each, P.F.

SWITCHBOARD METERS, 4in. scale moving coil (D.C.) only 0 to 14 amps, 17/6 each, post 1/6.

MAINS TRANSFORMERS (New). Input 200/250 volts in steps of 10 volts, output 350/0/350 volts 180 m/amps, 4 volts 4 amps, 5 volts 3 amps, 6.3 volts 4 amps, 45/- each, post 1/6; another, 350/0/350 volts 180 m/amps, 6.3 volts 8 amps, 0/4/5 volts 4 amps, 45/- each, post 1/6; another, 500/0/500 volts 150 m/amps, 4 volts 4 amps C.T., 6.3 volts 4 amps, C.T., 5 volts 3 amps, 47/6 each, post 1/6; another 425/0/425 volts 160 m/amps, 6.3 volts 4 amps, C.T. twice, 5 volts 3 amps, 47/6 each, post 1/6.

MAINS TRANSFORMERS (New), input 200/250 volts in steps of 10 volts, output 350/0/350 volts 300 m/amps, 6.3 volts 8 amps, twice, 4 volts 4 amps, 5 volts 4 amps, 70/- each, carriage 3/6; ditto, 450/0/450 volts, 250 m/amps, 6.3 volts, 8 amps, twice, 4 volts 4 amps, 5 volts 4 amps, 70/- each, carriage 3/6; another, input as above, output 500/0/500 volts 250 m/amps, 6.3 volts 8 amps, twice, 6.3 volts 4 amps, 4 volts 4 amps, 5 volts, 4 amps, 75/-, carriage 3/6; another, wound to (electronic) specifications, 350/0/350 volts 250 m/amps, 4 volts 8 amps, 4 volts 4 amps, 6.3 volts 8 amps, 0/2/6.3 volts 2 amps, 70/- each, carriage paid; another, input as above, output 500/350/0/350/500 volts 250 m/amps, 6.3 volts 6 amps, 0/2/6.3 volts 2 amps, 0/4/5 volts 4 amps, twice, 75/- each, carriage 3/6.

MAINS TRANSFORMERS (New), suitable for spot welding, input 200/250 volts, in steps of 10 volts, output suitably tapped for a combination of either 2/4/6/8/10 or 12 volts 50/70 amps, 95/- each, carriage 7/6.

MAINS TRANSFORMERS, 230 v. input, 150/0/150 v., 200 amps, 6.3 v. 8 amps, 5 v. 2 amps output, 23/- each.

AUTO WOUND VOLTAGE CHANGER TRANSFORMERS, tapped 0/110/200/230 volts, 350 watts, 55/- each, post 1/6; as above, but 500 watts, 70/- each, carriage 3/6; as above, 200 watts, 40/- each, post 1/6.

EX-RADAR MAINS TRANSFORMERS, 230 volts input, 50 cycles, 1 phase output, 4500/5000 volts approx. 80 m/amps, 6.3 volts 2 amps, 4 volts 1⅞ amps, 2 volts 2 amps; these transformers are new, immersed in oil, can be taken out of the oil and used as television transformers, giving output of 10 m/amps, overall size of transformers separately, 5½in. x 4½in. x 4in. and 3in. x 3in. x 2½in., price 75/- each, carriage paid.

ELECTRIC LIGHT QUARTERLY TYPE CHECK METERS, all for 200/250 volts A.C. 50 cycles 1 phase, 5 amp. load, 17/6 each, post 1/6; 10 amp, 21/- each, post 1/6; 20 amp. load, 25/- each, post 1/6.

IN STOCK.—Meters, Chargers, Rheostats, Transformers specially made to order. Please forward your enquiry.

No workshop or handyman's bench is complete without a quality vice. When seeing your dealer, ask for WODEN Tools by name. He will be pleased to sell you "WODEN" because, in his experience, he knows that they are second to none for accuracy and perfect finish.

THE STEEL NUT & JOSEPH HAMPTON LIMITED
WODEN WORKS WEDNESBURY PHONE DARLASTON 331

Plastic Marble

The entirely new Karlena artificial Stone for casting Bookends, Ashtrays, Wall-vases, Statuettes, etc. Sets rock hard with a scintillating crystalline structure like marble or alabaster for colour, veining, texture, density and hardness. It is enormously strong, highly resistant to heat, impervious to water. Natural "veining" can be simulated in any colour. A range of pigments is available for this purpose. Most attractive marble effect in models, plaques and statuary.

Make your own Elastomold

Rubber Moulds

ELASTOMOLD is high quality synthetic rubber for making flexible moulds that faithfully reproduce the most minute details of ornamentation and surface texture. ELASTOMOLD is permanent and ideal for repetition casting or plaques, bookends, ashtrays, and art models. Moulds can be taken from any type of material including Karlenite, wood, metal, plaster, cement, stone, glass, ivory. Elastomold is incredibly simple to use and has great dimensional stability, but flexes easily for the release of cast without damage to fine detail or undercuts.

Send for full details of this new, fascinating and profitable craft

KARLENA ART STONE COMPANY LTD.,
PLASTICS 2.F. DIVISION
KARLENA HOUSE, 270-272, OXFORD ROAD, MANCHESTER, 13

"DE LUXE" SLIDE RULES

AMAZING VALUE

12 Inch log-log sin-tan rule, 9 scales, for all problems. Celluloid faced on polished hard wood. Multiplication, division, proportion, percentages, discounts, roots, weights, measures, currencies, etc.

11/6

Post and Packing 9d.

Complete in Case.
Also
5in. scale model complete in case. (As illustrated.)

ONLY 6/- Post & Packing 9d.

Including Comprehensive Slide Rule Book.

Approval or money refunded.

RAPID ANGLE INDICATOR

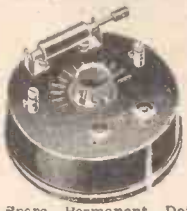
Solves at a glance all angles, sides of a right-angled triangle Post 3d. **2/3**

THREAD CHART

Threads per inch, Whitworth, B.A., and Gas tapping—clearing sizes for threads. Standard sizes, decimals, wire gauge, millimetres, etc. Post 3d. **2/6**

MARINE & OVERSEAS SERVICES (1939) LTD.
(DEPT. P.Z.)
16, BARTER STREET, HOLBORN, LONDON, W.C.1 (Tel. Hol. 0380)

HIGHSTONE UTILITIES



Crystal Sets. Our latest Model is a real radio receiver, which is fitted with a permanent crystal detector. Why not have a set in your own room? 12/6, post 8d. De Luxe Receiver in polished oak cabinet, 18/6, post 1/-. Spare Permanent Detectors, 2/- each. When ordered separately, 2/6. With clips and screws, 2/10, post 3d. Headphones, brand new, S. G. Brown, G.E.C., etc., 15/-, 23/-, and super-sensitive, 30/- a pair, post 1/-.

New Headphones, 10/- a pair. Balanced armature type (very sensitive), 12/6 a pair. Both post 1/-. New **Single Earpieces,** 2/6. Bal. armature type, 4/6; ex-R.A.F. earpiece, 2/6, post 4d. **Headphones,** in good order, 6/- (better quality, 7/6), all post 1/-. **Headphones** with moving coil mike, 15/-. Similar phones with throat mikes, 12/6, post 1/-. **Headphone Cords,** 1/3 a pair, post 3d. **Replacement Bands,** 1/3, post 4d. **Wire Bands,** 6d.
(All Headphones listed are suitable for use with our Crystal Sets.)

Bell Transformers. These guaranteed transformers work from any A.C. Mains giving 3, 5, or 8 volts output at 1 amp., operate bulb, buzzer or bell. Will supply light in bedroom or larder, etc. PRICE 9/-, post 8d. BELLS for use with either the above or batteries, 6/6, post 6d. **"Big Ben" Chimes.** Housed in Cream Plastic Case. Easily connected to give Two-Note Chime from Front Door, and Single Note from Rear. Operates from 6-9 volt Batteries or Transformer (shown above), 23/-, post 1/-.

Ex-R.A.F. 2-valve (2-volt) Microphone Amplifiers as used in 'plane inter-com., in self-contained metal case; can be used to make up a deaf-aid outfit, intercommunication system, or with crystal set; complete with valves and fitting instructions, 20/-, post 2/-. Useful wooden box with partitions to hold amplifier, 2/- extra. Ditto, less valves, 10/-. One-valve amplifier, complete with valve, 10/6 post 1/6.

Hand Microphones, with switch in handle and lead, 4/6. **Tannoy,** 6/-. Similar instrument, moving coil, 7/6, post 1/-.

Sparking Plug Neon Testers with vest-pocket clip, 3/3, and with gauge 3/6, post 3d. **S.B.C. Neon Indicator Lamps,** for use on mains showing "live" side of switches, etc., 3/6, post 4d. **Neon Indicator,** complete with condenser (pencil type), with vest-pocket clip, indispensable for electricians, etc., 7/6, post 5d.

Soldering Irons. Our new streamlined iron is fitted with Curved Pencil Bit, 200/250 v. 50 watts, 11/6, post 6d. **Standard Iron** with adjustable bit, 200/250 v., 60 watts, 13/6, post 6d. **Heavy Duty Iron,** 150 watts 16/6, post 8d. All parts replaceable and fully guaranteed. **Small Soldering Irons,** for use on gas, 1/4, post 4d. Resin-cored solder for easy soldering 6d. packets or 1lb. reels, 6/-, postage extra.

Microphones.—Just the thing for impromptu concerts, room-to-room communication, etc. Bakelite table model, 6/9 Suspension type, 8/6. Post 6d. **Mike Buttons** (carbon), 2/-. **Moving Coil,** 4/6; **Transformers,** 5/-. All post 4d. each.

Rotary Transformers, 24 v. input; Output 1,230 v., .2 amp. in case with suppressors, etc. easily converted to run as a high voltage motor, 25/-, carr. 5/-. Also 12 v. input; Output 6 v., 5 amp.; 150 v., 10 mA.; and 300 v., 20/240 mA., 22/6, carriage 5/-.

Morse Keys.—Standard-size keys wired to work Buzzer or Lamp, 3/-, post 6d. Slightly smaller keys, 2/6, post 4d. **BUZZERS,** 3/9, or heavy duty, 4/6, post 5d.

Terminals, brass, 2BA, mounted on strip, 6d. pair. .0005 Airspaced **Variable Condensers,** 2/6, post 4d. .00003 twin gang with trimmers, 2/6, post 4d. 24 volt, 15 m/m., **M.E.S. Bulbs** for model railways, etc., 1/- each, 10/- doz., post 4d. **Wander Plugs,** Brass, 1/6 doz., post 4d. **Fuses.**—1 amp., 1¼in., packet of 10, 2/6 post 3d. Also 150 mA. and 250 mA., same price **Hydrometers. Standard Type,** 6/-, post 6d.

Bargain Parcels of really useful equipment, containing Switches, Meters, Condensers, Resistances, Phones, etc., 10/-, or double assortment, 17/6; treble 25/-. All carriage 2/-. This country only.

Field Intercommunication Sets, complete with ringing hand generator, bell, signal lamp, morse key, relay, in strong metal case with circuit diagram, 30/- each, carr. 2/6; 57/6 pair, carr. 3/6. Ex-G.P.O. Telephone Twin Bells, with box, 5/-, post 9d. Telephone hand generator, with handle, 9/6, post 1/6; Bell, 3/6, post 6d.

Meters. 10 v., 2¼in. Rectifier (A.C.), in wooden carrying case, 14/6; 15 v., 2¼in. m/c., 9/6; 150 v., 2in., m/c, 10/-; 3.5 amp., 2in., T.C. 6/-; 4 amp., 2¼in. T.C., in case with switch, 9/6; 100 mA., 2in., m/c, 7/6; Meter Units containing 2-500 microamp. movements, 6/-, post 1/-.
All meters post extra.
Money refunded if not completely satisfied.

HIGHSTONE UTILITIES
58, New Wanstead, London, E.11.
Letters only.
New Illustrated List sent on request with 11d. stamp and S.A.E.

QUERIES and ENQUIRIES

A stamped, addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 16 (THE CYCLIST), 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.

Readers are asked to note that we have discontinued our electrical query service. Replies that appear in these pages from time to time are old ones and are published as being of general interest. Will readers requiring information on other subjects please be as brief as possible with their enquiries.

