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NEWNES

PRACTICAL MECHANICS

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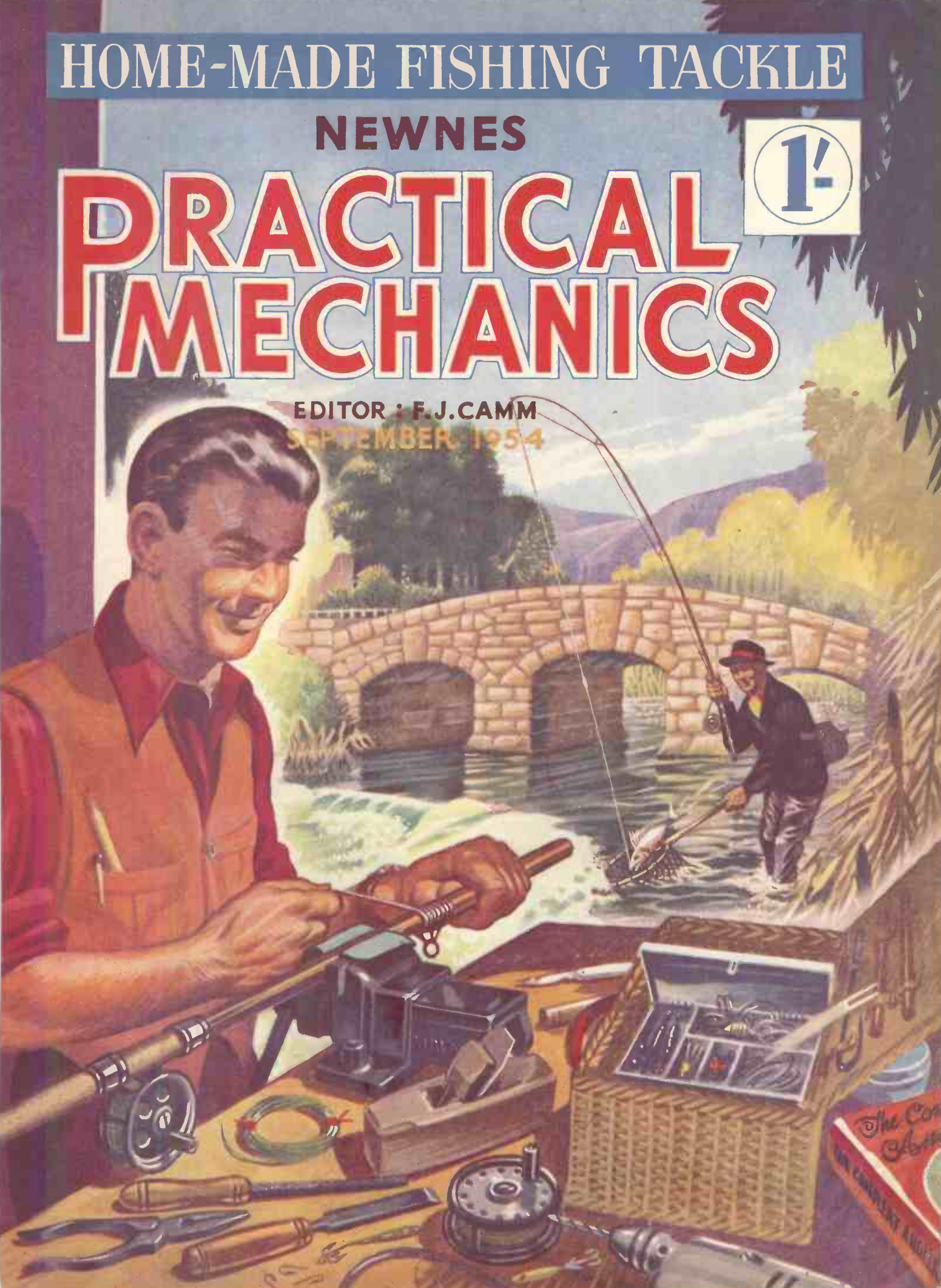
EDITOR : F.J.CAMM

SEPTEMBER 1954



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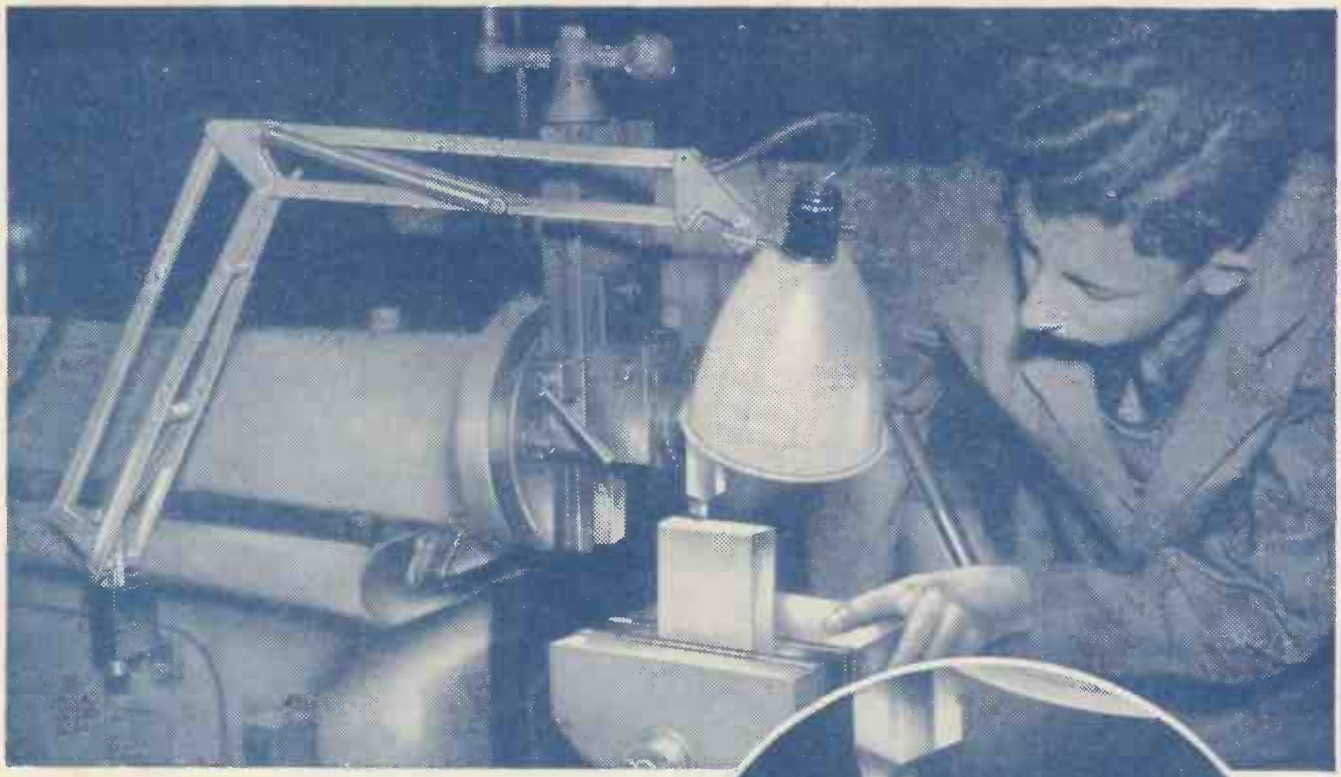

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PRACTICAL MECHANICS

The "Cyclist," and "Home Movies" are temporarily incorporated.

VOL. XXI. No. 249 Editor: F. J. CAMM SEPTEMBER, 1954

Next Month—21st Birthday!

THIS issue completes Volume XXI, and so with our next issue we shall celebrate 21 years of continuous publication with one minor gap due to the printing strike. It is, I hope my readers will agree, with justifiable pride that I can look back on 21 years of editorship of this journal. Last year saw the celebration of the 21st birthday of our companion journal, *Practical Wireless*. In next month's issue I shall review the events of the past 21 years, but it is appropriate in the closing issue of the 21st volume that I should express my pleasure at the continued growth year by year of our readership, and my thanks to that large and loyal band of regular readers who have taken the journal from its first issue; for it is fair to say that this journal is unique amongst British technical journals. It has not a competitor which deals with such a very wide range of subjects from model making to science, from astronomy to flying saucers, from mechanics to chemistry, and with all those subjects dear to the heart of the amateur craftsman and the practical householder.

The service which we give to our readers through our Advice Bureau ranges over a sphere of subjects vaster even than the subject matter in the paper. Technical schools and colleges are regular subscribers, and our readership extends to almost every country in the world.

In this 21 years we have described how to make a very vast range of models, domestic appliances, and articles of utility. We pioneered the construction of the Flying Flea, my little runabout car which could be built for £21 before the war, motor boats, canoes, electrically-operated bicycles, the Luton Minor Light Aeroplane, motorised lawn mowers, washing machines, radio-controlled models, unique models such as the Burrell Road Tractor, the Lethal Bed at the Ostrich Inn, Harmonographs, Macmillan's First Bicycle, Model Aircraft powered by elastic, steam, compressed air, petrol, and diesel fuel, weaving machines, wind power generators, to mention but a few of the subjects. I do not wish here to anticipate what I shall have to say next month in a special article, but will content myself with assuring my readers that the journal enters its 22nd year in a far stronger position than it has ever been before, that its readership continues to grow, and that we dedicate ourselves afresh to the service of our great band of readers.

FAIR COMMENT

By

The Editor

Craftsmanship and Draughtsmanship

AS a member of the panel of judges of the annual Craftsmanship and Draughtsmanship Competition, organised by the Gauge and Tool Makers' Association, which this year showed an even greater increase in skill than last year's contest, I reflected during the judging on the very great advances in skill and technical education which had taken place during the past 21 years. Some of the tools made by apprentices under 19 years of age were superior in finish and accuracy to even high grade commercial products. In the drawing section of the contest some of the competitors under 19 years of age showed designing ability of quite outstanding merit. We are beginning to see the results of the facilities for technical education which were instituted in the early 'thirties, and as those facilities have improved during the past 21 years, so has skill advanced amongst youths to the point where, at the age of 19, they are producing work almost equal in accuracy and skill to the work of an experienced man of 21 years ago. The number of youths leaving school applying for apprenticeship courses steadily increases each year, and youth is relying less and less upon the guidance of parents in the selection of a career.

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The "P.M. How-to-Make-It-Book"

BACK issues of this journal are in constant demand, but it is seldom that we are able to supply the particular copy a reader requires. It was for this reason that we reprinted in our "How-to-Make-It-Book" some of the articles which are in continuous demand. In order to avoid queries on the subject I here repeat its contents: A Tape Recorder; A Master Battery Clock; An Electronic Organ; An Electric Washing Machine; A Hand Vacuum Cleaner; Electrically-operated Garage Doors; A Bagatelle Table; A Reflecting Telescope; A Harmonograph; A Designograph; A 15 in. Four-heddle Hand-loom; A Potter's Wheel; A Pottery Kiln; An Electric Oven; Westminster Tubular Door Chimes; A Cycle Trailer; A Pedal-cycle Sidecar; A Portable Air Compressor; A Water Softener; A Spanish Hawaiian Guitar; A Steel-stringed Ukelele; A Double-seater Canoe; A Radio Deaf-aid Unit; A Garden Pool; A Vertical Enlarger; A Photo-electric Exposure Meter; A Synchronised Flash-gun; A Combined Printing Box and Safelight; Diascopes and Episcopes; Steam-driven Motor Boat; An Electric Wall Bracket; Inexpensive House Telephones; An Electric Gas-lighter; An Adjustable Drawing-table; and A Toboggan.

Another Winner!

OUR companion journal, the *Practical Motorist and Motor Cyclist*, the sixth issue of which is now on sale, has steadily advanced in circulation since it was launched in April of this year. It is the only journal entirely devoted to the upkeep, overhaul and repair of all makes of motor-cars, motor cycles, and motorised cycles, irrespective of the year of manufacture. It does not deal with touring or racing. Its Advice Bureau advises readers on the remedies for all of the defects which may occur in running, and articles help the reader not only to save money, but also to keep their vehicles in first-class and economical running condition. It costs 1/- every month.—F. J. C.

Home-made Fishing Tackle

A Series of Articles Dealing With the Construction of a General Purpose Fresh Water Rod : a Sea Rod and Reels in Wood and Light Alloy

1.—The Making of Built (Split) Cane

By C. W. TAYLOR, M.I.E.T.