Using Cellulose Dope

I RECENTLY purchased a five-gallon drum of stone cellulose dope. The drum is marked "highly inflammable," and I should be very much obliged if you would inform me whether it is safe to use it for domestic purposes (e.g., wall-painting, internally); or whether it will give off poisonous fumes, thus rendering it suitable only for outdoor work.—A. F. Andrew (Barnsley).

THE paint to which you refer will undoubtedly be of good quality, but like all cellulose paint, dopes, enamels and varnishes, it contains highly-inflammable ingredients, particularly acetone. Strictly speaking, there is always a risk of fire when using these paints. This means particularly that if you apply a naked flame to the can of paint or to the wet paint on a wall the paint will catch fire and will burn. But, ordinarily speaking, the fire-risk with such paints is very small. The vapour from the drying paint will not ignite because it is too small in amount relative to the volume of air in the room. The only precaution you need to take is to withdraw naked lights from the room in which you are working. Do not splash or spray the paint about in the vicinity of flames. Once the paint is dry it will be quite safe. Remember, too, that the vapours of these paints will sometimes affect you to the point of slight dizziness if you breathe an excess of them, and in our opinion the hazard of this vapour toxicity is a far more practical one than any theoretical hazard which compels a paint manufacturer to label his can with "Highly Inflammable" and similar would-be alarming legends.

Oilskin Queries

COULD you give me details of the method of preparation of the well-known oilskin type of waterproof fabric, the proofing agent and coloured pigments used in the process?

Can old oilskins be reproofed, and if so, how? Sometimes when oilskins are left folded up they go "tacky", what is the cause of this; is there any remedy for it and can such an oilskin be reproofed?—S. Ford (Liverpool).

1. Oilskin material is made by brushing on to strong cotton fabric raw linseed oil in which about 15 per cent. of resin has been dissolved. The linseed oil also contains about 4 per cent. of a naphthenate paint drier and it is ground into a thin paste with a colouring agent such as yellow ochre. It is maintained in a shallow pan through which a roll of the fabric is slowly passed mechanically. After impregnation, the fabric is festooned into loops and then passed very slowly through ageing tunnels for the oil mixture to dry and to harden, the temperature of the tunnels being very carefully controlled for this purpose. The whole effect is very similar to the drying of paint on a painted surface, the oil absorbing oxygen from the air aided catalytically by the presence of the drier in the oil and by the raised temperature so that, eventually, it becomes hard and resinous.

2. Oilskin material cannot satisfactorily be reproofed. For one thing, the fresh reproofing mixture would not unite with the dried oil mixture on the fabric. Furthermore, the final passing through warm rollers which produces the good finish on the commercial material could not be carried out on a small scale. The most one could do in the reproofing would be to paint lightly a thick raw linseed oil (containing about 5 per cent. of a paint drier and a little yellow colouring matter) on to the fabric and to hang the material up in a warm, dry atmosphere for several weeks until the new "paint" became hard and firm. The process is quite impracticable, and, from any utilitarian point of view, is quite useless, as well as being very messy in operation. You would not be advised to undertake it.

3. Fresh oilskin material contains resin and, also, the resin to which the original linseed oil used for proofing the material has been oxidised. Now, whilst this mixture has been obtained in a perfectly "non-tacky" state, it will not withstand any pressure. If a weight is placed on to a sheet of oilskin for a week, the oilskin will stick both to the weight itself and to the surface on which it is laid. If the oilskin proofing were oxidised sufficiently for it to withstand pressure over a prolonged time, it would be brittle and would flake, crack and powder up under the slightest friction.

When an oilskin garment is folded and put away for a time particularly in a warm place, the above weight effect immediately comes into operation. Two or more proofed surfaces of the garment are brought into pressure contact. The surfaces, in consequence of their inherent softness, become tacky. They unite together, and the union becomes the more complete as they are left undisturbed in the folded condition. Pressure (even light pressure) and atmospheric warmth are potent contributory factors in bringing about this undesirable result.

If, for any reason, an oilskin fabric has to be folded and stored away for a time, its surface should be dusted over with a fine powder, such as fuller's earth. This will minimise the sticking of the folds by preventing close contact between them. For storage purposes, oilskin garments should be hung freely, allowing plenty of cool air to get round them. They should not be folded. If they become contaminated with fat, grease or oil (or even foodstuffs, such as sugar or milk) their sticking tendency usually increases, for the contaminating substance slowly sinks into the resinous surface of the fabric and makes it softer.

Removing Bitter Taste from Wine

I HAVE 12 bottles of home-made wine (Elderberry and Rhubarb), approximately 15 years old, which has developed a slightly bitter taste. I have tried using sugar with it, but without success.

Can you say if there is any treatment I can try to dispose of the bitter flavour?—W. H. Timperley (Derby).

IT is unfortunate that your home-made wine has developed a bitter taste because you will find it extremely difficult, if not altogether impossible, to get rid of. The bitterness is due to the presence of traces of acetic acid and other acids in the wine which have been generated as a result of the continued fermentation and oxidation of the alcohol in the wine. This has been caused by some defect in the sterilisation of the wine or of the bottles in which it has been placed. Thus, the alcohol in the wine has been slowly oxidised by bacterial action to acetic and other acids which are causing the bitterness. If anything, this action, once having set in, will develop so that the acidity of the beverage will become more and more intense with the passage of time. You can stop this continuing process by uncorking the bottles, standing them upright in a pan of water and by very slowly bringing them to the boiling-point. Although this treatment will prevent the increasing acidity of the wine, it will not remove the acidity which is already present. One way in which you can get rid of the present acidity is to filter the wine through a layer of slaked lime. Another way would be to scatter a few teaspoonsful of slaked lime into each bottle of the wine and then to let the wine stand in contact with the lime for two or three weeks, shaking it up every day. At the end of this time the lime is very carefully filtered off and thrown away. We cannot guarantee these treatments will entirely remove the acidity from the wine because much depends on the precise nature and character of the acid substance in the beverage. We suggest, however, that you treat one bottle in this manner and that, if the result is satisfactory, you then extend the treatment to the entire stock of the wine. Please note that all bottles and corks used for storing the wine must be adequately sterilised by boiling in water for ten minutes.

Using Canada Balsam

IN attempting to make photographic light filters, using gelatine between optical flats, I have had difficulty in spreading the cement on the glass without leaving any marks. The medium I am using is Canada Balsam. Could you please advise me as to some means of working this glue or an alternative type of cement? The area of glass is rather small and difficult to handle.—C. F. Bruin (London, N.W.9).

THE acknowledged cement media for optical glass gelatine light filters are solutions of Canada Balsam in benzine, toluene or xylene. The proportion should be about 1 part of the balsam in 2 parts of the solvent. The cement medium is spread on both surfaces of the glass by means of a brush, after which the gelatine film is applied and pressed down with a needle, care being taken to cover it adequately with the balsam. The opposing glass surface is then applied, and the whole placed under light pressure for anything up to six weeks. On an average the filter dries within about five weeks, particularly when a benzine or toluene solvent is used for the balsam.

An alternative solvent of great convenience and quick drying properties is a solution of 10 parts of gelatine in 90 parts of hot water. This, however, whilst quite transparent, has the disadvantage of not being damp-proof like the balsam solvents.

Making Knife Handles from Bone

WE wish to process bones for use in manufacture of knife handles, etc., but believe a boiling process is usually employed (this comes under the Noxious Trades Laws here).

Is there a chemical process which could be employed to clean the (animal) bones and remove the marrow and particles of meat without leaving a deposit injurious to the metal tang of the knife?

What further process is required to produce a bone handle, i.e., machinery for finishing, colouring of bone, i.e., brown finish as on handles of carving knives, etc., and fixative to hold the knife in handle?—T. & J. Taylor (Melbourne).

1. Bones are normally cleaned and prepared by extraction or boiling processes. The fatty, organic matter is removed by digesting the bones with solvents such as benzene, naphtha, trichlorethylene, etc., which dissolve the fat and leave behind the "degreased bones." The gelatinous material can be extracted by digesting the bones in water heated under pressure. This removes the gelatine and leaves behind the "degelatinised bones." Usually this latter process is not required. You will, however, have to adopt some process of fat and grease solvent extraction. The degreased bones should then be soaked in ortho-phosphoric acid for 12 hours, the acid being diluted with 1 third of its volume of water. This will temporarily soften the outer layers of the bone, and you may be able to dispense with any water-boiling process. After this, the bones should be rinsed and steeped for 12 hours in cold water containing about 2 oz. of chloride of lime per gallon. This process will whiten the bones and will render them fit for further treatment.

The bone material is then shaped by grinding machines and its surface is smoothed by the usual processes of mild abrasive polishing on lapping wheels.

2. For dyeing, the bones are gently heated in water for 3 hours, or treated with ortho-phosphoric acid in order to soften the outer layers so as to permit of the penetration of the dye. Then immerse the bones in a dyebath containing 10 per cent. of dye and about 2 per cent. each of Glauber's salt (sodium sulphate) and common soap to assist the dyeing process and to bring about equal dyeing. The bones should be immersed in the hot dyebath, which latter is brought to near boiling point for half an hour and then allowed to cool. Any ordinary water-soluble aniline dye may be used for this purpose. Spirit-soluble dyes can be used, but their penetration is not good and not uniform. After dyeing, rinse the bones in cold water. Then dry them in warm sawdust. Finish them by rubbing with olive oil.

For cementing the metal tangs of the knife blades in the bone handles, many different types of adhesives have been used. Modern manufacturers use a secret formula. Among published formulas, the following may be recommended:

1: 4 parts resin; 1 part beeswax, 1 part brickdust. Melt the resin and wax together. Then stir in the

brickdust. Pack this into the handle. Then push home the heated tang of the blade.

(b) 4 parts resin, 1 part beeswax, 1 part fine white sand. Melt together. Allow to cool. Then powder. Fill the hole in the knife handle with the powder and then drive in the heated metal tang of the blade.

(c) "White glue" prepared on a casein basis. There are many preparations commercially available.

Glass Blowing Christmas Decorations and Silvering

IS it possible to blow glass toys for Christmas decorations in the home? What glass is used? Can it be done with a coal gas burner or with the addition of charcoal? If it is possible, could they be moulded and what would be the best material for heated moulds?

Would it be expensive to silver them and what process is used?—F. W. S. Baron (Hull).

FOR your proposed glass-blowing work, you will require a soft or low-melting glass. A suitable glass of this type will be of one of "soda" glasses, which are obtainable, fairly cheaply, in the form of tubes or rods of various diameters from any firm of laboratory furnishers such as Messrs. Reynold & Branson, Ltd., Leeds, or Messrs. Philip Harris & Co., Ltd., 144-146, Edmund Street, Birmingham. This type of glass is by far the easiest to soften and to melt. It can be softened and rendered plastic quite readily in any bunsen-burner flame or in the flame of a paraffin or petrol blowlamp. It could be moulded at a temperature of around 900 deg. C. This would necessitate the use of a gas-fed muffle furnace. Cast steel could be used as a material for the moulds. Also, any refractory material, such as baked, unglazed clay, fireclay, asbestos, etc.

For really fine work you would require a gas-fed blowlamp together with a foot-operated bellows. These are fairly costly articles, but may be had from the firms above-mentioned. We would advise you, also, to consult one or other of the following books which deal with the practical aspects of glass blowing and manipulation:

D. B. Briggs: "Practical Glass Blowing."
W. A. Surnstone: "Methods of Glass Blowing."
R. D. Bolas: "Handbook of Laboratory Glass Blowing."
Hodkin & Cousen: "Textbook of Glass Technology."
H. P. Warran: "Elements of Glass Blowing."

It is relatively quite inexpensive to do glass silvering, although the procedure is an exacting one, and considerable care and experience is needed to get the best results. The silvering method to some extent depends on the type of object which is being silvered. Let us say, for example, that you require to silver the interior of a glass vessel. The glass is made, in the first place, as clean as possible. It is thoroughly washed out with soap and water, rinsed with plain water and then with dilute nitric acid, afterwards being again washed out with water. Finally, it is rinsed out with a 10 per cent. solution of stannous (tin) chloride. The silvering solution is then poured into the vessel so as to fill it completely, and the vessel is then immersed in a pan of warm water. Within a few minutes, a layer of mirror-like silver will be deposited on the inner side of the vessel. The vessel is now rinsed out with water, dried and clear lacquered. Silvering solutions are of many types, but the following one is fairly simple and is quite satisfactory for most purposes. Two solutions are required, viz.:

Solution A.—Dissolve 48 grains of silver nitrate in 1 oz. of distilled water and add to the solution ammonia drop by drop until the copious precipitate which first forms nearly (but not quite) re-dissolves, leaving a slightly milky or opalescent liquid.

Solution B.—Dissolve 12 grains of Rochelle salt in 1 oz. of distilled water. Boil the solution in a glass flask, and add, whilst boiling, a solution of 2 grains of silver nitrate dissolved in 1 fluid drachm of distilled water. Then allow to cool.

Both solution A and B, made as above, should each be made up with distilled water to a total volume of 12 fluid drachms. Stored in clean, well-corked bottles they will keep almost indefinitely, but after being mixed they will only remain good for a few minutes.

To Use.—Mix equal volumes of solutions A and B, and pour immediately into the vessel to be silvered.

Polishing Marble

I HAVE recently acquired a clock in a black marble case. The marble is very dull and almost a matt surface. Can you tell me how to restore its original lustre? Is it possible to do this by hand?—J. A. Jones (London, N.W.2).

BLACK marble, when polished, is handsome to look at, and we can well imagine your wanting to repolish the clock.

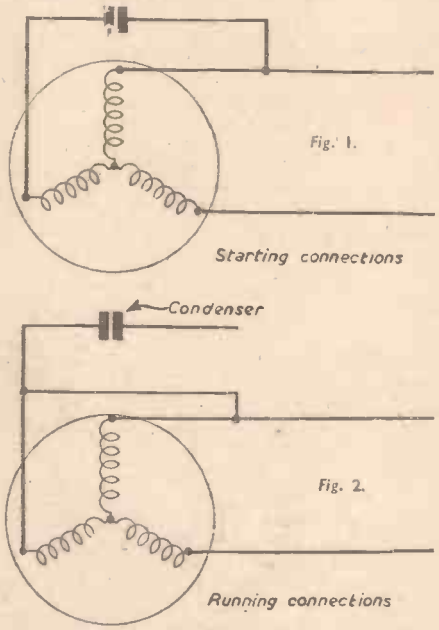
When marble becomes matt this is usually due to microscopic pitting of the surface, or weathering. The only way of getting the surface back to the original condition is to polish with abrasive. This will prove a laborious hand operation, the final burnishing calling for high-speed machines with almost no abrasive. But you can try and see how far you get with hand polishing, using a flat, clean oilstone on its fine side. The marble surface should be wet with water. Another way is to rub the marble surface with another piece of marble, using pumice or other medium hard abrasive in water or white spirit.

We think, nevertheless, that it may be more satisfactory if you asked your local monumental mason to treat it with his motorised polisher. It is surprising what a few minutes on a high-speed polisher will do.

Converting Three-phase Motor to Single Phase

OWING to sometimes not being able to obtain the required single-phase electric motor for doing jobs up to 5 h.p., I was wondering if it is possible to convert a three-phase motor to single phase, as we have quite a few available.—D. H. Reay (Rugby).

A THREE-PHASE motor can be run on single phase if it is given a start by hand before switching it on. If it has been designed for three-phase voltages, of the same voltage as the single-phase supply available, the motor may operate satisfactorily on about 65 per cent. of its normal horse-power rating. If the single-phase voltage is lower than the intended three-phase voltage the horse-power loading should be correspondingly reduced further, in addition to the reduction for single-phase operation.



Connections for converting a three-phase motor to single phase.

The motor could be used on single-phase mains by starting it up by hand or other means before switching only two of its terminals on to the supply. It may be possible to make it self-starting, if the starting load is not excessive, by connecting the motor, as in Fig. 1, for starting, using a condenser of about 50 microfarad capacity per horse-power. As soon as the motor has speeded up the connections should be changed to the running connections given in Fig. 2. A star-connected motor is the best for this purpose.

Organ Notes and Temperature

CAN you please explain how the frequencies of note emitted by an organ pipe depend on the temperature of air?—C. Jones (Nr. Wrexham).

WHEN a string is stretched tightly between two points and then set into vibratory movement the frequency of its vibration depends mainly on the length of the string. In precisely the same way, when a column of air or gas contained in a tube or other vessel is set into vibratory movement, the frequency of vibration depends on the length of the column—the greater the length the smaller the vibrational frequency and, consequently, the lower the pitch of the note which is set up.

Imagine that you have a tube or an organ pipe which, at a temperature, say, of 15 deg. C., emits a note of a definite frequency. If the air surrounding the tube becomes warmer the tube itself attains the same temperature. Consequently, it expands and thus increases in length. Therefore, the vibrated column of air becomes longer, the vibrational frequency is lessened and the pitch of the note is lowered. If the converse happens and the organ pipe is cooled, it contracts. The vibrating column of air is made smaller and the frequency of the vibration is increased. Therefore, in this case, the pitch of the note is raised.

Lens for Slide Projector

I AM about to build a lantern for slides measuring 3in. by 3in. with two plano-convex lenses as condenser, 4¾in. dia., with a 150 w. bulb for illuminant. Could you advise me as to the sort of lens I should use?—D. J. Roberts (Nr. Wrexham).

FOR your lantern the condenser lenses should be deeply convexed of very short focus mounted with their convexed surfaces almost touching each other.

A watchmaker's simple lens would be of no use. Your camera lens might be used, but only if it is a large one. What is required is a rapid rectilinear lens of at least "half-plate" size working at an aperture of about f4.5. An old portrait lens is just the thing. The focus should be about 8in. It must be borne in mind that the larger the lens and the aperture of it, the greater will be the illumination on the screen.

You are recommended to write to: Messrs. Broadhurst, Clarkson & Co., 63, Farringdon Road, London, E.C.1, for a lantern projection lens or, alternatively, an old portrait lens with rack and pinion focusing.

Independent Household Supply of Electricity

I AM isolated from mains electricity and I am investigating the possibility of installing a self-contained unit, in respect of which I should be glad of criticism and advice. My idea is to commence with a small unit such as the "Lucas Freelite" wind-operated dynamo to supply light only, and then, by adding various machines, to gradually build up to a plant giving a fairly heavy output to supply power for household use. Is this feasible? Could the wind-operated unit supply the current to act as an "exciter" for an alternating dynamo which would then give the output to operate most if not all of the household machines? Among the latter I include a water pump to fill a roof storage tank from the well, an A.C. vacuum cleaner, a 2,000-watt fire, an immersion heater in the hot-water tank, a refrigerator, toaster and other appliances. The number of lamps would be six 100-watt, six 60-watt and three 25-watt. I should prefer strip lighting if possible in the main rooms, at least. There is plenty of accommodation for a sizeable plant and accumulators, etc., and almost always a breeze blowing to operate a windsail.—John Brashwood (Lincs).

IF you are contemplating an extensive electrical installation eventually we think that you would be well advised to install wiring and switchgear and fuses, etc., of adequate volt and ampere rating to deal with the future load, otherwise you may be involved in waste and inconvenience in having to rewire the premises at a later date.

If you wished you could use a wind-driven dynamo for immediate loading, although these are usually of low voltage and current rating. We do not consider that such a dynamo would be practical as an exciter for an alternator.

Two important points should be decided at an early date. First, the voltage to be employed. There is much to be said in favour of using 240 volts, because standard apparatus can then be employed. Secondly, if a lower voltage is adopted a higher current will have to be supplied for a given watt loading, hence larger cables will be needed on low voltage.

The second point to be decided is whether D.C. or A.C. is to be employed. Both have advantages and disadvantages. One advantage of D.C. is that it can be stored in accumulators so that the supply is available when the generating plant is not in operation. A.C. cannot be stored. If you adopt A.C. you would need to run the plant when one light only is required. Of course you could fit an automatic plant which starts itself up when a light is switched on. The latter scheme has many advantages. It would appear that you may eventually need a generator having an output of 7 or 8 kilowatts, or else a smaller dynamo with accumulators of large capacity. The latter are very expensive to buy and maintain, especially if 240-volt accumulators are used.

We suggest that you read the following books: "Private Generating Plant," by "Proton" (George Newnes, Ltd.), and the "Regulations for the Electrical Equipment of Buildings," issued by the Institution of Electrical Engineers. You may be able to obtain a suitable secondhand generating plant at a reasonable price through the advertisement columns of a trade paper or PRACTICAL MECHANICS. The Clydesdale Supply Co., Ltd., 2, Bridge Street, Glasgow, C.5, may be able to help you.

Treating Porous Rubber Dinghy

I HAVE a one-man ex-R.A.F. dinghy which has become slightly porous, and as rubber patches will not stick I would like to know if there are any preparations on the market suitable for repairing the dinghy.—J. Scott (Ashington).

IF, as you say, your rubber dinghy has only become slightly porous, the simplest way of treating it will be, first of all, to inflate it tightly and then, after thoroughly drying it, to give it two thin coats of a good aluminium paint, allowing the first coat to dry thoroughly before the second and final one is applied. The paint should be not merely brushed on to the surface, but an attempt should be made to work the paint into the surface so that its vehicle or medium penetrates the pores of the rubber fabric and eventually acts as a sealing agent. Any clear lacquer or cellulose paint can be used in this way, but an aluminium paint is about the most readily obtainable from any paint stores, and it is usually not only the cheapest of such materials, but also the most efficient and lasting for this particular purpose.

Increasing porosity in a rubber fabric is a sign of a slow deterioration of the material, which deterioration may be due to unsuitable storage, to oxidation, to undue heat, to undue light exposure, or to a number of other factors. Once this deterioration has set in it is usually progressive, and there is no treatment which will keep it at bay permanently.

PORTASS

PRECISION DREADNOUGHT

4 5/8

Heavy Duty S.S.S.C. Lathe

BUILT FOR PRODUCTION.

Dept. P.M., Portass, Buttermere Road, Sheffield, 6. Tel. 51353.

£144

CASH OR TERMS

Jubilee

EITHER IT IS —or it isn't!

JUBILEE has been our registered trade name for 30 years, and may not be used to describe any other clip.

THE FINEST CLIP *in the world*

L. ROBINSON & CO., (GILLINGHAM) LTD., London Chambers GILLINGHAM KENT PHONE 5282 L3262/R1

IMMEDIATE DELIVERY

ELECTRIC WELDER & COMPLETE KIT

for Welding, Soldering, Brazing, effecting all metal repairs in the home and on the car or cycle. Instant heat, 6000° F. Works from 6v. or 12v. car battery or transformer from A.C. mains. Complete kit of Welding Tool, 9 ft. cable, clip, carbons, cleansing fluid, fluxes, filler rods, goggles, instructions, hints. Thousands of these amazingly low-priced—but remarkably effective —Electric Welders are in daily use in workshops, garages, factories, throughout Britain and Overseas. Welds all metals. Up to One-eighth gauge. *C.O.D. IF REQUIRED. Post Free.* 53/6

HARRIS ENGINEERING CO., (Dept. P.M.) 269, Kingsland Road, London, E.2.

IMPETUS Precision PLANERS

Circular safety type cutter-head High quality tempered steel knives. Tables mounted on machined inclined ways. Ground table-surfaces. Fences adjustable to 45 deg.

4 in. MODEL, £9.10.0

Motorised, £18.10.0. 6 in. MODEL £28.10.0. Motorised £44.0.0. *Send for Catalogues of other 'Impetus' Products.*

JOHN P. M. S. STEEL, Dept. 80. BINGLEY, YORKS. Phone : BINGLEY 3551 (4 lines)

RATCHET & REVOLUTION COUNTERS

Ask for Leaflet No. 18/7

Speed up to 6,000 r.p.m.

B. & F. CARTER & Co., Ltd., Bolton 5

Members of B.E.S.T.E.C. Organisation.