THE present article is devoted to the making of built cane—very often called split cane—which is the timber used for both rods. For those who do not wish to try making this material, ready made tapered lengths can be bought at tackle stockists.

Hexagonal built cane consists of six strips of bamboo cemented together. Each strip is an equilateral triangle in section, and making such strips to precise dimensions is not a formidable, but an interesting job for the mechanic.

The Former

A simple wooden jig or former is first made from a piece of knot-free hardwood, about 2in. square and 4ft. 6in. long. This former must be made accurately to produce strips of bamboo to precise dimensions.

One edge of the hardwood is planed true and the ends are squared off. On each end of the timber two lines are struck off at 60 deg. to the planed face, to form an equilateral triangle. (See Fig. 3.) Once the former has been completed, the surfaces should be preserved by staining them as shown in Fig. 3. The illustration also shows a section of a completed former on which top, middle and butt joint strips are made. The wood is then sawn and planed accurately to these two lines throughout its length. A bevel set at 60 deg. is used to check the angles of the planed faces. An accurate former is essential, so care must be taken with this work. The former can be temporarily screwed to a board in the vice to facilitate planing. (See Fig. 4.)

With this work completed, flats are next carefully planed on the corners of the former. The flats are of the precise width and taper as the strips of bamboo which are to be produced. The sizes and details of the bamboo strips will be specified in following articles.

Working on the Bamboo

Having completed the former, work commences on the raw material, which consists of stout Tonkin bamboo poles, about 1in. to 1¼in. diameter. It is important to obtain thick-walled bamboo; old tent poles or heavy curtain poles will often suit, but material can easily be obtained from certain tackle stockists.

The poles are split down into strips (see Fig. 5), about ¼in. wider than the flats on the former, on which they are later temporarily mounted.

Six strips about 6in. longer than the required rod joint are laid side by side. Each strip is moved a little to stagger the knots,

The hexagonal section of a built cane rod consisting of six triangular pieces of bamboo

Fig. 1.

Faults which result from an inaccurate former, or from faulty finished strips

Fig. 2.

and all six strips are then cut to the correct joint length. The knots are filed flat, and each strip is straightened by warming it. This makes the bamboo pliable and it can then be pulled straight. Further heating, but not scorching, toughens the bamboo.

The outside, *skin side*, of each strip is next slightly roughened with a file, and each strip in turn is glued by the *skin side* to the appropriate flat on the former (see Fig. 6). The glue used for this is "Casco" powder, cold water glue. Having applied "Casco" to the *skin side* of the strip, string is used to bind the strip tightly to the former along its full length (see Fig. 6).

The former (and strip) is next warmed over a gas ring, or in front of a fire for a few minutes until the wood is warm. The former is then allowed to cool and the glue hardened for 40 minutes. *This period must be observed.* Meanwhile, other work can be undertaken.

Cutting to Shape

After the above period has elapsed, the glue should be tested with the finger-nail and should be found quite hard. This being so, the string binding is removed and the waste bamboo of the glued strip is cut away by planing, or by careful paring with a knife. Both of these tools must be extremely sharp and the plane set very fine.

Finishing

The bamboo strip is finished flush with the faces of the former; a file can be used for this, but the 60 deg. angles must be maintained. After very little practice the job becomes easy.

The finished strip is *immediately* prised away from the former by carefully inserting the blade of a penknife between the two. It will be found that the strip comes away quite easily and without damage to the former if the time which has elapsed, after glueing the strip, is not excessive. This part of the job should, therefore, be carried out according to the clock and to the stated routine.

Glueing and Straightening

All six strips for each joint are finished in the same manner, and after applying "Casco" to each the six are glued together to form the hexagonal joint. The six strips are bound together with string in an open spiral along the full length. The *skin side* of each strip must be on the *outside*, and the joint is pressed and rolled on a board to straighten. Any twisting of the strips must be corrected while the glue is wet by sighting along the joint and correcting where necessary. The rough finished joint is then stood up to dry for a few days.

Built cane is expensive material and the mechanic will get considerable satisfaction from producing his own tough rod timber at low cost.

Next month's article will describe rod fittings and general construction.

(To be continued.)

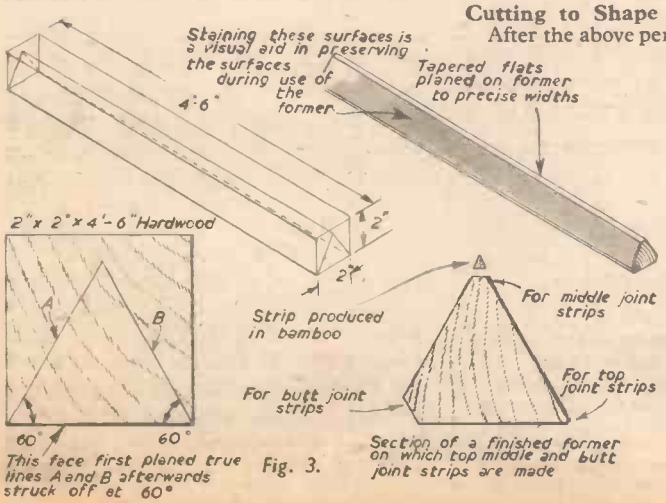


Fig. 3.

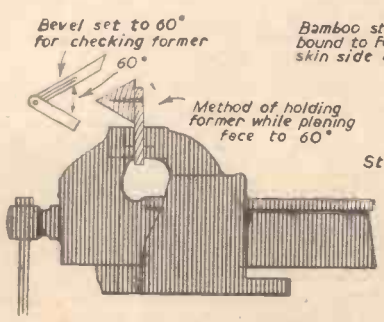


Fig. 4 (Above).
Fig. 5 (Right).

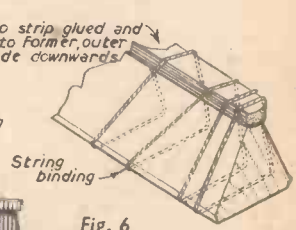


Fig. 6.

The plane, made from thin aluminium.

AN ELECTRIC BOMBER

A Novel and Entertaining Game for the Handyman to Construct

By F. G. RAYER

THIS model is of a somewhat novel and entertaining type and has proved to be very interesting in operation. It consists of a small aircraft which circles upon the end of a boom, and carries a dart or "bomb" which can be released electrically from a control panel. The aim of the operator or competitor is to release the dart at such a time as will gain the highest score on a marked-out board on the floor, the scores being added together over a series of runs. The same dart may be used each time, or a number may be used so that each competitor may complete his series of attempts before the darts are removed from the scoreboard.

means of support out of doors. In most cases it should be feasible to arrange a hook or other means of suspension. If this is quite impossible, the model could be modified so that a mast or pole could be used, mounted vertically from the floor or ground, and supported by stays or wires. For such an arrangement the motor platform would be underneath and the large wheel carrying the boom would be on top. The three long brackets used in the hanging model would be omitted.

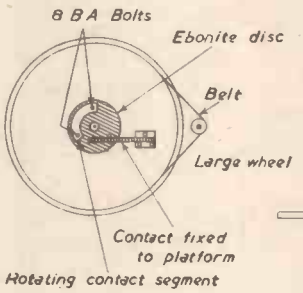


Fig. 2.—Contact and wheel.

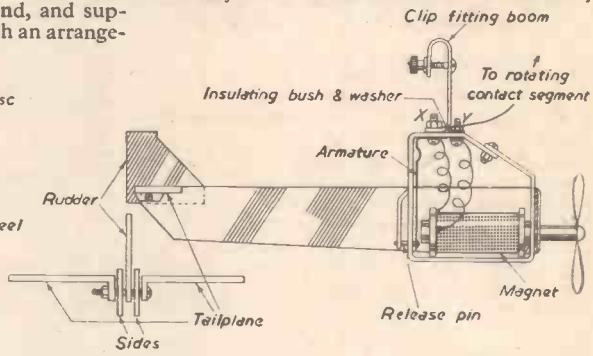


Fig. 3.—Bomb release and plane.

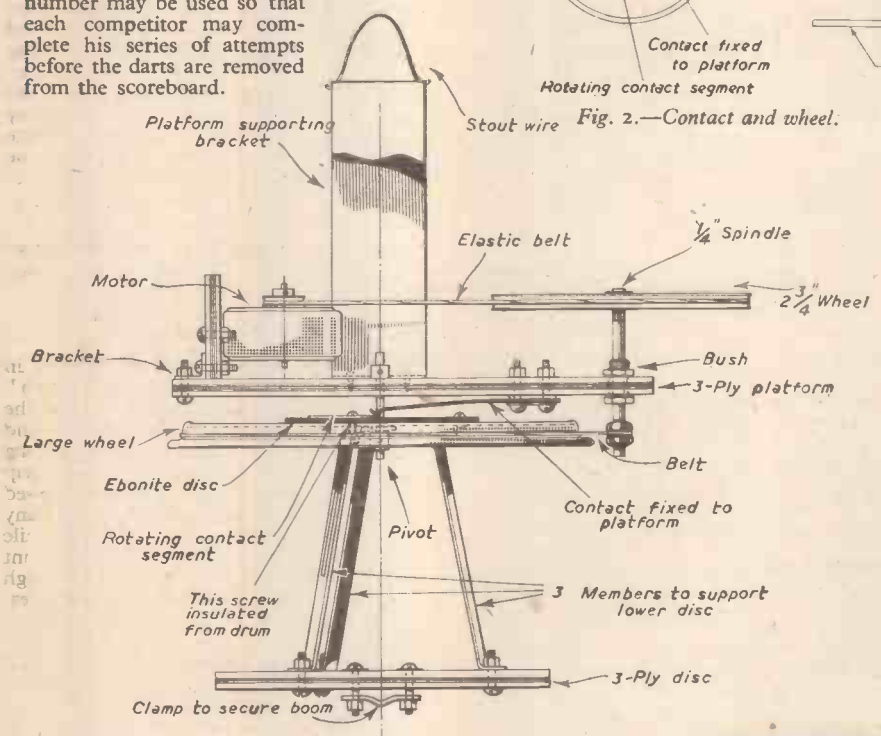


Fig. 1.—Side view of the driving mechanism.

So that dry-battery operation is feasible, consumption was kept as low as possible, and is about .4 amp., rising momentarily to about 1 amp. when the "bomb release" control is operated. This proved satisfactory for long operation from flashlamp type 4.5 volt or 6-volt dry batteries. As the model is suitable for use indoors, and the circle covered by the plane is large, an automatic arrangement is provided so that the dart cannot be released over articles of furniture or the operator. To achieve this the circuit to the magnetic bomb release is only completed for a part of the revolution of the boom (about 90 deg. of the total rotation) and the target is arranged within this sector. To add interest, a speed control is fitted, and a bulb which lights only when the plane is within the sector of rotation during which the bomb may be released.

The model is made for suspension from the ceiling, or from a strained wire or any suitable

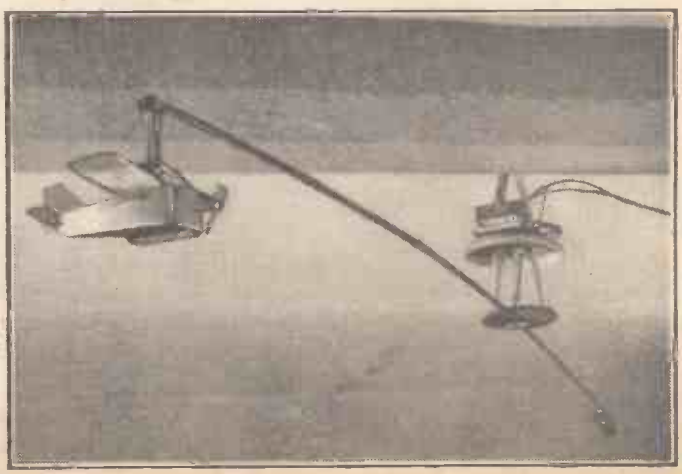
Construction of Driving Mechanism

Fig. 1 illustrates this, two belt drives being used. The bush, axle and wheel for the intermediate spindle may readily be obtained, being sold by many advertisers of radio components as a reduction drive for tuning condensers. (The 2¾in. wheel, with set-screws, would then be mounted on the condenser spindle, but is here screwed to the shaft—which would normally bear the control knob—instead.)