ADANA PRINTING MACHINES

Print in the odd hours with an Adana—still the most absorbing of crafts. No. 1 H/S Machine £4-17-6 No. 2 H/S Machine £10 - 15 - 0. Will quickly pay for itself. *Send for illustrated folder to Dept. P.M.58.*

ADANA (Printing Machines) Ltd., Twickenham, or call 8, Grays Inn Rd., London, W.C.1

THE Ⓟ MICROMETER 0"—1/4"

USEFUL TO ALL TRADES SATIN CHROME FINISH 17/6 Post Free

JAMES CHAMBERS & SONS 78, JUNCTION RD., LONDON, N.19

—AN INVITATION . . .

to introduce yourself to the

COMPLETE SERVICE FOR MODEL SHIP BUILDERS

Send off to-day ! 1/6 for our 32-page handbook, packed with illustrations of everything the marine model-maker requires. Or 2½d. stamp for illustrated folder of the range of over thirty SCOMOD modern working ship model plan sets and kits. (These amounts refunded with first orders over £1.)

SCOTTISH MODELCRAFT (P.M.), DUMFRIES SCOTLAND

who offer these additional benefits:—

ADVICE BUREAU. WORKSHOPS SERVICE. DRAWING OFFICE SERVICE. NEWSLETTER SERVICE. PERSONAL PART-PAYMENT SCHEME.

One coil, 4 circuits. Simple receivers from a crystal set to a 3 valver. Full circuits enclosed.

T.R.I. Coil. 5/- P.P. 6d.

HILLFIELDS RADIO

8, BURNHAM ROAD, WHITLEY, COVENTRY

SPECIAL OFFER A.C. MOTORS. THIS MONTH ONLY. ALL PRICES SLASHED.

1/6 h.p. Crompton Parkinson, New, £3/18/6, carriage 5/6. 1/4 h.p. B.T.H. Capacitor, £5, carriage 5/6. 400 Other Motor Bargains. Wholesale & Export Enquiries invited. Send S.A.E. for list.

L. C. NORTHALL, 16, Holly Road, Quinton, Birmingham, 32.

Retail : **416, High Street, Smethwick.**

'Phone : WOO 3166.

MULTI-PURPOSE BENCH TOOLS

Combination Tools for Sawing, Grooving, Multiple Slitting, Grinding & Drilling. Standard range from 29/4d. Circular Saws, Motors, Vee & Flat Pulleys, Vee Belts, Bearings, Saw Benches, Log Sawing Machines, Saw Spindles and Flanges.

Send 8d. for fully illustrated Catalogue.

BEVERLEY PRODUCTS, Ranskill, Notts.

RADIO. TELEVISION.

Components for Radio. Viewmaster Kit of Parts. Service Aids. Pickups. Loudspeakers, Amplifiers. *Write for Free List.*

RADIO EQUIPMENT COMPANY

(Dept. P.M.)

Castor Road, Brixham, Devon.

ELECTRIC HAWAIIAN GUITAR

Full details and drawings for building a professional instrument. Many highly successful guitars have been made from this data, throughout the world.

7/6 post free.

C. W. CRAGG, 48, High Street, Oakham, Rutland.

WIND CHARGING

Height ensures success and reduces battery capacity. Lattice tube pylon masts, easily climbed, erected and extended. Lighter type for aerials. Also Lucas "Freelite" Sets, new, used and spares.

S.A.E TUBECRAFT

Long Itchington, Nr. Rugby.

WANTED.—Back Numbers of "Practical Mechanics" for October, 1949 ; Sept.-Oct.-November, 1950 ; and August, 1951.—Any offers to : **J. O. BURNS, 25, Cavendish Ave., W.13.** *PER 6350.*

BARGAIN LINES

COLLARO 3-Speed Autochangers, play 10 10in. or 12in. records at 33⅓ or 78 r.p.m., also 7in. at 45 r.p.m. Our price £12-8-2. Single-speed ditto £9-17-4. P.U. Heads from 39/5.

CONSOLE RADIOGRAM CABINETS, 36in. high, pull-out motorboard cut for autochanger, price £6.17.6. **PORTABLE RECORD PLAYER CABINETS** in brown rexine, 39/6. **PORTABLE MICROGRAM CABINETS,** take gram unit, amplifier and 6½in. speaker, price 57/6. **"SYMPHONY" AMPLIFIER** for A.C. mains, amazing realism, separate Bass, Treble and Middle controls, scratch-cut, negative feedback. 5-watt model 10 gns.; 10-watt model, 15 gns. **BASS REFLEX CABINET KITS,** 30in. high, complete to last screw, 85/- to 107/6. Send 2½d. for full catalogue. **NORTHERN RADIO SERVICES, 16, Kings College Road, Swiss Cottage, London, N.W.3.** PRImrose 8314.

REFILL YOUR OWN BALL PEN

VISCOID REFILL KIT

Post Free **3/8** inc. tax

COMPLETE WITH TOOL AND ILLUSTRATED INSTRUCTIONS

Contains Ink for 15 Large Refills | Blue, Red or Green Trade supplied.

VISCOID INKS (PM), 6, Sherlock Mews, Baker Street, London, W.1.

PLASTICS

sold ; Perspex sheets and offcuts in stock, large quantity of clear and all colours, 1/16in.-½in. thick at cheap price ; Cellulose Acetate film, Moulding Powder, etc.

Please send your enquiries to :

MULTITEX LIMITED

10-11, Archer Street, London, W.1

Tel. : GERrard 9520 and 5728

BATTERY CHARGERS

2-6-12 volts one amp.

Brand new in steel case with Ammeter for 200-250 volt A.C. mains.

Only **59/6**

(delivery 2/6) guaranteed.

THAMES VALLEY PRODUCTS (P) "Orari," Eleanor Rd. Chelfont St. Peter, Bucks.

1.044 Flat Twin, TRS, £3/-/- ; 3.029 ditto, £4/-/- ; 7.029 ditto, £6/6/6 ; 100 yds. All sizes and types of TRS available. PVC Single Red/Black 1.044, 18/9 ; 3.029, 26/- ; 7.029, 46/- ; 100 yds. 5A Shuttered Sockets, 2/9. Ceiling Roses, 11/6 doz. Switches, 19/6 doz. 2-Way, 25/9 doz. Lampholders, 10/- doz. Junction Boxes, 15/- doz. Stamp for lists. Get our quotation for anything electrical.

HUNT & CO., STEPCOTE HILL, EXETER

---

200 SHAVES—2d.

Amazing Cyelop 'ATOMIC' Blade Keener keeps razor blades equal to new or better. 200 super shaves from only ONE 2d. blade.

Nothing like other known gadgets. *Post 6d.*

Guaranteed. Pr. Patent. Try it !

KORVING, (P.M.1.) 3/6

54, Frederick St., London, W.C.1.

Price £9 5s. 0d. Carr. Extra.

The 'Adept' Bench Hand Shaper

Length of stroke of ram 3½ins.

No. 2B. H Shaper, 6½in. stroke.

Price £18 17s. 0d.

Ask your dealer.

Manufactured by

Machine Vice 25/-

The SUPER 'ADEPT' LATHE 1½in. centres, 6in. between centres.

Price £5 15s. 0d. Postage and packing 3/6 (U.K.). The "Adept" 2½in. 1" B.S.F. 4-Jaw Independent Chuck, Reversible Jaws, 39/6.

A Good Range of Accessories is available.

F. W. PORTASS, MACHINE TOOLS, LTD. ADEPT WORKS, 55, MEADOW STREET, SHEFFIELD, 3.

BE PREPARED for the next FREEZE ! ! !

BETTER BE WISE THAN SORRY

"TRIP" is a small adjustable MAINS Thermostat for fitting in your garage or in any place liable to damage by freezing. It will switch automatically on and off a 500-watt heater. WHEN IT'S NEEDED !

PRICE 6/- Post 6d.

IRONCLAD TRANSFORMER, 230 v. 6v.+4v. 8A. for Greenhouse or Cold Frame.

25/-. Post 1/6.

EVERYTHING ELECTRICAL FOR THE AMATEUR

S.a.e. for Bargains List.

LAWRENCE FRANKEL

MAIL ORDER,

134, Cranley Gardens, London, N.10

'Phone : TUDor 1404.

TELEPHONE SETS, comprising 2 G.P.O. hand-phones, 2 bells, 2 pushes and 80ft. twin wire. Price 65/- post free. Makes an excellent inter-office, works or domestic installation. Really professional instruments. Brand new, not rubbish. Single instruments, 18/6.

BATTERY CHARGERS for A.C. mains. For charging 2-volt accumulators at ¼ amp. Parts with diagram, 17/6. Complete, 21/6. Postage 10d.

FOR TRICKLE CHARGING CAR CELLS, parts with diagram. Output 1½ amps. for 6v. or 12v. cells. Price 42/6. Post 1/-. 3 amp. output, 50/-.

POWERFUL HAND ENGRAVER for all Metals, Plastics, etc. Operates from 8 v. battery or through transformer from A.C. mains. Engraver, 22/6. Transformer, 12/6. Post 1/-. Instrument Wires, Ebonite, Metals. Workshop Materials. Illustrated List 2d.

ECONOMIC ELECTRIC Co.

64 London Rd., Twickenham

POCKET SIZED RADIO DESIGNS

Both the designs below are of midget, pocket-sized radio receivers using British midget components and valves, and the new layer type dry batteries. Both sets work without an aerial or earth.

POCKET LOUDSPEAKER SET. Loudspeaker reception on long and medium waves. Design 3/6 post free.

"TWIN" ONE-VALVE POCKET RECEIVER. Powerful headphone reception on medium waves, and can be adapted for long waves. Design 3/6 post free.

SWIFT RADIO (P).

137, COTHAM BROW, BRISTOL, 6

Orders by post only.

Ballpens refilled for 2½D.

Your ball point pen has an ink container which YOU can refill in two minutes. Fifteen average size ball pens can be refilled from one 3/1 tube of

BALL PEN INK BINK

Five Colours. Post Free with full instructions on receipt of P.O.

MODERN INKS LTD. (Dept. 825), 82, Centurion Road, Brighton, Sussex.

CHEMISTRY APPARATUS

Send 2½d. stamp for

COMPLETE PRICE LIST

Booklets :-

"Experiments" 10½d

"Formulas" 10½d

"Home Chemistry" 2/3

Post paid.

BECK (Scientific Dept. A) 60 HIGH STREET, Stoke Newington, London, N.16

THE Cyclist
Editor : F. J. CAMM
VOL. XXI NOVEMBER, 1952 No. 366

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

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

Comments of the Month

By F. J. C.

BOTTOM BRACKET GEARS

ONE or two Continental manufacturers are marketing two-speed bottom bracket gears. This reminds us that these first appeared in England many years ago. A notable example was the James two-speed bottom bracket gear, and it was remarkably efficient. It did, however, tend to make the bottom bracket clumsy, although we believe that its weight was less than a hub gear or a Derailleur. From the point of view of performance there is not much to choose between all the forms of gear. Each has performed well in competitive racing. It does not seem likely that we shall revert in this country to bottom-bracket gears and coaster hubs, for the present gears and braking system have proved themselves by the most strenuous tests over a long period of years to be entirely satisfactory.

Whilst tubular frames continue to be used there is little room for radical departures from design. The tube is not the most ideal material for a bicycle frame. Ideally it should be of pressed channel section, but it is almost impossible to make a pleasing design this way. It is doubtful whether very much can be saved in weight, whatever system is employed, for all attempts to do so have resulted in somewhat freakish machines having disadvantages which more than outweigh the advantages. Whip is the chief bugbear.