Elastic bands were found best for driving purposes, and each should be sufficiently long so that it is not under excessive tension. Such tension in the first belt, in particular, might prevent the motor running properly. The latter is of the small permanent-magnet "electrotor" type and only consumes about .3 amp. Other motors could be used and the motive power required is very small.

The three-ply platform is 5in. by 2½in. and hangs by means of the large bracket. This can be bent up from aluminium or other metal, a strip 1in. wide and 8in. long being suitable, giving a final bracket with sides about 3in. long and ¼in. feet, suitably drilled, to bolt to the platform. A small bracket holds the motor in position, the height of the 2¾in. wheel being adjusted so that the belt does not come off during running. With the type of motor mentioned, the bearing surfaces are small, and the motor was found to run best with the small driving pulley as near as possible to the motor casing. The belt passes inside the supporting bracket, the nearest side of this bracket being cut away in Fig. 1 to show the pivot.

The contact strip is cut from brass and fixed



A view of the complete device.

to the platform with small bolts; it is quite near the pivot, as shown in Fig. 2. Its purpose is to convey current to the magnetic release, the circuit being completed by the pivot itself.

The rotating part of the mechanism is shown in Figs. 1 and 2, and the large wheel is 4½in. in diameter. A sound, clean lid of the push-on type with a flange about ¼in. wide is satisfactory, and no upper rim is required to hold the belt on during running if the intermediate spindle is correctly positioned.

An ebonite disc 2in. in diameter is fitted to the top of the large wheel, the rotating contact segment, cut from thin brass, being bolted to this. Paxolin or thin plywood could be used. The bolts holding the contact segment pass down through the large wheel, insulating bushes being provided underneath so that no

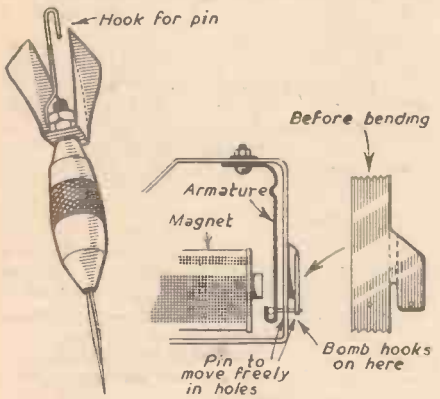


Fig. 4.—Parts for release.

electrical contact can arise. Three supporting members, bent up from aluminium strips 3in. long and ¼in. wide, descend to the lower three-ply disc, which is 3½in. in diameter. Two of these members are secured by the bolts which hold the rotating contact segment; the remaining member is held by the bolt which passes through the ebonite and is in contact with the large wheel. (This is shown in Fig. 5.)

A clamp, cut from aluminium, enables the boom to be fitted in a few moments. The boom itself was made up from ¼in. diameter plated steel tubing of the type sold for use as vertical rod aerials, as sections may be plugged together immediately to build up a rod of suitable length. These rods are offered by many advertisers. A wooden boom would be suitable, either round or of square section. Its length is a matter of personal taste and the space available and 5ft. was used in the model made, giving a 3½ft. projection to carry the plane and 1½ft. for the lead balance-weight. It would be feasible to obtain balance by using two planes.

Plane and Release

The plane is shown in Fig. 3, the nearest side member having been removed. Thin aluminium is suitable, each wing being about 1½in. by 2¾in. For the sides of the body pieces 5½in. long are suitable, 1in. wide at the front and ¾in. wide at the tail end of the plane. The tailplanes are ½in. by 1in. However, the dimensions and method of building the plane are not important. A model of light wood could be used or a plane already to hand might in some cases be adapted.

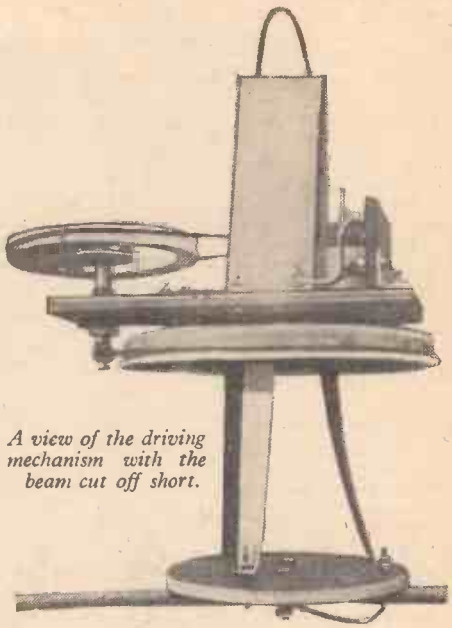
The release fits inside the plane as shown in Fig. 3, connections to the magnet being completed by the metal boom and clip and by an insulated lead passing inside the tubular boom and emerging near the 3-ply disc. With a wooden boom two wires would, of course, be required.

The magnet employs an iron core ¼in. in diameter and 1¼in. long, wound to capacity with 26 s.w.g. insulated wire. When it is energised the armature is drawn towards the core and the release pin thereby allows the dart to fall. Details of the magnet are not very critical, and one to hand could be used if it operates satisfactorily. The magnet circuit is completed only momentarily, so that a magnet with stouter wire (thus consuming an increased current) would be suitable.

The release is shown in greater detail in Fig. 4, its frame consisting of a strip of aluminium ½in. wide and 6in. long, bent as seen in Fig. 3. A projection is left on this strip, and bent round as shown in Fig. 4. A 1/16in. drill is then taken through strip and projection, forming holes in which the pin can move. All roughness should be filed away. The pin itself has its point cut off and passes through a small hole in the end of the armature, the lower end of which is turned up so that when the armature is released the pin is pushed back into position.

The armature is cut from tinplate such as obtained from domestic canisters, and is about ¼in. wide and 2in. long. Its upper end is bolted to the aluminium frame, and its tension adjusted so that when the magnet is energised the pin is withdrawn sharply from the outer hole and allows the hook on the dart to escape. The pin should not be withdrawn completely out of the hole in the inner strip or it will not return properly when the circuit is broken. The full movement of the pin need only be about ⅛in. and the pole of the magnet should be as near the armature as possible. Such a release was found satisfactory with much larger weights than would normally be used in the present model.

The completed craft is easily removable, one 6B.A. bolt clamping it to the end of the boom. For the dart a ready-made one with thin wire hook bound to the tail would be satisfactory. That actually used was made up with a brass body, steel point and thin aluminium fins.



A view of the driving mechanism with the beam cut off short.

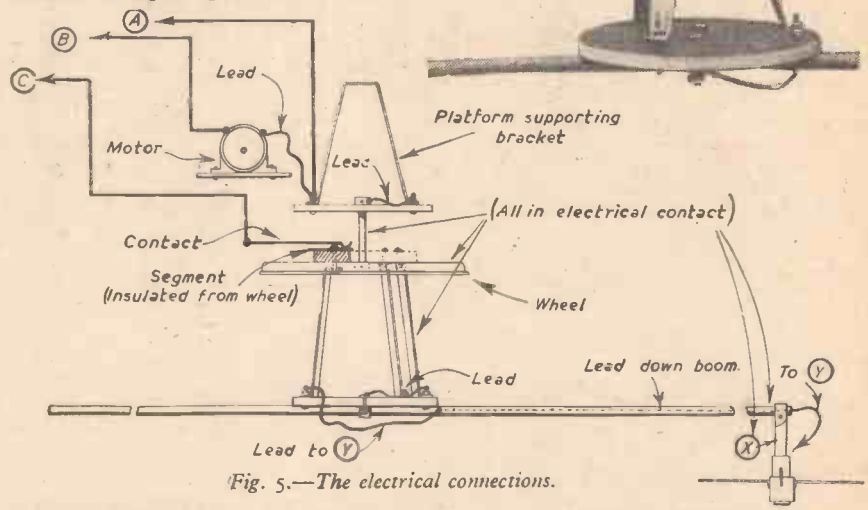


Fig. 5.—The electrical connections.

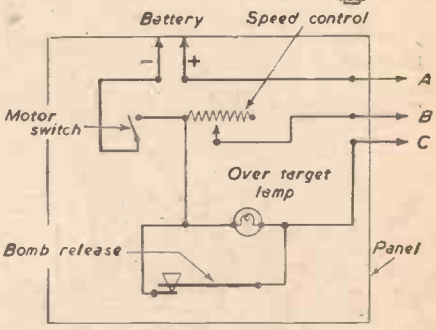
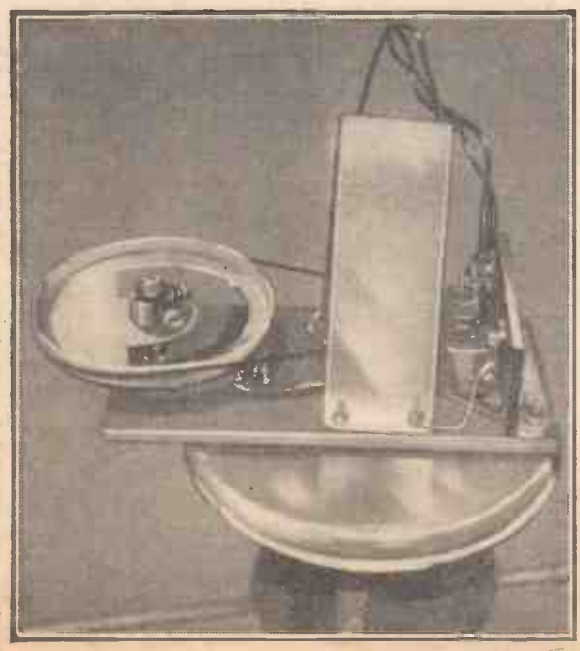


Fig. 6.—The control circuit.



A view from above of the driving mechanism.

Electrical Connections

The circuit is shown in Fig. 5, and is very

straightforward. Lead "A" acts as a common connection for both motor and magnet, the circuit to the latter being made through pivot, wheel, bracket, boom clamp, boom and the clip supporting the plane. Lead "B" is to complete the motor circuit. Lead "C" is for the bomb release control, the circuit being via platform contact, rotating segment, bracket, and the lead passing along the boom to point "Y" in Fig. 3.

Three leads pass from the platform across the ceiling to the control panel. Thin 2-amp. or 5-amp. flex is suitable for these, or thin, single strand "bell" wire. (With the latter, a slight increase in battery voltage may be required to compensate for the voltage drop in the connections.) Separate wires, twisted together, can be used, or a three-core cord.

Control Panel

In its simplest form this may consist of a single switch for starting and stopping the motor and a push-switch or key for releasing the bomb. However, the arrangement shown in Fig. 6 was found better in several respects, and gives added interest.

As the type of motor mentioned (and all permanent magnet motors) reverses the direction of rotation when polarity is reversed, the battery must always be connected correctly. When the "motor switch" is closed the circuit is completed, and the motor commences to run, its speed being controlled by the variable resistance. At the same time, the indicator bulb will light each time the contact circuit to the release is made by the rotating contact segment. This bulb circuit is via the magnet windings, but the current passing is insufficient to release the dart. When the "bomb release" key is depressed, the bulb is shorted and the dart immediately drops, unless the craft is over a part of the circuit where release is not possible, as already explained.

For the speed control, a 5-ohm resistor was found suitable. It can be omitted, of course. Or a form of speed controller may readily be made up for battery operation from iron or resistance wire of about 30 to 32 s.w.g. 1ft. or 2ft. of such wire would be sufficient.

The "over target" bulb must be of low-consumption type, or the release may operate. A .06-amp. bulb, such as intended for use with cycle-dynamo rear lamps, is ideal. However, some torch bulbs are satisfactory. The bulb will light at fair brilliance, the magnet coil being of quite low resistance.

For the "bomb release" switch any push-type switch is satisfactory. This item can also be made up with ease. All the items of the control circuit may be mounted on a panel or fitted to a box housing the battery. Connections should be correctly marked so that proper operation is possible.

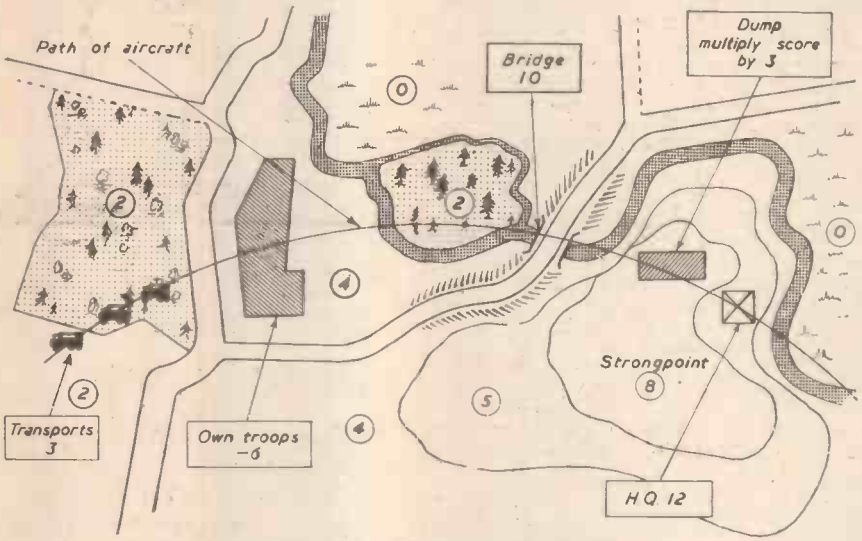


Fig. 7.—A suggested target design.

For Two Planes

With a single plane correct balance is achieved by adding a lead weight to the free end of the boom, sliding this along to a suitable place. A second plane, duplicating that described, would be satisfactory. To enable it to be controlled a lead should pass from it to a second contact segment bolted opposite that already shown.

Each "bomb" could then be released in turn by operating the release switch of the control unit. Whether this arrangement is adopted or not would depend upon personal preference. The second plane could be added in this way at any time without difficulty.

Making Blueprint Paper

How to Prepare Your Own Sensitive Material

The method used for swabbing large areas of blueprint paper.

THE "blueprint" process is extensively used for making copies of engineers' tracings, but it can be used successfully for prints from photographic negatives if the negatives are strong and contrasty, having dense highlights and clear shadows.

Blueprint paper is exceptionally easy to prepare and the following solutions should be made up and stored in amber-coloured bottles until wanted:—

Solution A:	
Ferric ammonium citrate ...	½ oz.
Gum arabic	50 grains.
Water	2 oz.
Solution B:	
Potassium ferricyanide ...	90 grains.
Water	4 oz.

In making up solution A it is best to soak the gum arabic in the water for a few hours in order that it may swell up and dissolve more or less completely before the ferric salt is added. The ferric ammonium citrate is obtainable in the form of green or brown "scales." Either of these varieties will suit, but the green form is preferable.

All these solutions are poisonous, and where there are children in the house, it is advisable not to store them unless a safe place is available. *Never* store any of these solutions without labelling the bottle clearly and indicating that the contents are poisonous. If, however, the solutions are stored, they should be kept away from the light.

Coating the Paper

Choose a good quality paper, rough or smooth, lay this material down on a level surface and in a small vessel mix equal parts of solutions A and B. By means of a fragment of sponge, a flat camel's hair brush or a piece of cotton wool, charged with the mixed solutions, wipe the latter evenly over the surface of the paper. When large areas have to be dealt with, a piece of absorbent cloth, folded into two or more thicknesses, doubled over the edge of a piece of glass and held in place with a rubber band, is used; and old plate negative will do for the glass (see illustration). This operation should be carried out under a weak light only and when it is completed the paper should be hung up to dry in a dust-free place.

The best way to apply the solution is in long parallel bands each slightly over-lapping its predecessor until the surface is covered and then while still wet apply another coat in the same way, but at right angles to the first. It does not matter if the result looks a bit streaky, as long as the surface is covered completely.

The time required for printing cannot be given, as it depends upon the density of the negative, but it should be continued until the deepest shadows assume a bronzed appearance. Then immerse the print in cold water and allow it to soak (changing the water if necessary) until the water runs off clear and free from yellow tinge. The colour becomes darker as the print dries and will be slightly improved if the wet print is subjected to a bath of extremely weak acid—say a teaspoonful of vinegar in a pint of water—before the final rinse in clean water.

Small Wind Power Plants

5.—Lighting Problems : Wiring Details : Converting Old Lamps

(Concluded from the August issue.)

This series of articles was first published in "Practical Mechanics" in 1944 and is now being reprinted in response to readers' requests.

RECENT years have seen a marked increase in the number of amateur lighting installations in use throughout the country. In particular, the influx of American-built "Windchargers" has aroused widespread interest in this source of free power, and many technical magazines have published designs of home-made wind-generating plants. Little attention has been given, however, to the layout of the lights and fittings, on which the ultimate success of the plant depends. A short account is given here of some dodges and devices found effective when used in conjunction with the wind-charger previously described in this series.

Lighting Problems

In windcharger lighting two main problems emerge : (a) the minimum working intensity of illumination necessary to supply each part of the house ; (b) to do this with the utmost economy of current consumption. For distribution purposes, the house is divided into three sections : (1) Two main rooms—living-room and kitchen—where comfortable reading and working light is necessary ; (2) bedrooms and other rooms where a small light is sufficient for normal purposes, with provision for a more powerful light at strategic points when occasion demands it ; (3) halls, stairways, coal-house, etc, where one or two candle-power is quite enough.

The requirements of the living-room are best satisfied by two separately switched bulbs, arranged (Fig. 1) to throw light on the two positions usually occupied on each side of the fire. When only one person is reading, the second bulb is idle. With both bulbs in use, good illumination is provided over the whole area in front of the fire, since the cones of light will overlap. In normal practice, 25-watt bulbs would be considered the minimum for such a job, but 12-watt lamps are sufficient if particular attention is given to the mounting. These lamps are made to fit standard 9-10in. bayonet sockets, in any voltage from six to 100. Failing this, 12-watt clear-glass car bulbs are just as good.

Lamp Holders

Whatever the type of bulb used, a holder is necessary, and this is usually difficult to

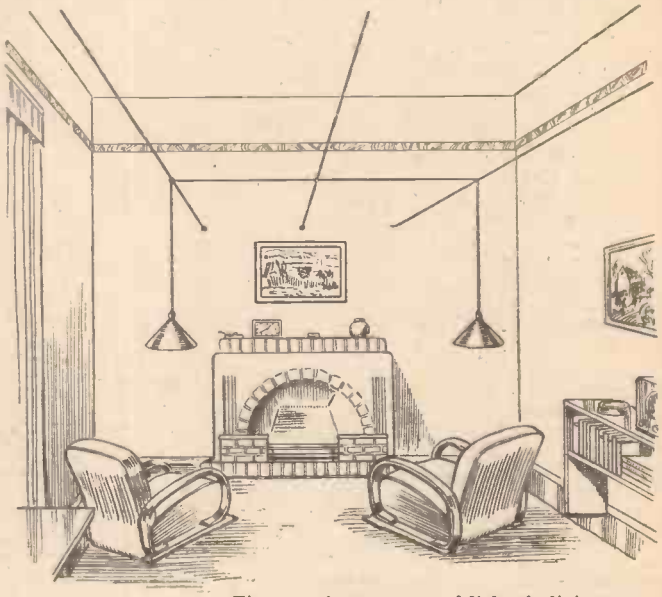


Fig. 1.—Arrangement of lights in living-room. Separately switched 12- or 18-watt bulbs, suspended by flex from bare 7/22 aerial wire stretched from walls at a height of about 9ft.

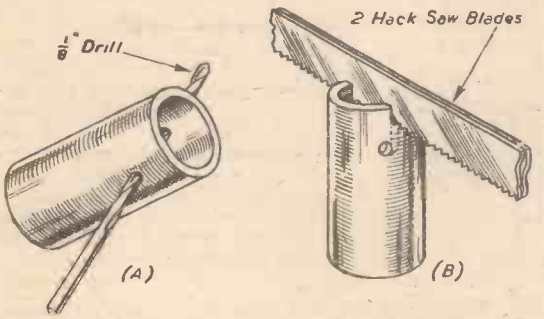


Fig. 2 (Left).—Two operations necessary to make a bayonet socket for car bulbs. (A) Drill ⅛in. hole, (B) make two cuts, using two hacksaw blades.

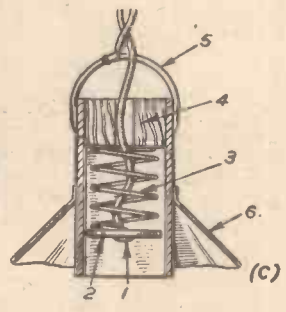


Fig. 3 (Right).—Section through finished bayonet socket for motor-car bulbs.

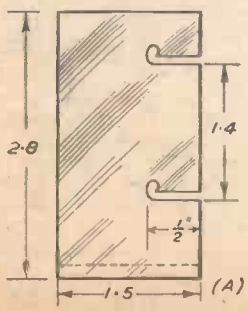


Fig. 4 (Left).—Bayonet grips cut in strip of tin.

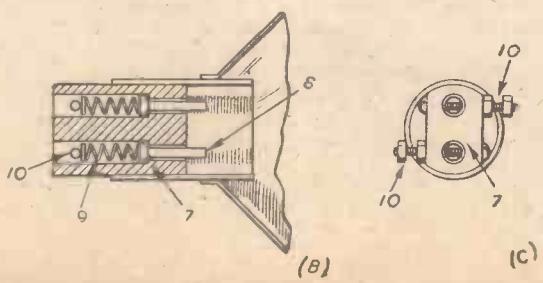


Fig. 5 (Right).—Section and end view of bayonet socket for bulbs with standard size bases.

A converted candle lamp.

Fig. 6.—Details of the adjustable reading lamp, showing the retort clamps.

obtain. It can be made up easily and rapidly from odds-and-ends. For the car bulb, a piece of light tube is selected with a diameter of about ⅝in., a loose fit for the base of the bulb. A piece of curtain rod is the most suitable source of material. Cut the tube into 1½in. lengths. The bayonet grip is made in two operations. First, drill a ⅛in. hole right through the tube, accurately along a diameter, about ½in. from one end (Figs. 2 and 3). Then, using two blades in a hacksaw frame to give the necessary width, make a cut down each hole, slightly to one side, so that the typical bayonet socket is produced (Figs. 4 and 5). It is best to make these cuts separately by tilting the saw, so that each may be guided accurately to the correct position. The single contact stud consists of a brass paper-fastener (1) in the centre of a disc of fibre-insulating material (2). The legs of the fastener are passed through a slit made with a small, sharp screwdriver; cut off the legs about 1/16in. below the disc, open them out to secure the fastener, and solder on a length of heavy flex. Pressure between fastener and bulb contact is maintained by a spring (3), which is a close fit in the tube. A wooden plug (4), with a hole for the flex, keeps the spring in position. A "stirrup" of bare wire (5) is soldered to the end of the holder to support the weight of the lamp and shade evenly over the centre. The tin shade (6) is soldered directly to the holder at any suitable point.

It is advisable to make holders for standard-sized bulbs on the following system. A strip of tinplate (Fig. 4) is cut to the size shown and bent into a cylinder around the base of a bulb, a strip of thick paper between bulb and tin giving the necessary clearance. The cylinder is held temporarily with a loop of wire and soldered lightly along the joint. A piece of wooden rod (7, Fig. 5) about 9/10in. diameter has two ⅛in. holes, separated by ½in. drilled along its length. These holes are then widened to within ¼in. of one end by a ¼in. twist drill. Two wire nails (8, Fig. 5) are cut down to about 7/10in. length and inserted to act as contact studs. The heads may need to be filed to pass freely into the ¼in. holes. Two small springs (9, Fig. 5), preferably of brass or copper, press on the heads of the nails. The springs are best held in place by two 6 B.A. bolts (10, Fig. 5). The bolts act as terminals for the flex and are arranged "back-to-front" as shown, to support the weight of the lamp evenly. Flat surfaces are obtained for the bolts by four hacksaw cuts. The tin is held in position on the timber by small screws or tacks, and the shade is soldered to the holder, as before.

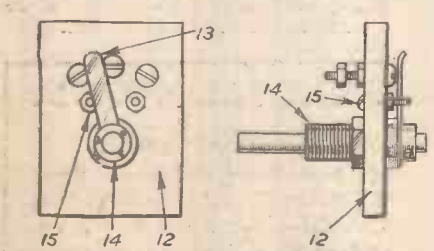


Fig. 7.—Back and side view of "snap action" changeover switch for use with double filament 6-8 volt, 18/3 watt bulbs for use in reading lamps.