THE CYCLE SHOW

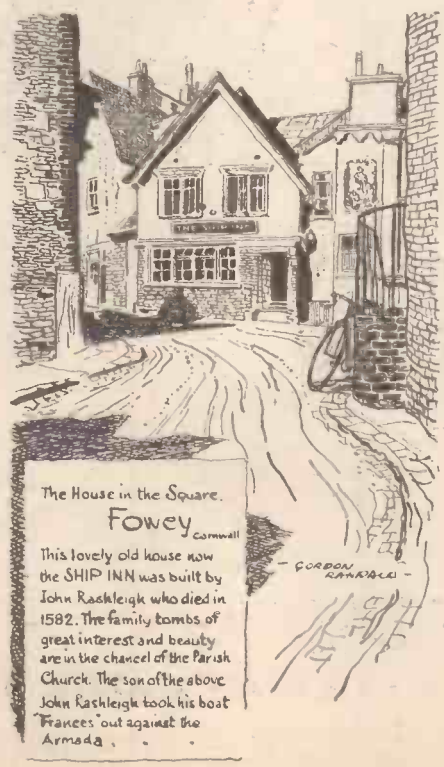
THE Duke of Edinburgh opens the International Cycle and Motor-cycle Show at Earls Court on November 15th. All the available space has been allotted and over 161 manufacturers of bicycles, motor-cycles, components and accessories will be exhibiting. We feel that a great deal more could be done to keep the modern generation in touch with cycling history. There could be a miniature exhibition within the exhibition showing the development of the bicycle from the hobby horse to date. There are many collections of old bicycles and accessories, and the Science Museum at Kensington would be pleased to lend exhibits, including the reconstructed version of Macmillan's machine. We know that there are odd exhibits of early machines, but we envisage something in chronological sequence. Care must, of course, be taken in the selection of such exhibits. The so-called cycling "historian" claimed to own the machine on which Hume won the first bicycle races to be run on pneumatics. Yet Hume, in an article contributed to this journal in 1938, stated quite clearly that the machine was destroyed. What the alleged historian did was to write to Hume and ask for a description of the machine. He then found a machine which fitted the description and claimed it to be Hume's. His collection of bicycles was bequeathed to Coventry and we took steps to point out to the recipients the large number of anachronisms and false and spurious claims made for the collection.

This year's Cycle Show does not promise many surprises, but it does promise to enhance the position established after all these years, and every cyclist should pay a visit at least once. The model we made of Macmillan's rear-driven bicycle, and which was described in this journal some months ago, is to be presented to the Centenary Road Club during the run of the exhibition. It is hoped that visitors will be able to inspect it there. This model is made to ½ scale and is accurately made in all particulars, including felloe-built wheels, shrunk-on tyres, and, of course, it is a working model.

ADVERTISING

WE are glad to note the tendency to relax rules relating to the definition of an amateur, to the extent of permitting wins to be advertised so far as the machine and accessories are concerned, but without disclosing the name of the rider. We have never been able to understand why it should not be allowed for an amateur to have his name associated in the Press with a particular make of bicycle. It is carrying the rules of amateurism too far. There is very little professional cycling to-day, nothing like the amount there was in the early part of the century, when trained riders were common cheats and frauds, and whose activities caused the definition of amateur status to be tightened up. The sport, the pastime, and the industry were never more in need of publicity, and now that the trade is beginning to support cycling events by advertising, we see no reason why the bodies controlling cycle sport should not immediately change their rules. Advertising which merely proclaims that the "South Road Hundred" was won on a Tinkerponk bicycle fitted with a Hayless free wheel, a Cook's saddle, was made from Joshua tubing fitted with Bunlop tyres, and a Cherry chain, will not appeal very much to the public. The personal factor needs to be introduced, such as the inclusion of a photograph of the rider with the machine. We have no doubt, however, that the trade will exercise its influence here by refusing to advertise unless names of amateur riders can be included. It is plainly absurd to consider a man a professional because his name has been associated with a particular bicycle or accessory. There are signs of the times changing. Cycle sport cannot continue to be controlled by a creed outworn. The mere fact of date of birth must mean that many of our pocket dictators will not be with us many more years, and this connotes the introduction into management of younger men with modern ideas and who are not inflexible to change.

At this stage in the sport's history it would be well if there was only one cycling organisation, a sort of cyclists' A.A., instead of so many smaller autonomous bodies which continue to be at one another's throats.



FALL IN N.C.U. MEMBERSHIP

THE fortunes of the N.C.U. are certainly not in the ascendant, for the latest membership figures show a drop of more than 9,000 up to the end of August, whilst the drop in membership since 1950 is over 20 per cent. Its financial position will not, therefore, be improved and the large number of measures of economy which it is intended to introduce is not a healthy sign. There is little doubt that this year it will show a trading loss. Perhaps that is a good thing. It will draw attention to the penalty they have paid for their mistaken policies over mass start. Beyond doubt this has alienated the sympathies of some of their supporters, many of whom have gone over to the B.L.R.C. and will not easily be persuaded to return to the fold after they have practically been proclaimed lechers of cycling sport.

The N.C.U. proposes to keep its head just below water by increasing the subscriptions, although they were only put up about a year ago.

Cycle Racing Gossip

A Monthly Summary

By W. J. MILLS

Sunshine and cloud in the Lakes.

Dalehead, Cumberland.
Looking towards High Rigg and High Fells with Saddleback in the centre.
Grasmere-Keswick road.

THE greatest secrecy is being observed by the leading cycle manufacturers about their plans for the annual Cycle Show, due at Earls Court on November 15th to 22nd.

Not one will let out a "peep" about the one question which the cycling clubman is asking, "Will the big firms launch out into the 'frame only' trade?"

This is the situation: buy a complete bicycle and you pay purchase tax; buy a frame set only, and fit your own wheels and it is tax free.

Since the introduction of purchase tax, the small lightweight firms and the importers of foreign products have had the monopoly of this very profitable market.

Last year, at the Cycle Show, Raleigh's exhibited a really lovely road-racing frame set, complete with double chainwheel, selling at sixteen guineas.

Club interest was terrific . . . but, owing to shortage of Reynolds' 531 tubing, Raleigh's were unable to put the frame into production.

At the price, this frame set would have swept all the imported French and Italian frames off the market.

What are the chances of British frame sets from the big firms—Raleigh's, B.S.A. and Hercules, etc.—for 1953?

With a tightening of export markets, and a slackening of home demands, I think we shall find, at Earls Court, a racing frame set offered on all the big stands.

Thanks to racing experience gained this year, the big firms will be offering frames fully up to modern club standards. Raleigh's with Reg. Harris, Hercules with Eileen Sheridan, and B.S.A. with Bob Maitland and his boys, have all been able to translate this year's racing experience, via the drawing-board, into a production job.

Racing and records are, after all, the acid test, not only of rider, but of machine. The result will be seen at Earls Court in racing frames with slightly less upright head tubes (most firms are going back to 72 deg. heads) giving a machine which is easily handled in the rough and tumble of mass-start road racing.

* * *

THE recent Paris Cycle Show brought out innumerable motor-assisted bicycles, but little progress in the purely pedal-propelled velo. The only novelty was an all-plastic machine, with frame tubes of extruded plastic, and even the wheel spokes were of nylon.

Practical? Yes, for ordinary riding to work and back, but sporting opinion was that the plastic bicycle would lack "life" when speed was called for.

We are not likely to see a plastic bicycle in this country; steel tubing is not the problem to our makers as it is to the French firms. They buy most of their tubing from Sweden, which means paying in hard currency, hence the attempt to find an alternative to steel.

* * *

IS there a future in women's cycle racing? On the one hand you have Mrs. E. Stancer, president of the British-formed "Women's International Cycling Association," flying to France and the U.S.A. to form national branches to encourage women's racing . . . and back home we have the National Cyclists' Union announcing that the women's 3,000 metres National Pursuit Championship has had to be abandoned . . . for lack of interest in the final!

Twenty-six girls entered back in the spring, the competition carried through to the quarter-final rounds, and then Stella Farrell, the 1951 champion, withdrew. Daisy Stockwell, of London had qualified for the final, but her opponent could not be settled, owing to the failure to run off the other semi-final. Lacking an opponent, Daisy told the N.C.U. that she was prepared to race up to September 26th, but not after. Reason? Wedding bells and a honeymoon abroad. September 26th has come and gone!

The women's National Sprint Championship, due to be decided at Southampton on September 27th, started without Miss Stockwell, the title holder, but in any case came to nothing, for the meeting was rained off after the quarter finals.

In view of all this, can the International body really hope to influence Olympic and International bodies to put on women's Olympic and world's titles?

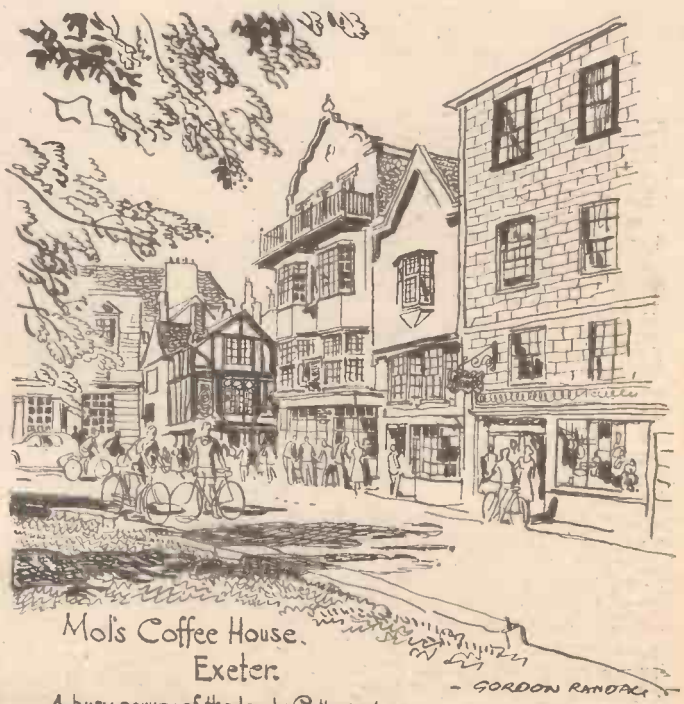
* * *

REPERCUSSIONS of the Tour of Britain, the international road race promoted by the *Daily Express* under British League of Racing Cyclists' rules . . . the N.C.U. are trying to make a "scapegoat" out of one prominent N.C.U. personality who, at the orders of his employer, a prominent cycle manufacturer, managed a team through the race.

The N.C.U. claim that he "officiated" in the race, and is, therefore, liable to suspension.

If this is endorsed, then obviously even a working journalist turning out, at the orders of his editor, to report the race can equally be deemed to be "officiating," and so liable to suspension.

By the time you read these notes I hope a more sensible outlook will have prevailed and the whole matter quietly dropped into oblivion.



Mol's Coffee House, Exeter.

A busy corner of the lovely Cathedral Close. Mol's Coffee House (centre) was the noted meeting place in the 16th century of Devon's seadogs.

AROUND THE WHEELWORLD

By ICARUS

The Unspoilt Villages

DURING Coronation year the B.B.C. is to televise a typical unspoilt English village and it has already selected the village for this purpose. I should have thought this village to be a good example of a deserted village, for it is sadly neglected. Workmen are busy re-thatching the roofs of the old cottages and buildings and generally straightening up the place so that it can be represented on the screen as it was and not as it is. Apart from that, I should have thought there were plenty of other villages which could have been televised and which would not have needed refurbishing. After all, viewers would prefer to see the village as it now exists and not presented on the screen as a piece of stage-set scenery.

"The 100 Miles"

MR. E. A. SHEPHERD, of Bradford, draws my attention to my paragraph under the above heading in the August issue in which I stated that the 100 miles competition record of 4h. 27m. 23s. by Keith Mosedale remained at that figure until 1950 when Ken Joy reduced it by 15 minutes. I should have said that there are six intermediate records for this distance:

1936	C. Holland	4h.	26m.	48s.
1937	C. Heppleston ...	4h.	26m.	9s.
1938	J. W. Palmer ...	4h.	23m.	48s.
1938	H. Earnshaw	4h.	20m.	48s.
1946	A. C. Harding ...	4h.	17m.	46s.
1947	R. Firth	4h.	17m.	2s.

Is an Independent Class Wanted?

AS this issue goes to press (and no doubt the point will be decided before it is published) there are discussions as to whether we should re-introduce the "Independent" class of racing cyclists. The Manchester section of the N.C.U. is raising it at the general council meeting. Whatever the result of the proposition to re-open discussions on the matter I feel it undesirable that we should further complicate road sport by introducing a class which is bound to give rise to abuses. The line of demarcation between an amateur and a professional is clearly defined at present, and if there are abuses, such as returning the prizes after the presentation to the supplying jeweller for a cash consideration, they are very *sub rosa*. Perhaps there is less of this sort of thing now than before the war. An independent, it seems to me, wants the best of both worlds. He does not want to be considered a professional, but wants the rewards of professionalism; nor does he want to be an amateur, but wants the advantages of amateur status. It is true that safeguards should be introduced by limiting the period during which he may dither between one class and the other, but I do not think that a satisfactory solution. On the Continent the independent rider is considered something of a pariah in the sport: but then Continental methods are less rigid than ours. Whether our controls are too rigid could be debated; certainly anyone reading through the rule book of the R.T.T.C. would consider that its Council, as I have said before, thinks every racing cyclist a potential cheat. A good case could be made out for simplifying and amending these rules. I do not like the idea of an independent class which merely means a class which can break the rules of amateurism without any of the penalties for doing so.