Shade Construction

The shades for the lamps are made from tinplate, polished well with metal polish. A 12in. gramophone record is suitable for marking out the circle, but if a big enough sheet of clean tinplate is not to hand, open out two canisters, at least 6in. long and 4in. diameter, and mark two semicircles. Solder these together along one half of the common diameter, leaving the other half free for bending purposes. Shape the tinplate into whatever size cone is required, and, after cutting away the extra tinplate, solder lightly along the joint. Cut a hole at the apex to fit the holder

A useful reading lamp which can be tilted at any angle.

in use, and enamel the back of the shade to suit the colour-scheme of the room. The angle of the cone may lie anywhere between 90 deg. and 135 deg. The shades are soldered directly to the home-made holders described.

Wiring Details

On low voltage system it is essential to use the largest possible diameter of wire, so that the voltage drop along it may remain small compared with the voltage of the battery. Heavy rubber-covered cable is expensive and scarce, and the best substitute is bare 7/22 aerial wire, which can be bought quite cheaply in rolls of 50ft. or 100ft. It should be nailed or stapled along walls so that opposite polarity wires are separated by at least 2in. or 3in. To save material and power, the wires should be stretched directly from one point to another on their journey from battery to lights, rather than follow neatly the contours of the building. Fig. 1 shows this plan adopted in the wiring of the living-room. Three lengths of 7/22 wire are stretched tightly from hooks across the room, and the bulbs are suspended by heavy flex soldered

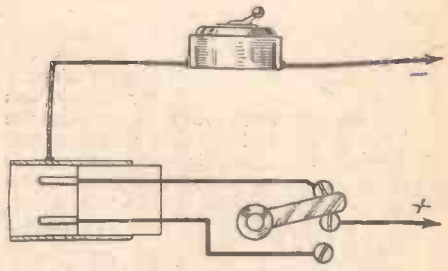


Fig. 8.—Connections for double-filament 18/3 bulb, using the switch shown in Fig. 7.

to the bare cross-wires. The two outside wires are positive, coming from the two switches inside the door, and the inside wire is a common negative for both bulbs. Any one 7/22 wire may feed bulbs totalling 24 watts on 6-volt circuits, where the drop in voltage will be 0.045 volts per yard. Small 6-watt bulbs can be supplied through 18 s.w.g. wire taken from an old dynamo field coil or ignition coil, provided the distance from battery to bulb is not too great.

In the bedroom, a 6-watt car-bulb, with a small tin shade about 6in. diameter, gives a satisfactory light, but a socket should be provided for a bedside reading-lamp containing a 12- or 18-watt bulb. The bases of old plug-in coils form very useful sockets, which can be placed at suitable points throughout the house where a good intensity of illumination is needed occasionally. Fig. 6 and the photograph on the left explain the construction of a very useful lamp, which can be arranged, by readjustment of the clamps, to throw intense light on the most awkward positions. The shade is semi-cylindrical, and is easily made from tin canisters, soldered at the joints. It should be large enough to surround the bulb completely. A bulb-holder with a built-in switch is used. Retort clamps (11, Fig. 6), of the type used to hold school laboratory apparatus, make an ideal stand, which can be attached to any support. When used as a bedside reading-lamp, it clamps neatly to the top rail of the bed, throwing the light just where it is needed.

Converting Old Lamps

Old candle or oil lamps, with good silvered reflectors, can often be converted into ideal reading-lamps. The photograph on page 520 shows a typical conversion, using an old parabolic reflector candle-lamp. A small toggle panel-mounting switch is fitted into the base. The best type of bulb for these lamps is a double filament double contact car-bulb, rated usually at 6-8 volts, 18 and 3 watts. The appropriate filament is selected by a small changeover switch, made from the wiper of an old wire-wound rheostat or volume control, moving over small round-headed brass 6 B.A. bolts arranged on a piece of fibre or paxolin (12, Fig. 7). The wiper (13) moves in its original bush (14), and just

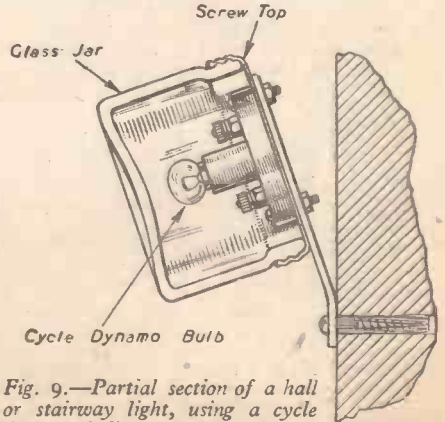


Fig. 9.—Partial section of a hall or stairway light, using a cycle dynamo bulb in a clear glass screw-top jar.

touches a pair of the bolt heads, giving a pleasant "snap-action" as it crosses the central bolt. Two small bolts (15) act as stops. Fig. 7 shows details of the construction of this switch, while it can clearly be seen on the base of the reading-lamp shown on page 520. Fig. 8 gives the connections necessary when using the switch to control a double filament bulb. From this it is obvious that the holder could be wired up with only one contact-stud in use, the second wire being attached to the metal of the holder. Changing from one filament to the other would then be effected merely by reversing the bulb in the holder, so that the "live" contact of the holder would touch the other contact of the bulb. This would eliminate the changeover switch, and is particularly useful for positions where a strong light is needed only now and again (e.g., a shaving light for the bathroom).

For passages, stairways, etc., screw-base 6-volt or 8-volt cycle dynamo bulbs are ideal. These can be mounted very artistically under clear glass ointment or cosmetic jars with screw lids, attached either flat against the wall or roof, or by a small aluminium bracket. Fig. 9 gives an idea of the way in which it is made.

Total Load

With an installation consisting of twelve 6-volt lights arranged on the lines suggested, the total load will rarely exceed 6 amps., while the average nightly load over a period will be about 3 amps., provided reasonable care is exercised in switching off unnecessary lights. Allowing five hours for each night, the average consumption would therefore be about ½ kilowatt hour per week. Allowing a battery efficiency of 80 per cent., and an average charging rate of 8 amps., this would need about 16 hours' charging in every week of 168 hours, or one hour in every 10. Wind surveys reveal that we get about 2,000 hours of 10 m.p.h. winds over most of the country during the year, which works out at about one windy hour in every five, or more than sufficient to supply the load mentioned. The weak point in this reasoning depends on the fact that many of the 2,000 hours of wind will come in the form of sustained gales, lasting up to 24 or more hours, with hardly a break. To make good use of such windy periods, large storage capacity is necessary.

Accumulators

The single car accumulator, with a top capacity of 100 amp-hours, is obviously insufficient. Several accumulators in parallel go a long way to solve the problem, but large glass house-lighting 2-volt cells are the ideal solution. These cells have correct charging rate of about 20 amps., and can be fitted with visual charge indicators, taken from old Exide radio batteries.

Making a Film Rewinder

An Accessory for the Ciné Enthusiast

By S. A. MONEY

THOSE enthusiasts who take up home movies as a hobby soon discover that the film must inevitably be rewound at some time or other, and therefore that some form of rewinder is an invaluable piece of equipment to possess. Films can, of course, be rewound by hand, or on the projector, but, whilst these methods are satisfactory, it is far better to use a proper rewinder for the purpose. The apparatus required consists of two shafts, to carry the spools, mounted some 2ft. to 3ft. apart and fitted with some form of hand drive for winding. The drives are usually geared with a step-up of about 10-1 to reduce the time required if a long film has to be rewound. The construction of such a simple piece of equipment takes only an hour or two, and need not cost more than a few shillings.

The first requirement is a suitable pair of drives for the spools. A visit to the local multiple store brought to light some small, hand-driven grindstones which are ideal for the purpose. These grindstones have a step-up gear ratio of 12-1 and are of cast steel construction. A pair of these can be obtained for about twelve shillings. In addition to a pair of these grindstones, a piece of wood 6in. by ¾in. and 2ft. to 3ft. long will be required for the baseboard. The exact length of this baseboard has not been specified, since it will depend on the personal preference of the constructor.

Dismantling

Since the grindstone is to be used for a purpose for which it was not designed, it is necessary to carry out a little dismantling before construction can be commenced. The toolrest at the side of the grindstone can be removed, since it is no longer required. The grinding stone itself can be taken from the shaft by unscrewing the 2 B.A. shake-proof nut which holds it there. The grinding wheel, being of little use on its own, may be disposed of, but the two washers which were used to hold it should be set aside for future use. Projecting from the front of the main casting are two lugs, which form part of the clamping arrangement used in fixing the grindstone to a bench or table. If the normal 400ft. spools are to be used, it will be necessary to cut these lugs down by at least ¼in., so that they will clear the spools. The lugs are no longer required for clamping, since the bottom flange alone will be used for this purpose. The bolt which screws through the bottom flange should be removed by sawing off the washer which is fixed to it and then unscrewing the bolt.

The upper shaft is removed next by undoing the 2 B.A. bolt at the top of the casting. This shaft has to be modified to take the spools, and the actual changes necessary will depend on the gauge of film being used.

Construction

The modification to be described is for use with 9.5 mm. spools, but, no doubt, some similar method can be devised if the rewinder is to be used with 8 mm. or 16 mm. spools. Take one of the washers that were used to clamp the grinding wheel and drill a ⅛in. hole in it at a point 0.4in. from the centre. A ⅜in. length of ⅛in. brass or steel rod should be soldered into this hole, as shown in Fig. 1. The washer may then be soldered to the shaft as shown. The bearings on the shaft will expand when heated for soldering and the shaft should be left for about a quarter of an hour to allow the metal to contract to its original size. When the shaft is replaced in the main casting it should rotate freely. If this is not so, it may be necessary to rub the bearings down a little with fine emery cloth. When the shaft has been replaced the alterations are complete and it only remains to mount the two drives on a baseboard.

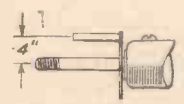
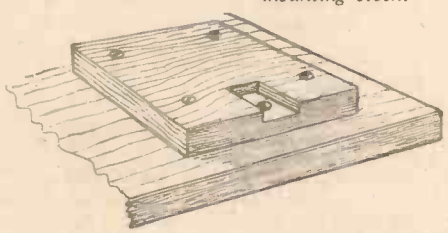


Fig. 1 (Left).— The shaft modifications.

Fig. 2 (Below).—The mounting block.



The Baseboard

The two drives are first mounted on pieces of wood 4in. by 4in. by ¾in., the sole purpose of which is to raise the rather long handles to a convenient height above the table. A recess ⅜in. deep should be cut at one edge of these pieces to take the bottom flange of the drive, as shown in Fig. 2. This recess is necessary to prevent the drive rotating on its fixing bolt. Since the flange is already tapped for a ¼in. Whitworth thread, it is most convenient to use this size bolt for fixing the drive to the baseboard. A ¼in. hole should be drilled through each of the mounting blocks to take the fixing bolts.

The two mounting blocks should be fixed, one at each end, to the baseboard proper, with their front edges about ½in. in from the front edge of the main board. Two holes, large enough to clear the heads of the fixing bolts, should be drilled through the baseboard in the appropriate positions. The upper edges of the baseboard should then be bevelled and the whole painted or stained to make a presentable piece of work. The two drives may then be bolted into position.

In commercial rewinders it is usual to have the end of the spool shaft pivoted so that after the spool has been pushed on, the end can be bent up to prevent the spool from slipping off as it is being rotated. In this case, it was decided that it would be much simpler to screw a 2 B.A. wingnut on to the shaft, since the latter is already tapped with a 2 B.A. thread. It is not necessary to screw these nuts up tight against the spool, since they only serve as stops. The original 2 B.A. nuts fitted to the grindstone could, of course, be used, but the wingnuts are to be preferred since, being larger, they are less likely to be mislaid when not screwed to the shaft.

A working Model Rowing boat

A Novel Design for the Modelmaker

By D. WASSELL

WITH the object of attempting a new subject for modelmaking, I constructed the electrically operated row-boat seen in the accompanying photographs. The details which follow are intended to form a basis for the modelmaker to work from, and possibly the individual may incorporate ideas of his own. The hull was made of cardboard, stiffened and waterproofed by layers of 1in. wide adhesive material and coats of paint. Using cardboard pieces of card were cut to the cross-section contours at the four positions shown in Fig. 1 and fixed temporarily to the keel and to each other.

A sheet of card was bent along its mid-length, gummed to the keel, folded and secured together at the forward end to form the bows and then fashioned round the formers. This process called for numerous scraps of gummed paper applied *ad lib.* wherever they would best serve to hold the card in position. As soon as the approximate lines of the gunwales could be drawn the card was cut, allowing a small margin for finishing off. Paper strips were crossed athwartships to hold the sides in position and prevent warping of the job as a whole.

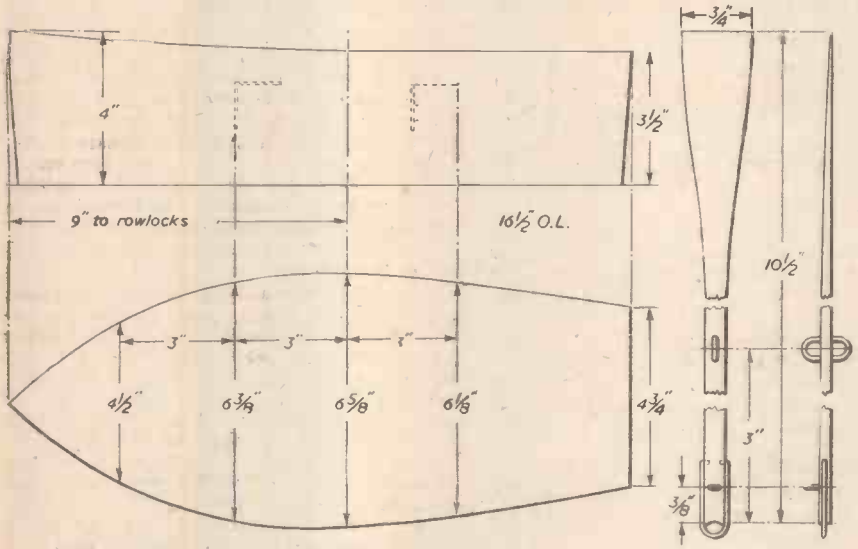


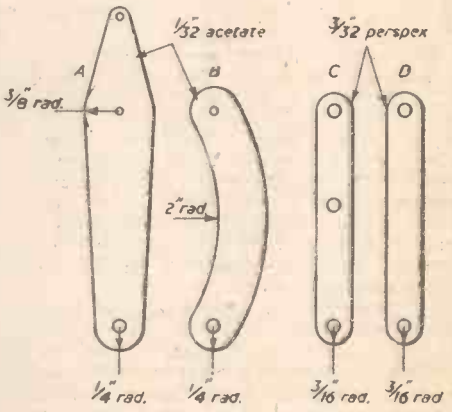
Fig. 1.—Plan and side elevations of the hull.

Fig. 2.—The oars.

To deal with the severe curvature of the hull near its maximum beam two cuts, 1½in. apart, were made from the gunwales half-way to the keel. If wetted slightly the card can be moulded to some extent, and the overlapping edges can be faired off by increasing thicknesses of gummed paper scraps. At the stern, where the angle at the keel is 90 deg., a transom was fitted, cut from three-ply wood.

The next operation was to cover the outer surface with slightly overlapped paper strips, port and starboard strips laid on opposite diagonals and overlapping each other along the stem and keel. When dry and given a coat of cellulose paint, the job was firm enough to allow removal of the formers and other supports and to cover the inner surface in the same manner.

Over the first coat of paint I repeated the process, using strips of self-adhesive Sellotape applied oppositely to the layer of the paper strips. Then the gunwale edges were cut accurately and protected by lengthwise strips



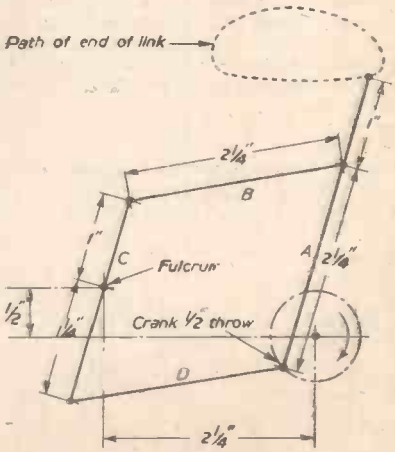


Fig. 4.—The linkage.

A view of the completed model showing the linkwork.

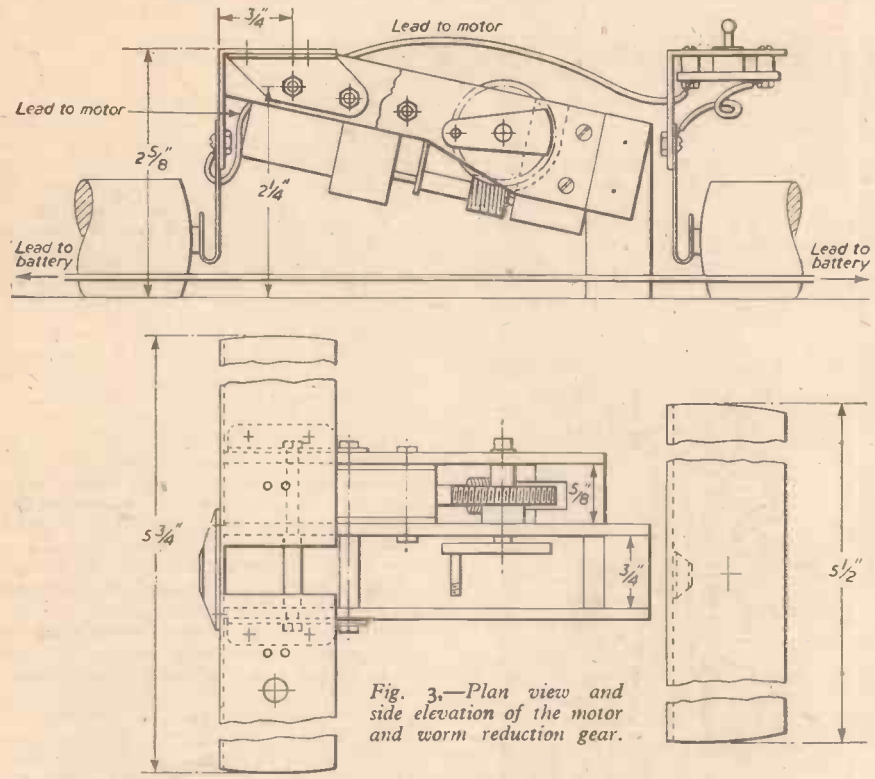


Fig. 3.—Plan view and side elevation of the motor and worm reduction gear.

of Sellotape, and the whole structure received two coats of cellulose paint.

I completed the hull itself by steaming two ⅛in. strips of three-ply wood to shape and screwing them along the gunwales, with a small connecting V-piece at the bows.

The oars were carved from 12in. office-type rulers, and the rowlocks made from ⅛in. split pins, flattened at the eyes and opened out to shape (see Fig. 2).

The Drive

The mechanism for this model consists of a six-volt fractional horsepower motor, surplus war stock, obtained from Gamages of Holborn, coupled direct to a 50 : 1 worm reduction gear, supplied by Bonds of Euston Road, London, N.W.1, driving a crank. They are positioned as shown in Fig. 3. The crank operates linkwork connecting to the inboard ends of the oars, giving them their proper actions, i.e., horizontal motion forward and elliptical motion rearward.

The Linkage

The arrangement is shown in Fig. 4, links A and B being in duplicate pairs and of thin material to allow them to flex in following the radial motion of the oars about the rowlocks. Links B may be straight, but they are less visible in motion if they are arcuate. Link C is double, separated by short-distance tubes for the assembly of links B and D. Two pairs of single-cell batteries, Ever-Ready U2, wired in series and connecting to the flat spring contacts attached to the boat seats, provide ballast fore and aft as well as motive power.

The Figure

It will be understood that the model as described will function without the figure of the oarsman whose movements are derived from those of the oars. He may, therefore, be a ready-made puppet given an approximate movement by some simple connection with the oars. I have given him a more realistic action by building him up on a wire frame, Fig. 5, hinged at the elbows, shoulders and at the hips which are pivoted to the boat seat.

The leg frames are seen separately attached to the seat for easy access to the mechanism which they normally conceal. The wire eyes at the wrists are permanently coupled to staples in the oar handles where five turns of brown line simulate fingers. When the crank pin is in its lowest position the oars can be folded back with their blades over the transom for protection.

The body of the oarsman is lightly sprung forward by means of a projection of the framework below the level of the seat, so that tension keeps the arms outstretched until the backward motion of the body is limited by a stop, causing the arms to bend during the remainder of the stroke.

Loose floorboards in two sections were added, cut from cardboard and covered with brown paper strip in imitation of planking. A second seat farther aft serves to mount a switch with enough lead to allow the main seat with mechanism attached to be removed for inspection.

Provision should be made to prevent the oars being knocked out of the rowlocks by flotsam. Failing a better arrangement, tie a loose loop of thread round the rowlocks, and make fast inside the hull.

In practice this little craft rides well, and the general arrangement has proved quite satisfactory while the motions of the working parts closely resemble those of their life-size counterparts.

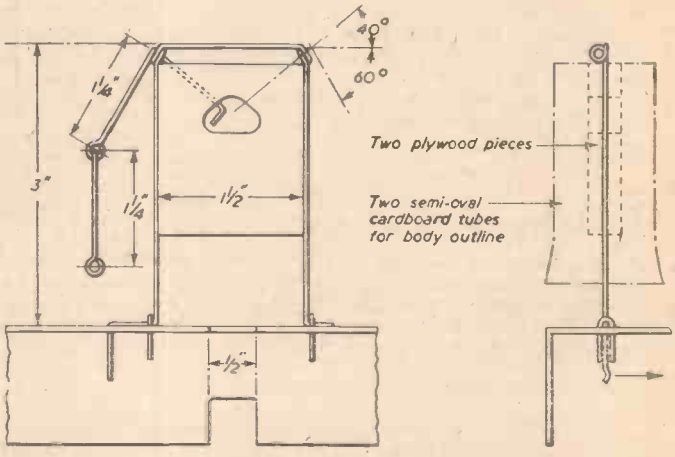


Fig. 5.—The wire frame of the figure.

The Dunlop Diving Apparatus

A REVIEW of the breathing endurance secured with Dunlop's self-contained diving apparatus for shallow water was given in a paper read to the Institution of Mining Engineers by Professor R. McAdam of the Mining Department of Edinburgh University and Heriot-Watt College.

"If the apparatus is fitted with two cylinders," he says, "and the safety pressure is 30 atmospheres, then the apparatus endurance is 2 hours at depths of 0-30ft. when charged with pure oxygen at a pressure of 120 atmospheres. Using a 60 per cent. oxygen/40 per cent. nitrogen breathing mixture, the maximum period that the apparatus can be used for depths of 0-80ft. is 1½ hours when charged to 120 atmospheres, or 2 hours when charged to an initial cylinder pressure of 150 atmospheres."

For depths of 0-140ft., requiring the use of a 40 per cent. oxygen/60 per cent. nitrogen breathing supply, the endurance times are :

45 min. when charged at 120 atmospheres,
60 " " " " 150 "
and 85 " " " " 200 "

"Considering," he adds, "the special problems involved in diving at depths of over 80ft. with the aid of self-contained breathing apparatus and bearing in mind the necessity for controlled decompression, it is recommended that the services of professional divers should be obtained for all work beyond a depth of 80ft."

Professor McAdam describes the apparatus as "one of the most compact of the self-contained types of diving apparatus suitable for underground use, and its general performance and reliability has been adequately proved by the diving units of the Royal Navy.

"No special dress is required," he explains. "For long dives, however, it is advisable to wear some type of diving dress in order to give protection from cold and abrasions. Bearing in mind that a rescue man will generally be on the move when under water in a mine and there is the possibility that he may have to walk along the roadway after negotiating the flooded part, it is advisable to choose a light-weight type of dress such as the Dunlop Mk.1 neck-entry underwater swim suit, or a frogman suit. Boots, if required, should also be comparatively light and 5lb. lead soles are quite sufficient."

A Surveyor's Level & Theodolite

By J. VOSE, A.M.S.E.

Made From an Astro Compass

AN accurate surveyor's level and theodolite can be easily made at small cost by adapting an ex-R.A.F. Astro compass (Mark 2), which can be purchased from advertisers in PRACTICAL MECHANICS. The one constructed by the writer, and described here, was tested against a standard dumpy level of a good make, with the result that no difference in accuracy could be detected over short distances up to 70ft. or 80ft. Above this distance the simple telescope was not sufficiently powerful to enable figures to be read on the staff, but by using a plain staff with a target, as described later, sufficient accuracy could be obtained for all normal building purposes, at distances up to 200ft. or more.

In addition to straightforward levelling, the instrument can be used as a simple theodolite, divided circles allowing horizontal bearings to be measured as well as gradients.