Perhaps the move is intended to pave the way for the best of our amateurs to indulge in mass-start racing, which is semi-professional without sacrificing amateur status. Whatever the arguments in favour of that, this is not the time to throw another spanner in the works. The mass-start controversy has made the atmosphere sufficiently turgid during recent years, and now that the lion is about to lay down with the lamb let us have a period of peace before another hare is set in motion. I do not like the cunning with which we try to disguise something we do not like with names. There are those who try to hide the term "mass start," with "in-line," and racing against the watch as "time trials." The word "racing" has been almost taboo until the B.L.R.C. demonstrated that its use did not bring in its train the dire penalties which the N.C.U. and the R.T.T.C. apprehended. The use of the term "independent" is a wangle, and let us not disguise the fact. It is an attempt to placate the amateurs and at the same time an attempt to attract them to the neo-professionalism.

The Smith's Arms, Godmanstone, Dorset.

At the recent Roadfarers' Club luncheon at the Savoy—Mr. Raymond Mays, Lord Brabazon (president), and new member the Hon. Gerald Lascelles.

Air Resistance

THE resistance of a cyclist and his machine increases as the square of the velocity, not the cube as some may think. Double the speed and you get four times the resistance, increase the speed by four times and you get sixteen times the resistance. The 1/10th horsepower which a healthy human being can exert for any considerable time is spent in overcoming this resistance and that of the tractive resistance of the machine and the friction of its moving parts.

"The Smallest Inn in England"

WHERE is the smallest English inn? Like the oldest English inn there are claims from all over the country. The fact is that no one has ever measured the inns to find out which is the smallest. Mr. N. Foot, of Shaftesbury, referring to a paragraph in last month's issue dealing with "Down Dorset Way," says that the "Smith's Arms" at Godmanstone is reputed to be the smallest inn in England. I show it in the appended photograph.

Cable Brakes

Notes on Their Repair, Overhaul and Maintenance

By C. J. J.

MORE cyclists are realising the advantage to be derived from the use of light wheels. The lighter type of rim used to-day (the Endrick) has parallel braking surfaces as distinct from the Westwood rim, where the braking surfaces are formed of two concave inclined faces (see Fig. 1). Using this lighter type of wheel necessitates the fitting of cable brakes.

Brakes require regular cleaning and

Fig. 1.—A sectional view of the Endrick (left) and Westwood rims.

adjustment, and to do this thoroughly the brake should be completely dismantled. The steel inner cable should be removed from its waterproof covering and inspected for broken strands. A cable which has any fractured wires in it should be replaced, as the loose strands may restrict brake action, and undue strain is imposed on the remaining strands, which sooner or later will snap. An accident of this nature usually happens when the brake is needed most, sometimes with unfortunate results.

Resoldering a Nipple

With cable brakes the nipple may pull away from the cable. It is not difficult to repair this type of breakage, but care must be taken to do the job properly or the brake will fail the user at a critical moment. First the splayed ends which have pulled out of the nipple should be cut off so that a firm end with all the wires bound tightly together is obtained. The channel through the nipple should be cleaned and also the recess in the wide top of the nipple, so that the solder will take readily. The inside should then be tinned: this is done by running solder through the nipple, and while heat is still being applied, passing a wire through to spread the solder and to ensure that only a thin film adheres to the side of the nipple. When this has cooled, the end of the cable should be passed through the nipple so that it just protrudes from the widest end, and the whole nipple heated so that the solder melts and fixes the cable inside. The ends of the cable should then be parted, splayed out, and solder applied so that it runs down into the nipple and round the spread ends (see Fig. 2). As the channel through the nipple is only very slightly larger than the diameter of the cable, it cannot be pulled through until the splayed ends come together, and as these are fixed by the blob of solder run round them, it is not possible for the nipple to be pulled off again.

Cable Lubrication

If, on inspection, the cable is found to be sound, it should be lubricated before being replaced. This serves a double purpose—facilitating the action of the brake and protecting the cable against rust. The cable can either be treated with thick grease or oil may be run through the outer cover. When this has been done, the cable should be pulled through its cover once or twice to spread the lubrication. This is one method of lessening friction in the cable, and another is to ensure that the cable has no sharp bends in it. The minimum of friction is encountered when the cable lays in a straight line, and therefore any bends should be made as shallow as possible.

Cables are basically the same, with whatever type of brake they are used, but different shaped nipples and methods of fixing are often employed. It is necessary, therefore, when replacing a cable, to ensure that it is the correct one for the brake concerned. Some have nipples at either end, others only at one. Some employ a mushroom-shaped nipple, others a drum-shaped one, and these small differences often mean that no other type of cable will be suitable.

Adjustment

When reassembling the brake or fitting

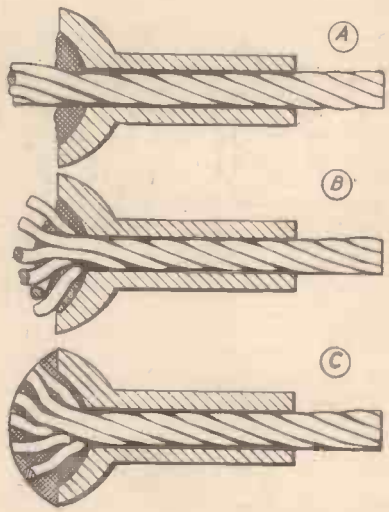


Fig. 2.—A: cable is soldered into the nipple: B: the end is splayed: C: the whole is fixed and sealed with a blob of solder.

new brakes, ensure that the brake is central and the brake blocks are spaced evenly each side of the rim; the wheel, of course, must be running centrally. Check that the brake shoes have a clear path of travel and that they do not foul the front forks or rear seat stays when the brake is applied. If they do, specially shaped spacing pieces may be obtained and fitted between the brake and the fork crown or, in the case of the rear brake, between the brake and the bridge across the seat stays. If the return spring action of the brake is sluggish it may be due to the locking nuts on the spindle being too tight, or to the return spring having lost its tension. If the slackening of the locking nuts does not cure the trouble, a new return spring may be purchased for a few pence. The brake should be adjusted so that the brake blocks are in hard contact with the rim when the lever has been applied through half its length of travel. Methods of adjustment vary according to the type of brake in use, but in the more modern types fine adjustments are effected by turning a knurled nut on the brake lever or as shown in Fig. 3.

Brake Blocks

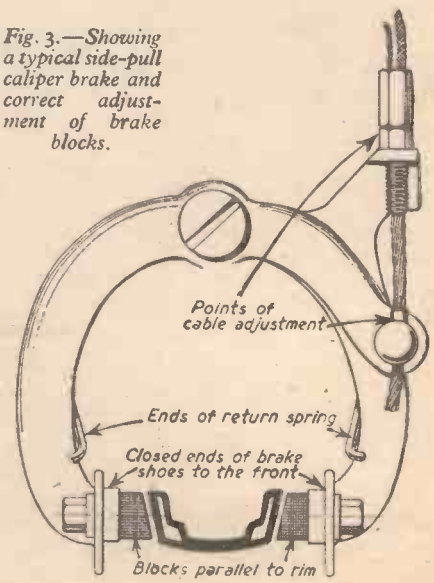
As with buying new cables, brake blocks must also be selected to suit the brake concerned, and in these days when alloy rims are widely used, the material of the block must also be considered. It must, of course, match the brake shoe both in length and method of fitting but as most traders keep a large and varied stock there should be no difficulty about this. With steel rims a hard brake block may be used, but with an alloy rim a special soft block is necessary.

Care should be taken to see that the brake shoe is fitted the right way round, i.e., with the closed end towards the front (the direction of the wheel's travel), otherwise the friction between block and rim will tend to work the brake block out of the shoe. Also, it is important to fit the brake block itself the right way up as the bearing edge is usually cut to conform to the shape of the rim (Fig. 3).

One of the most aggravating faults a brake can develop is that of squealing, a noise that is anything but pleasant. There are many things which may make a brake squeal and before curing it the cause must be found. Usually it is due to vibration, and an elimination of all movement in the brake often checks it completely. Another common cause of this trouble is that only part of the brake block comes into contact with the rim; it may be that the brake block is not properly fitted in the shoe or that the shoe is not parallel to the rim. In the latter case the shoe will have to be bent round until it is true. Using hard brake blocks on an alloy rim can cause squealing and sometimes accumulated rubber on the rim has this effect, the cure for both these being obvious.

When it is found to be impossible to apply the brake gradually as every time the blocks come into contact with the rim the brake jerks savagely, the trouble is known as "snatching." The chief cause is the brake not being tightly enough locked on the centre spindle and the rim taking the brake forward every time it is applied. A very loose headlock can have the same effect, the movement instead of being in the brake, being between the forks and the head column. Finally, a very common cause is that of the wheel not being true: the braking surfaces on the rim waver from side to side as the wheel revolves and one moment the brake is applied hard and the next has no apparent effect at all. These defects when applied to a rear brake, usually result in the wheel locking and a skid every time the brake is applied.

Fig. 3.—Showing a typical side-pull caliper brake and correct adjustment of brake blocks.



THE "FLUXITE QUINS" AT WORK

"With this iron we'll begin Lesson One,
On 'Soldering and How it is Done':
Make the bit clean and bright,
Dip it in some FLUXITE,
And it's all set for tinning — what fun!"

For all SOLDERING work—you need FLUXITE—the paste flux—with which even dirty metals are soldered and "tinned." For the jointing of lead—without solder; and the "running" of white metal bearings—without "tinning" the bearing. It is suitable for ALL METALS—excepting ALUMINIUM.

With Fluxite joints can be "wiped" successfully that are impossible by any other method

Used for over 40 years in Government works and by leading engineers and manufacturers. Of all Ironmongers—in tins, from 1/- upwards.

TO CYCLISTS! For stronger wheels that will remain round and true, here's a time-tested tip. Tie the spokes where they cross with fine wire AND SOLDER It's simple—with FLUXITE—but IMPORTANT.

FLUXITE

SIMPLIFIES *ALL* SOLDERING

Write for Book on the ART OF "SOFT" SOLDERING and for Leaflets on CASE-HARDENING STEEL and TEMPERING TOOLS with FLUXITE. Also on "WIPED JOINTS." Price 1½d. Each.

FLUXITE LTD., Bermondsey Street, S.E.1

Carefree and Farefree...

on a BSA

OUT AND ABOUT on B.S.A. Bicycles. That's the holiday programme for Britain's most carefree and *fare-free* families. On their comfortable, smooth-running B.S.A.s they travel when and *where* they please. And when holiday time is over, B.S.A.s mean fare-free working days for Father, fare-free shopping trips for Mother and fare-free journeys to school for the children.

But ... all the world wants B.S.A.s. More and more go for export. Hurry to your dealer! He may still have the model you want. Make your choice from the fully-illustrated catalogue. *9 out of every 10 B.S.A.s produced go to swell the export drive.*

To B.S.A. Cycles Ltd., 12, Armoury Road, Birmingham, 11. *Please send Bicycle Catalogue.*

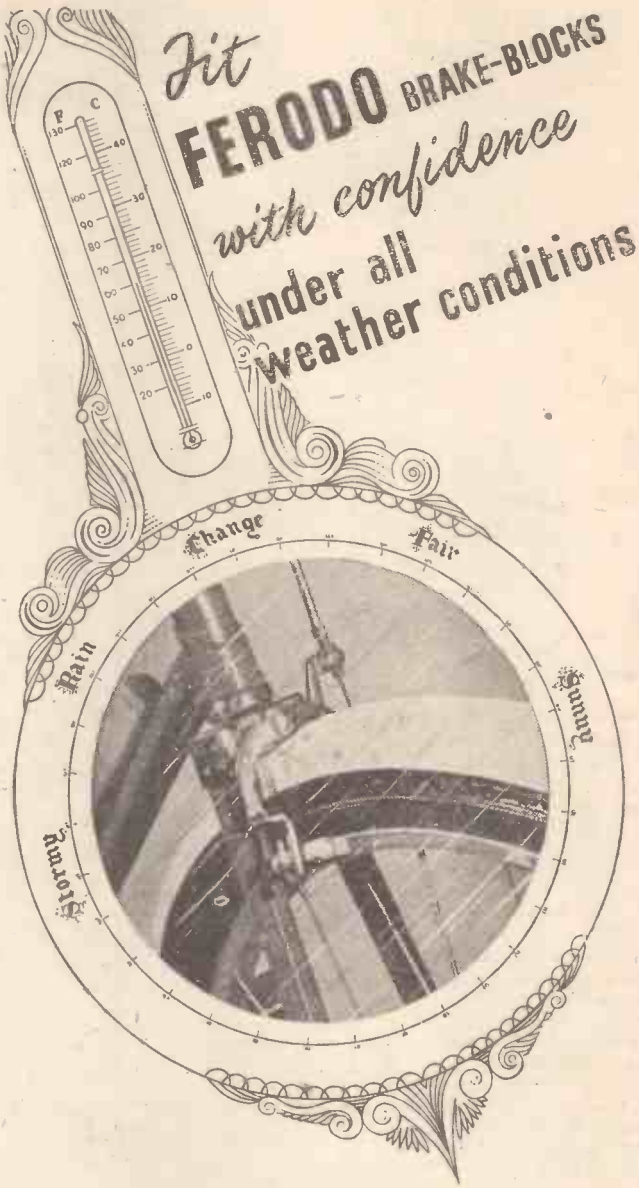
NAME.....

ADDRESS.....

***It's time you had a* BSA**

Post this coupon TODAY *in unsealed envelope bearing 1½d. stamp.*

Fit FERODO BRAKE-BLOCKS *with confidence under all weather conditions*



Made from a special friction material Ferodo all weather Brake Blocks are practically unaffected by rain or sleet. You can rely upon Ferodo to give safe, smooth, snatch-free control on the long descent or in the emergency stop.

Special softer quality blocks for alloy rims are available.

STANDARD SIZES
8D a pair

AT THE CYCLE SHOW VISIT OUR STAND No. 2
NOV. 15—22

FERODO

ALL WEATHER BRAKE BLOCKS

FERODO LTD., CHAPEL-EN-LE-FRITH
A Member of the Turner & Newall Organisation

Nr. BECKFOOT STATION, Cumberland.

Approaching one of the many delightful little bridges over the track of the RAVENGLASS and ESKDALE RAILWAY. This unique miniature railway runs from the seashore at Ravenglass through beautiful fell country to Boot.

Wayside Thoughts

By F. J. URRY, M.B.E.

The Curious Public

"HOW awkward to ride to work in the rain," was my greeting at the works the other morning, and I suppose that notion fills the minds of most people who think about the matter. As a matter of fact it isn't awkward or uncomfortable, the only trouble is the mental one, that urgent desire for fine weather during rainy hours, and it is this trouble, I think, that makes most riders hurry in rainy periods. There they are in error, for bustling along only brings a sense of frustration and annoyance that you are ill-served, forgetting that the rain descends on just and unjust without discrimination. I suppose I have discovered this easy philosophy of wet weather riding without consciously thinking about it, for when conditions are damp I invariably slow up and paddle along in quiet comfort, taking the extra five minutes for the journey without worrying. I suppose some of the hurrying trouble arises from the bad habit of always cutting the time as fine as possible for the inward journey to work, and the urgency carries over on the way home when a lost minute has no particular value. Actually I enjoy a wet ride, yes, even an all-day affair, provided there are meals on the way and my raiment is reasonably waterproof. That is true of the spring, summer and autumn days when there is no chill in the downpour, for then even if you do get damped it doesn't matter much. I've been wet hundreds of times and ridden dry again, nor can I remember ever suffering any uncomfortable results, for if you can keep reasonably warm little else matters. We all make far too much fuss about wet weather, and never, I think, is it half so bad as it looks, particularly from a sheltered window to a man with a disgruntled mind. So I'm going on riding wet or fine because I like it—but I like it better fine !

A Sound Approach

THERE seems to be a movement in the cycling game to evoke a greater interest in the pastime. It is aimed at the middle-aged and older people, and I hope it will grow for I sincerely believe we have here a means of making and keeping an active interest in life. I know it is not always easy for the family man to hold his youthful interest in the pastime, for as his domestic responsibilities grow he is expected to take his full share of them, and these duties cut heavily into his leisure time. Apart from the home and the children (and what is home without them ?) there are a dozen other incidents to wean him and probably his wife from the cycling game. Then in those fortunate circumstances where a man "gets on," there is always the over-riding temptation of motoring, frequently implanted in him by his good lady and often enough excused to himself as a necessity of business. These are a few of the reasons why people fall out of the cycling game when they get married, or in middle life, and many of them come to deplore it as they grow older and wish they had kept an active interest in the pastime. They may not admit it in so many words (for we all find it difficult to be critical of ourselves), but I know dozens of such cases where the erstwhile active player of games grown into a spectator looks back to the days of his youth with longing, and sighs because his health is not what he would wish it to be. It is this type, this old rider, I would like to see return to the game, not as a fierce player, but as a participant in the grandeur of its freedom, its ever persistent pleasure of change and activity, and its preservation of a sane, healthy outlook free from all silly little considerations that clutter life with fancied importance.

Good Reasons

THE emphasis on racing and speed in the cycling sense has grown vast with the increase in the sporting side of the game, until the pleasure and joy of the pastime, as such, has almost disappeared from the pages of our journals. That is not surprising, for the ardent youngster wants his news red hot and has little time for the potterer who, while still interested, sees the game as one which possesses so many quiet joys for the growing older. Yet it is only this aspect of a very lovely method of travel, of idle roaming, of filling an evening hour with delight that will woo the fierce rider to regard cycling as much more than a sport, and possibly inculcate in him a later desire to join the growing band of riders who, having warmed their enthusiasm at the sporting shrine, have now gone on to realise how much more the game holds for them. The domestic acceptance of responsibility will always increase the difficulty of cycling continuity, but if one likes the pastime sufficiently, these can be overcome, without complete withdrawal from it. I know that to be so, as must every married individual who has remained a cyclist until he flies the white flag of the years ; and I also know the genuine delight of arriving at such an age active and happy, and still moved to enthusiasm when the chance of a wheeling holiday comes my way. One of the really hurtful things in life is to be at a "loose end." It just doesn't happen to an active cyclist however old he may grow, for there are always places to visit and friends to see. It is not always easy to become enthusiastic about a habit that is daily exercised, and one can only measure its value when circumstances—like illness—rob you of it for awhile, for the delight in cycling grows with the habit.

Such Advantages

FOR once, this Easter holiday, I had made no arrangements to tour, probably a habit that will grow on me now the time has come when I can select the moment for my holidays. I prefer them to be lonely in the sense that all the country is not celebrating and, therefore, accommodation is easy to obtain. I only had the week-end at my disposal, and part of that was occupied in taking an elderly visitor around our Midland area in a car, but the two days I had free of all commitments were delightful. One I spent on a ramble to many of the nooks that attracted me as a lad, and surprisingly covered nearly 70 miles on the round, marking the changes and feeding at spots which sixty years ago were very lonely places, and were now entertaining crowds of young travellers. My other day was a straight ride to the valley of the Teme, one of the beauties of Worcestershire, which structurally has altered very little in the last half century. I was twelve hours on the job, most of which was occupied in leisurely cycling through lanes. It was a glorious ride, bowered in beauty, for the blossom was a tide of delicate colour, and field edges were golden with daffodils and sulphured o'er with primrose patches, with lots of violets in the hedgerows for the seeking. It is part of our glorious heritage, this English spring blooming in the beauty of its own loveliness, nor do I think a man can see it and thoroughly absorb it unless he goes slowly to taste its beauty.

It Has Its Uses

DURING August holiday I was on the Pembrokeshire coast with a family camping party, and for the third year in succession we resisted the stormy weather. It was warm, however, and there were some hours of sunshine most days, so we could dry out and be comfortably bedded down for the night, when most of the windy rain seemed to beat on us. I mixed my laughter with the shriek of the storm one early morning as I lay on my camp bed with a golf umbrella as protection from the finely spun spray driving through the canvas. It was the one time in many years I have found an umbrella useful. Pembrokeshire is becoming a little more popular, for I met a number of riders amid the tilted lanes that run along the high cliffs that swoop down to some little haven ; but it is a lonely county still, and the accommodation is scarce and widely flung. I like the area for this very reason as well as for its floral banks and its fine cliffs and seascapes. But it is a tough country for cycling if the rider is really to visit the worthwhile little places.

CYCLORAMA

By H. W. ELEY

In the heart of the lovely Surrey woodlands – Friday Street.

The Benevolent Fund

RECENTLY, an up-to-date and most attractive booklet about the Motor and Cycle Trades Benevolent Fund came into my hands, and I was glad indeed to note the healthy state of the fund, and to read of its ever-increasing activities. The good work put in after the war by a committee of publicity men, who launched enterprising schemes for publicising the fund and its beneficient work, has borne fruit—and I think that the fund to-day is more widely known than ever before. I never think of this great effort without thinking of its original founder—the late A. J. Wilson, "Faed" of immortal memory! He laboured long and strenuously to build this fund for the benefit of those in the "trades" who fell on hard times, or who, in the evening of their days, needed help and comfort. The fund stands as his monument, and it is the monument he would have wished! "A. J." is held in esteem and affection by hundreds of "oldtimers" who saw the birth and childhood days of the industry which is now such a strong stone in the edifice of British commerce.

Autumn Glory

NOW is the time of the glory of the woodlands, the magical colours of the trees, and the autumnal beauty of hedge and coppice. A great time for getting out into the English countryside . . . as beauteous as in green springtime or lush summer. Even in a suburban road one may see the fire of the reddening creeper on the wall of a small villa, and the gay colours of dahlias and Michaelmas daisies in the little gardens; but out in the rolling countryside—that is where to see the autumn pageantry of Mother Nature in excelsis. Browns and reds, and golds and russets all blend in a glory which seems to tell us that though the year may be on the wane, and summer gone, yet there is beauty left to entrance the eye and delight the heart.

More from my Post-bag

STILL the letters reach me from ardent cyclists who read these rambling notes and take the trouble to write to me about their rides and tours and experiences on the roads. One came the other day from a young rider of a "Robin Hood" machine, who during the good September days spent a cycling holiday in central Wales. How he enthuses about the beauties of Radnor and Montgomery! He mentioned Llanidloes, which I know well. He told of the wonders of the great Elan Valley water scheme—that epic engineering effort which, many years ago, was undertaken to provide the city of Birmingham with its water supplies. Central Wales is unspoiled; I recall many rides through Radnor, into Herefordshire, and my memory goes back to pleasant hill-sides, gay with the red berries of the rowan trees; of Welsh sheep on the green slopes; of little villages with almost unpronounceable names; and of many kindly Welsh folk who, in easier days, provided me with sumptuous teas and regaled me with many a legend of the Land of Song. I was glad to hear from my young pen-friend with the "Robin Hood"!

Road Safety

THE past summer saw many big efforts made by local authorities and other bodies to promote greater road safety. It is difficult to assess the results of all the praiseworthy "stunts"—but it is all to the good that they were held. Death on the roads is still a national tragedy and it is of no use, as is sometimes done, to wax furious about the faults and failings of cyclists. One national newspaper, in late summer, featured an article which seemed to suggest that every accident could be traced to the negligence of the poor cyclist. No intelligent road-user can believe that! Wise men continue to plead for a greater measure of understanding between *all* road users. That is the good aim of the Roadfarers' Club, that thriving organisation which continues to do good work and hold meetings and lunches which are distinguished by a spirit of comradeship I have never seen surpassed.