The Instrument Described

Fig. 1 shows the instrument as purchased. The base is a clamp, which can be fitted on to the tapered tip of a 1½in. diameter wood or metal rod, and is secured by a clamping screw, with a tommy bar attached. Two levelling screws are attached to this base casting for the purpose of levelling the baseplate of the instrument. This baseplate is secured by a gimballed universal joint to the clamp casting and carries, on a fixed extension, two spirit-levels. By means of the milled wheels on the levelling screws, the baseplate is adjusted until each of the two level bubbles lies central. Carried on this baseplate is a 360 deg. divided circle, which can be revolved in a full circle. An arrow pointer marked "True Course" enables horizontal angles to be measured. Carried in a pair of bearings on this divided circle is a further circle also divided into 360 deg. This circle can be turned by means of a milled knob at the side, and can also be tilted to correspond with the polar axis. A divided arc shows the tilt, which is controlled by a small milled knob having a vernier adjustment divided into degrees. This is used in the modified instrument for measuring angles of gradient. A fixed vertical plate at the top of the compass carries an optical sighting bridge marked "Declination." This is pivoted on one screw, and carries a pointer to indicate the declination angle against an engraved arc. The optical sight has a small lens at one side, and some kind of sighting bars at the other end. In the writer's instrument these bars were missing.

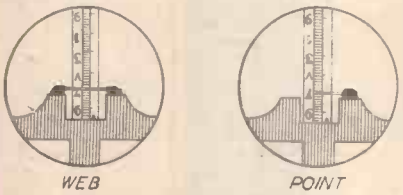


Fig. 2.—The two types of sighting line.

Fig. 1.—The ex-R.A.F. Astro compass as purchased.

It is obvious that the instrument can be used for measuring angles, and for rough levelling, without any modification, by sighting across the optical sights, but having regard to the precision workmanship in it, it was considered worth while devising a simple telescope, using the existing lens as an eyepiece, to enable observations to be taken at greater distances, and with much greater accuracy.

Making the Telescope

The optical sights are first taken off by unscrewing the locknut and taking out the screw. This screw and nut, together with the washers, should be placed on one side for replacement later. Care must be taken that the small lens is not damaged or dislodged. A sighting line is necessary at the opposite end, and the writer at first used a web, in the following manner. The two horns on the sighting bar were rubbed with a spot of "Metalfix" clear adhesive, and allowed to dry. Then a spot of "Metalfix" was picked up with the point of a pin and touched on to one of the horns, and immediately drawn away, pulling off a filament which can be drawn out to almost any desired fineness. This web is drawn across the other horn, and secured by touching it on to the prepared surface. After a few tries a satisfactory web was obtained—fine, taut, and level. This was later modified by using a point instead of a web. The end of a fine sewing needle was broken off and soldered to one of the horns, the point extending half-way across the gap. This was considered to be more robust than the web. Fig. 2 shows the two types as seen through the eyepiece when sighting on to a surveyor's Sopwith levelling staff.

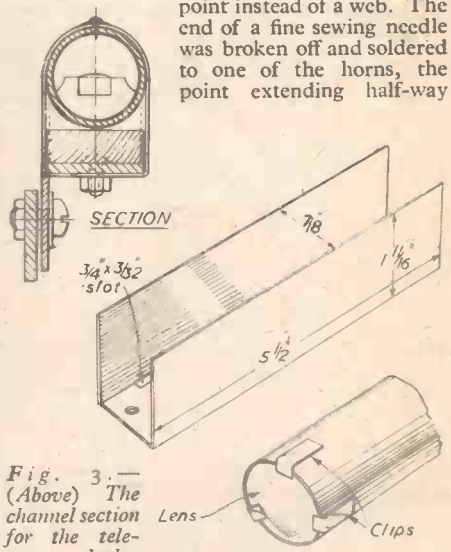


Fig. 3.—(Above) The channel section for the telescope body.
Fig. 4.—(Right) Holding the lens in position.

The telescope body is bent up from a piece

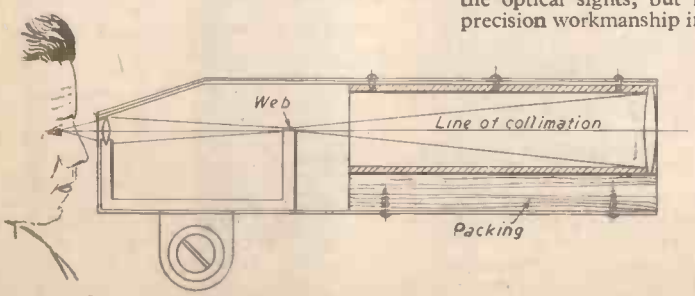


Fig. 5.—The completed telescope.

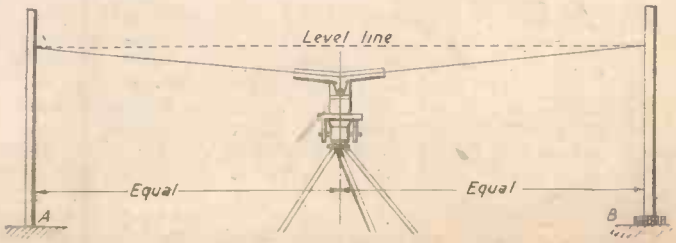


Fig. 6.—Adjusting the instrument.

of sheet aluminium 5½in. × 4½in. to the channel section shown in Fig. 3. A slot is cut out of the bottom of this channel ¾in. long × 3/32in. wide. The slot is ½in. from the eyepiece end, and is on the left-hand side. The optical sight assembly is pressed down into this channel with the tongue projecting through the slot, a small hole drilled through each end of the base, and through the aluminium, and a small bolt passed through each hole and secured on the underside with a nut. It is essential that this fixing is perfectly rigid, as a slight movement of the objective end of the telescope relative to the eyepiece and sighting web, or point, would cause large errors in levelling.

Objective Lens and Mount

The objective lens was taken from a watchmaker's eyeglass. It is approximately 3½in. focus and ⅞in. diameter, was obtained from a well-known multiple store very cheaply and is eminently suitable for the purpose. The quality of the lens does not affect the accuracy of the instrument in any way, and a more powerful lens of longer focal length would only tend to make the level unbalanced and more liable to shake. The lens was mounted on the end of a 3in. length of ¾in. internal diameter tubing. A piece of ¾in. copper water pipe was used in the instrument described. Three short pieces of thin copper strip were soldered to the side of the tube at one end and equidistant from each other, the lens dropped in, and the strips bent over forming clips to hold the lens in position (see Fig. 4). A touch of Bostick adhesive prevents any slight movement, and the inside of the tube is painted dead-black to prevent annoying reflections.

A packing piece is required to bring the lens mounting tube up to the axis of the eyepiece lens. A 3in. length of ⅞in. × ⅜in. hardwood is required for this, pressed down into the aluminium channel and secured by two small wood screws from underneath. The lens tube can now be dropped into the channel and on to the packing piece. It should be a fairly tight spring fit between the wings of the channel.

By sighting on to an object about 20 ft. away, the lens tube can be slid up or down, until the telescope is in focus. As the power of the telescope is quite low, it will be found that a fixed focus is quite good enough to enable readings to be taken from about 4ft. to infinity. When a satisfactory mean focus has been found, the two aluminium wings are bent snugly around the lens tube, overlapping slightly, and temporarily bound with wire or strong string. Three or four small holes are drilled through the overlap, and into the lens tube, and self-tapping screws driven in to hold all secure. At the eyepiece end, the aluminium will need bending down to rest on the metal lens mounting, see Fig. 5. A couple of coats of black lacquer will finish the telescope, which can now be replaced in position on the Astro compass, and screwed up hand tight for the time being.

Adjusting the Instrument

Select a level piece of ground, or a footpath, and set up the level on a tripod, or clamp it on to a strong stake driven into the ground. Level it up by means of the milled screws until both spirit bubbles show level. See that the "LAT" adjustment is set to 9 and the vernier to 0. This means that the instrument is 90 degrees from vertical, which, of course, is horizontal. Adjust the telescope as near level as can be judged, and then set out a point A, 30ft. in front of the level and another one B, 30ft. behind it. Have an assistant hold a staff vertically on the first point A, and get him to mark a heavy pencil mark on the staff where you see the web or point in the telescope cut across the staff. You will have to guide the assistants pencil by hand signals until it is at the right height.

Transfer the staff to the second position B and reverse the level by turning either of the horizontal circles, but without disturbing the tripod. Check the spirit levels again. If now the staff is packed up or lowered until the web again cuts the pencil line, the two points are level.

Fig. 6 shows, exaggerated, how the two

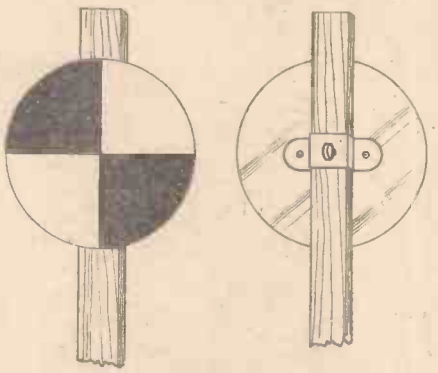


Fig. 7.—The circular metal target.

points are level, even though the telescope is pointing up, providing the two points are equidistant from the level. If now the instrument is set up a few feet behind one of the positions, and sights taken to the staff in both positions, the telescope can be adjusted until the same reading is obtained at both positions. This procedure should be repeated until it is certain that the line of sight, or line of collimation, as it is called, is dead level, when the screw can be tightened up and locked securely.

Using the Level

The easiest way of using the instrument, and one not liable to errors of reading figures, which is very easy, owing to the figures being viewed upside down in the telescope, is to use a staff, say 1½in. × 1in., and 5ft. or 6ft. long. A circular metal target 6in. or 8in. diameter and painted in segments as shown in Fig. 7, has a bridge piece on the back to slide up and down the staff, being adjusted to position by an assistant, and fixed with a screw in the bridge which tightens on to the staff. A strip of metal under the point of the screw prevents digging into the staff. The staff is held on the given datum, and the target adjusted to the height as seen through the telescope, and fixed by the screw. It is then transferred to the second position and held against a peg driven into the ground. The staff is raised or lowered until the target is again in register, the foot of the staff marked on to the peg, and the peg sawn off to the mark. When as many pegs as required have been levelled, they must be checked again to ensure that no movement has taken place in the level or tripod.

Horizontal angles can be taken by either the larger lower divided circle, or by the upper one, whichever is preferred. The upper circle is controlled by the milled knob at the side. Slopes or gradients are measured by the "LAT" adjustment. Each division on the arc equals 10 degrees and each division on the vernier knob equals one degree. Before gradients are measured, the upper horizontal circle must be adjusted so that the "True Bearing" arrow points to either 0 or 180 degrees, otherwise errors will arise.

The few hours spent in adapting this beautiful little instrument, and a further few pleasant hours spent in mastering its use, will result in the possession of a most useful and valuable levelling instrument, costing less than one pound complete, and capable of doing similar work to that of an instrument costing forty or fifty pounds.

The transit case supplied with the compass will not take the level after conversion. This can be overcome by unscrewing the bottom of the case, glueing and screwing 1½in. deep battens all round, and screwing the bottom on again. This makes the case 1½in. deeper, and a piece of thick felt or rubber sponge can be stuck on to the bottom to support the end of the telescope.

A Mercury Switch Relay

THE "Tiltray" relay has been designed to enable full advantage to be taken of the outstanding properties of the modern mercury switch, which include the ability to switch heavy and very inductive loads on both A.C. and D.C. and to perform millions of operations without the need for any maintenance.

Mercury switches will withstand inrush currents of many times their rating; will not ignite an explosive atmosphere and are unaffected by damp or corrosive conditions; require extremely little operating power and usually cost much less than an open switch to do the same job.

If the load is inductive, however, it is most essential that the switches are moved smoothly so that the mercury *flows* from one position to the other and is not splashed about so as to cause multiple make and break and, therefore, the production of unnecessary heat.

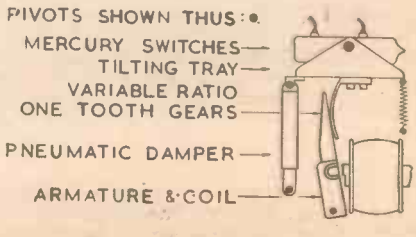
The usual design of a mercury switch relay in which the switch is directly connected to the armature will give sufficiently smooth action for the less inductive loads providing a weak coil is used, but this means that if the switches are at all heavy, the relay might not operate if the supply voltage drops significantly.