Those Good Old Days

I LISTENED to a talk recently about the "good old days"—and came away with a certain nostalgia for the groaning tables, gargantuan joints and sumptous meals of our forefathers; but I tried to get the matter into proper perspective. After the meeting I had an interesting little chat with an old man—a cyclist still, despite his seventy-six years—and he pointed out, with truth, that along with the rollicking frolics around the Maypole, along with the succulent chickens and sirloins of beef, and the cheap good ale there were the "black spots" of the period: ducking-stools for poor witches, "stocks" for offenders who would now be let off with a kindly caution from some indulgent magistrate; whipping-posts and "whipping at the cart's tail." We talked long, this old man and I, and he reminded me that it is not so very long ago that old women, accused of "casting the evil eye" on somebody's cattle, were unceremoniously "ducked" in a village pond. He told me of the whipping-post which can still be seen at the pleasant Essex village of Havering-atte-Bower. The good old days! They were not so good in some ways, and I think that despite atom bombs, and wars and rumours of wars, we have made some progress along the long road to the goal of human kindliness and toleration.

Stone Wall Country

HERE in Derbyshire, if one rides north from my pleasant Staffordshire-borderland, one soon reaches the stone walls and somewhat grey and grim features of grand and rugged Derbyshire: not far to the moorlands around Leek, not far to ancient Youlgreave, and its mystic stone circle—as old, some say, as Stonehenge or Avebury. It is a good land, with history abounding in every village and ancient church. In its little inns I have talked with those who prefer the softer south, who yearn for more lush lands, and to whom the stone walls are forbidding and a little awesome; but there is a strange charm about this county, it grows upon one. Derbyshire "has everything"—and the verdant dales of the Dove, where the river splashes silver among the ferns, are there when one tires of the more northern parts of the county. There is majestic Chatsworth, and historic Ashbourne, where the spirit of Dr. Johnson lingers still, and the old inn he loved, "The Green Man and Black Boy," has its great straddle-sign across the road. Hills and dales; ancient stone circles; mysterious lead mines; moors where the grouse come in August—that is Derbyshire, and I am well content that my lot is cast in its pleasant places, and amid its homely people.

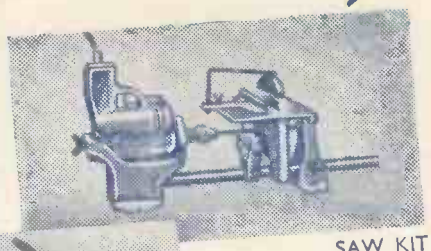
Published about the 30th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by W. Speaight & Sons, Ltd., Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand—Gordon & Gotch (A/sia), Ltd. Sole Agents for South Africa—Central News Agency, Ltd. Subscription Rate (including postage): For one year, Inland and Abroad 14s. (Canada 13s.). Registered at the G.P.O. for transmission by Canadian Magazine Post.

★ GREATEST VALUE FOR MONEY

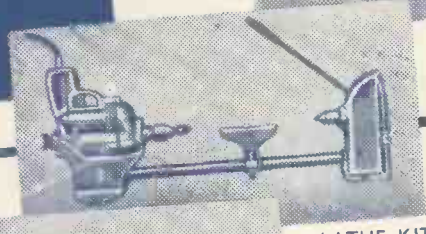
ever offered Home Constructors · Modelmakers · Handymen!

Complete Wolf Cub HOME CONSTRUCTOR OUTFIT

contains **3 MAJOR KITS**



SAW KIT



LATHE KIT

DRILLING, GRINDING AND POLISHING KIT

AND OTHER AUXILIARY EQUIPMENT

★ **EVERY PART IS INTERCHANGEABLE**

The only equipment of its kind where every part is interchangeable. Each kit is powered by the Wolf Cub Home Constructor ¼" Electric Drill. Thus you can begin to build up a complete outfit starting with the "Cub" and then add popular priced accessories and kits (as illustrated) or buy a complete outfit all at once.

SOLD BY ALL REPUTABLE TOOL DEALERS

Write at once for fascinating, fully picturised folder, "Profitable Pleasure".

WOLF ELECTRIC TOOLS LTD · PIONEER WORKS · HANGER LANE · LONDON · W.5
TELEPHONE: PERIVALE 5631-4 *BRANCHES:* BIRMINGHAM · MANCHESTER · LEEDS · BRISTOL · GLASGOW

THE 3⅜" "Zyto" Turning & Screwcutting Lathe

"Britain's Finest Lathe Value"

GAP BED BACK GEARED COMPOUND REST RACK FEED SET OVER 12½in. BETWEEN CENTRES AND TAILSTOCK

THE "ZYTO" 3⅜in. LATHE with many valuable refinements

CASH PRICE £28/1/0

Height of centres	3⅜ in
Distance between centres	12½ in.
Height from gap	4½ in
Height from Saddle	2 in
Guide Screw	8 T.P.I.
Headstock Mandrel Admit	⅜ in.
Tailstock Barrel Admit	⅜ in.
Headstock Pulley 3-speed	½ in. flat belt
Faceplate, dia.	6 in.
Overall length of Lathe	30 in.

Change Wheels: 20, 25, 30, 35 40, 45, 50, 55, 60, 65.

Back Gear Guards and Change Wheels, together with Catch Plate and Finished Back Plate for Chuck are all included.

A few unsolicited testimonials taken at random from a large number received from satisfied customers :—

"I have used Lathes for many years now, and consider the Zyto Lathe is really a first-class job, and I am very pleased with it." A. R., Hawkhurst, KENT.

"I must say, with great satisfaction, that the Zyto Lathe I had from you is ideal for model work and it performs well in every way. I am more than satisfied with the machine." J. C., Axminster, DEVON.

"I am greatly surprised at the quality of the Zyto 3⅜ in. Lathe. I am perfectly satisfied and consider I have obtained the maximum value for my money. It will be a pleasure to recommend you to my M.E. friends." C. M. D., Carlisle, CUMBERLAND.

"I am more than pleased with the Zyto Back-geared Lathe and with the way it turns the work out. I shall be only too pleased to recommend it to any person who should require a Lathe for small engineering work." W. D., Spitalfields, LONDON.

"Re Zyto Lathe, I cannot tell you how pleased I am with the whole outfit. It has won great praise from all my associates." C. H., GRAVESEND.

"I must say I am highly satisfied with my Zyto B.G.S.C. Lathe. One or two friends show a definite interest and may be future purchasers." V. S., Burnley, LANCS.

"I am very pleased with the Lathe, the performance is good." G. B., Workington, CUMB.

"With reference to the 3⅜ in. Zyto Lathe you supplied me with, all I can say is, I am a very satisfied customer." W. D., Rochester, KENT.

"I consider my Zyto Lathe an excellent tool." J. T., Malmesbury, WILTS.

"Delighted with the general excellence of the 3⅜ in. Zyto Lathe. A very creditable product." S. S., ISLE OF WIGHT

SPECIAL NOTICE

All "Zyto" athes are now supplied with calibrated index plates, and screw-cutting indicator at no extra cost.

AND IT COSTS ONLY £28/1/0

IF IT IS MORE CONVENIENT FOR YOU TO PURCHASE ON DEFERRED TERMS, PLEASE SEND US A POSTCARD AND WE SHALL HAVE MUCH PLEASURE IN SENDING YOU DETAILS BY RETURN

S. TYZACK & SON LTD

WOODWORKING & METALWORKING TOOLS & MACHINERY MANUFACTURERS

341, 343 & 345 OLD STREET LONDON, E.C.1

Telephone: CLERKENWELL 8301 (10 lines) *Telegrams:* TYZGAR, LONDON

Free Guide — SUCCESS IN ENGINEERING

132-PAGE BOOK FREE!

SEND FOR YOUR COPY

One of the following Courses taken quietly at home in your spare time can be the means of securing substantial well-paid promotion in your present calling, or entry into a more congenial career with better prospects.

ENGINEERING, RADIO, AERO, ETC.

Aero. Draughtsmanship	Elec. Draughtsmanship
Jig & Tool Design	Machine "
Press Tool & Die Design	Automobile "
Sheet Metalwork	Structural "
Automobile Repairs	R/F Concrete "
Garage Management	Structural Engineering
Works M'gmnt. & Admin.	Mathematics (all stages)
Practical Foremanship	Radio Technology
Ratefixing & Estimating	Telecommunications
Time & Motion Study	Wiring & Installation
Engineering Inspection	Television
Metallurgy	Radio Servicing
Refrigeration	Gen. Elec. Engineering
Welding (all branches)	Generators & Motors
Maintenance Engineering	Generation & Supply
Steam Engine Technology	Aircraft Mainten. Licences
I.C. Engine Technology	Aerodynamics
Diesel Engine Technology	Electrical Design

Ordnance Survey Dr'ship

BUILDING AND STRUCTURAL

L.L.O.B.	A.R.San.I.	M.R.San.I.
A.M.I.S.E.	L.A.B.S.S.	A.R.I.C.S.

Building Construction — Builders' Quantities
Costs & Accounts — Carpentry & Joinery
Surveying & Levelling — Building Inspector
Clerk of Works — Building Draughtsmanship
Quantity Surveying — Heating and Ventilating

GENERAL, LOCAL GOVERNMENT, ETC.

Gen. Cert. of Education	Common. Prelim. Exam.
Book-keeping (all stages)	A.C.I.S., A.C.C.S.
College of Preceptors	A.C.W.A. (Costing)
Woodwork Teacher	School Attendance Officer
Metalwork Teacher	Sanitary Inspector
Housing Manager (A.I.Hsg.)	Civil Service Exams.

BECOME A DRAUGHTSMAN—LEARN AT HOME AND EARN BIG MONEY

Men and Youths urgently wanted for well paid positions as Draughtsmen, Inspectors, etc., in **Aero, Jig and Tool, Press Tool, Electrical, Mechanical** and other Branches of **Engineering.** Practical experience is unnecessary for those who are willing to learn—**our Guaranteed "Home Study" courses will get you in.** Those already engaged in the General Drawing Office should study some specialised Branch such as Jig and Tool or Press Tool Work and so considerably increase their scope and earning capacity.

★ OVER SIXTY YEARS OF CONTINUOUS SUCCESS ★

NATIONAL INSTITUTE OF ENGINEERING

(Dept. 29)

148, HOLBORN, LONDON, E.C.1

SOUTH AFRICA: E.C.S.A., P.O. BOX NO. 8417, JOHANNESBURG

FOUNDED 1885 - FOREMOST TODAY

This remarkable FREE GUIDE explains:

- ★ Openings, prospects, salaries, etc., in Draughtsmanship and in all other branches of Engineering and Building.
- ★ How to obtain money-making technical qualifications through special RAPID FULLY-GUARANTEED COURSES.

MANY INTERESTING COURSES TO SELECT FROM!

A.M.I.Mech.E., A.M.I.M.I., A.M.Brit.I.R.E. A.M.I.P.E., A.M.I.C.E., A.M.I.Struct.E., A.M.I.Mun.E. M.R.San.I. A.M.I.E.D., A.F.R.Ae.S., London B.Sc., Degrees.

Fully guaranteed postal courses for all the above and many other examinations and careers. Fully described in the New Free Guide.

THE ACID TEST OF TUTORIAL EFFICIENCY

SUCCESS—OR NO FEE

We definitely guarantee that if you fail to pass the examination for which you are preparing under our guidance, or if you are not satisfied in every way with our tutorial service—**then your Tuition Fee will be returned** in full and without question. This is surely the acid test of tutorial efficiency.

If you have ambition you must investigate the Tutorial and Employment services we offer. Founded in 1885, our success record is unapproachable.

ALL TEXTBOOKS ARE SUPPLIED FREE
PROMPT TUTORIAL SERVICE GUARANTEED
NO AGENTS OR TRAVELLERS EMPLOYED

Free Coupon

SEND OFF THIS COUPON NOW AND BE ALL SET FOR SUCCESS

To: NATIONAL INSTITUTE OF ENGINEERING (Dept. 29), 148-150, Holborn, London, E.C.1

Please Forward your Free Guide to

NAME .....

ADDRESS .....

.....

My general interest is in: (1) ENGINEERING (2) AERO (3) RADIO (4) BUILDING (5) MUNICIPAL WORK *(Place a cross against the branches in which you are interested.)*

The subject of examination in which I am especially interested is .....

To be filled in where you already have a special preference.
(1½d. stamp only required if unsealed envelope used.)