In the "Tiltray" design, however, the movement is so smooth that almost indefinite life is assured and very heavy, very inductive loads can be switched in perfect safety, even though the supply voltage falls or rises by as much as 30 per cent. The method of operation (provisional patents) can be seen from the sketch.

The switches are carried in a tilting tray pivoted at the optimum point for smooth mercury flow. The armature moves this tray by "variable ratio one-tooth gears" which drop the gear ratio as the armature accelerates towards the coil. The smoothing of the armature's acceleration curve thus produced is increased by the pneumatic damper, which also ensures that the tray is brought smoothly to rest.

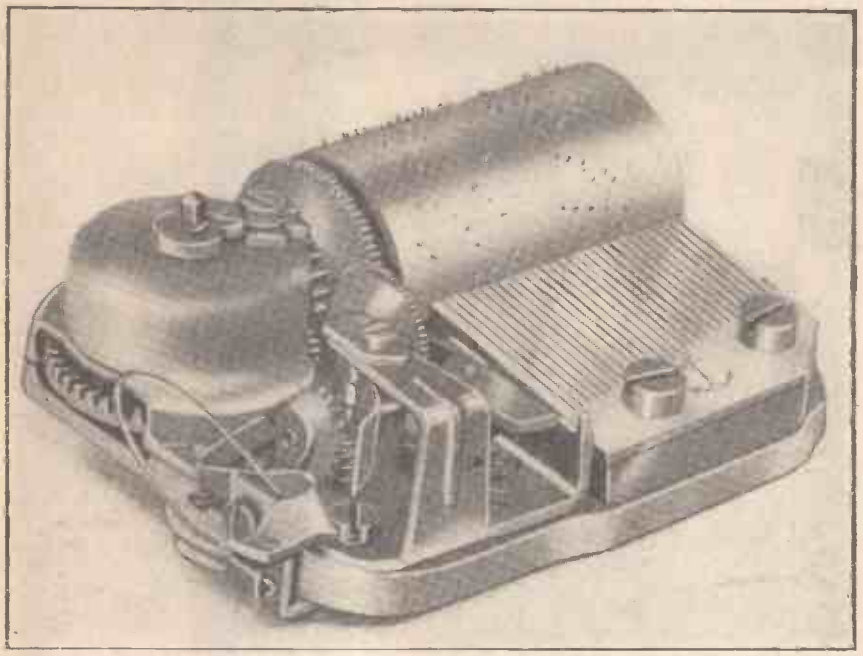
The relay-chassis employed is the patent B. & R. type "C," which gives inherently silent operation on A.C. and a coil consumption of 5-15 vA. on A.C. and ½-2 watts on D.C.

Any further information may be obtained from Messrs. Besson and Robinson, Ltd., 6, Government Buildings, Kidbrooke Park Road, London, S.E.3.



SCHEMATIC DIAGRAM OF CO6

Musical Boxes: Overhaul and Repair



A typical mechanism.

THE Swiss and the Germans were responsible for developing musical boxes, of which many fine and ingenious examples are in existence. There are those which play only a set tune or two tunes, those with large steel discs which will play as many tunes as one has discs, others where figures perform as the music is played, including singing birds and acting characters. A musical box preceded the gramophone as a form of home entertainment. The gramophone and other forms of mechanical entertainment have killed the demand for these remarkable mechanical devices. Since the war, however, there has been a revival in musical boxes somewhat smaller in size and incorporated in such things as ladies' vanity cases, flapjacks, jugs and cigarette boxes. In years gone by, musical watches which played a tune automatically every hour, or whenever a stud was pressed in the side of the case, were on the market. It is difficult to-day to get such musical movements repaired. This is somewhat surprising since the mechanism is extremely simple. The illustration at the top of this page is typical of the majority imported from Switzerland to-day. It consists of a mainspring in a barrel, driving a cylinder through simple gearing. On this rotating cylinder a number of pins are inserted at irregular intervals, corresponding to the tune or tunes it is designed to play. These pins come into contact with a comb or key-plate, lifting or plucking them to give the note. Each reed is individually tuned. They play both the air and the base. The speed is governed by a fan brake as on chiming clocks, and the mechanism is set in motion when the lid of the box is opened, the lid pressing on a plunger which acts on the fan brake. When the lid is opened this plunger is released and the mechanism is set in motion. In the case of musical jugs the plunger is in the base of the jug and the weight of the latter keeps it in contact with the brake. It is released as soon as the jug is lifted.

It will thus be seen that there is very little to go wrong, and the main troubles encountered are: sluggish action due to congealed oil or broken mainspring; broken pins on the cylinder or broken comb, so that some notes are missed.

Curing Sluggish Action

As far as sluggish movement is concerned, this may be remedied by immersing the whole movement, without taking it to pieces, in benzine and cleaning it with a reasonably stiff brush to remove all traces of dust and congealed oil. The movement should then be left to dry, and all the pivots and rotating parts oiled, smearing a little on the comb to prevent rusting. If it is necessary to remove the comb it must be carefully reset for depth of engagement with the pins, as too much lift may cause breakage of either pin and/or note. Place vaseline on the worm which drives the

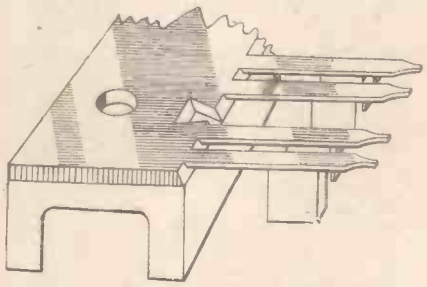


Fig. 1.—The dovetailed notch in the key-plate.

fan brake. A broken mainspring may, of course, be repaired in the ordinary way, but if the movement has stopped without the mainspring running down, do not forget to lift the pawl on the ratchet to let the spring down before dismantling the movement, otherwise pivots may become sheared and teeth distorted.

The following instructions relate to a complete overhaul, and are due to F. J. Britten.

First of all remove the comb or key-plate. Then let down the mainspring and see that the driving mechanism runs well, and that the cylinder, though free, has no end- or side-shake. The fly depth is important, for unless this runs smoothly and easily the movement will stop.

Replacing a Key

If there are one or more keys missing they may now be replaced in the following manner: At the point where the new key is to be toothed in, file a dovetailed notch in the key-plate (see Fig. 1). Then file up a key similar to the adjacent one, but rather full at one end and with a heel to fit into the notch. Harden the key and temper it. Drive it tightly into position, and to make it secure slightly rivet it or run a little solder into the joint by heating the spot with a blow-pipe or heavy soldering bit. Heat the comb as little as possible, and confine the heat to the place under repair. Now the key may be tuned, leaving it half a tone too high; for it is easier to lower than raise, and the damping spring will bring it down the half-tone or nearly so. Keys are lowered in tone by weighting them with lead near the point, and raised by thinning a little on the underside behind the lead. To get at the underside to file it, have a rectangular brass stake as wide as the key, and with a little ledge, as shown, on one side, hardly as high as the key is thick. Rest the top of the key to be filed on the stake (Fig. 2), holding the comb in the hand, so that there is enough weight resting on the stake to elevate that key above the rest, and then it can be filed in comfort, the ledge offering the requisite resistance to the file. If the key is near the middle of the comb it may be necessary to use a file with an *over* handle to it. When getting the point of the tooth to length, continually apply a glass surface plate or straight-edge along the tips, for it is essential that all the tips should be exactly in line.

If only the tip of the key is missing, it will not be necessary to replace a whole key, but merely to file a slit in the stump and let in a new point which may be fixed by soldering. The tip may be let down a little, by means of a blow-pipe, to enable the file to cut, but care should be taken not to soften the bending part of the key.

It is sometimes necessary to elevate or depress a key, or to make it point a little to the right or the left. Place the top of the comb on a steel stake or anvil, face downwards, and, to elevate a key, tap the under-surface gently with the hardened pene of a hammer so as to stretch it. In the same way, if a key is to be turned to the right, stretch the left edge. If a key is to be depressed, an expert will bend it with a smart blow of the hammer on the middle of the underside while it rests on the anvil, but this is risky and will often result in a broken key. It is better to stretch the upper surface of the key with light taps even though the marks show.

Adjusting the Key-plate

Now put the key-plate in position and see that the points of the keys are exactly in a line with the pins in the barrel, and if not, the cylinder bearings must be bent till this is

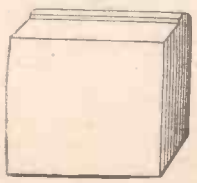


Fig. 2.—The Stake.

Fig. 3.—The free end of the damping spring should be as close as possible to the point of the key.

right. Then see to the damping springs and supply new ones where necessary, fixing them quite tight with the old pins. It will be observed that the thicker keys for the lower tones have heavier damping springs than the intermediate keys, while the highest notes are without dampers. Occasionally

some of the notes above the springs have dampers of quill. These are fixed with shellac dissolved in spirits of wine. The keyboard points not to the centre of the barrel, but above it, the proper elevation being about 15 deg. from the horizontal line. The free end of the damping spring should be as close as possible to the point of the key without touching it, shaped as shown in Fig. 3, so that the pin in the barrel touches the spring first at about the point indicated.

Adjusting the Springs

If the damping spring is too thin, it will fail to stop the vibrations of the key soon enough, and if too thick will create a buzzing noise just as the key leaves the pin. A spring may be thick enough and yet fail to stop the vibrations because it is not forward enough. The springs will be readily bent to position with a pair of tweezers.

To observe the action of the springs, place the key-plate in position and note first that it is the right height, as indicated by the dots on the cylinder. The shortest key should be on a level with the dots, and the longest one, which has more movement, about half a dot below it. To alter the height, the bearings of the cylinder may be raised or lowered as required.

To see if the key-plate is at the right distance from the pins, let the cylinder rotate slowly, and if the keys are not drawn up enough there will be but little sound, and the comb must be set a little closer to the cylinder by bending the feet of the base. If the sound is harsh and the dampers fail to stop the vibrations, the key-plate is already too close. If, in playing a tune, the notes at one end are produced too late, it shows that end of the key-plate is too close to the cylinder.

Let the box run through all its tunes, and if at any tune the pins do not pass exactly in the centre of the keys, the star wheel for that tune must be corrected. The drop from the highest to the lowest step of the snail, in time, causes an indentation in the latter, which may be filled by screwing into the face of the snail a piece of tempered steel to receive the blow of the pin. Any of the pins in the cylinder that are out of shape will be noted as the tunes run through, and carefully bent as required. New pins are formed with a pivot which fits tightly into the hole in the cylinder; the pin is driven in up to the shoulder, the part projecting being rather larger in diameter than the pivot.

Sometimes a buzzing noise is observed while the box is playing. This is generally caused by something loose. To discover it, sound each key by striking it with a suitable pointer till the buzzing is heard; then continue sounding that note while placing the hand on different likely parts of the box and mechanism till the buzzing is arrested, when an examination of the part will probably reveal a screw that requires tightening, or even the want of a drop of oil, which has been known to cause this disagreeable sound. In connection with these notes on musical boxes, I have to acknowledge the courtesy of Messrs. C. Paillard & Co., who have readily answered all my inquiries on the subject.

Making a Portable Heliograph

For Those Readers Interested in Signalling Work

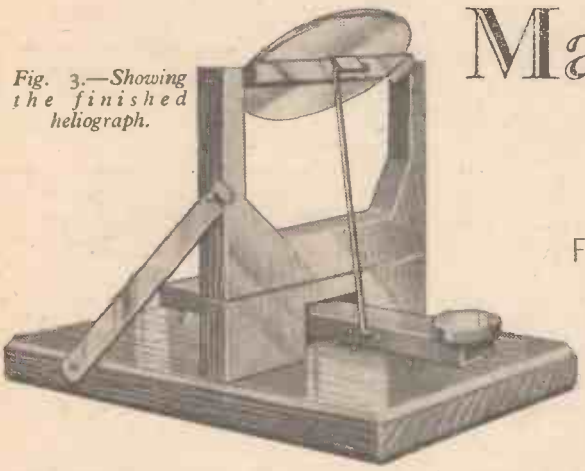


Fig. 3.—Showing the finished heliograph.

How it Works

READERS who are interested in signalling work, doubtless know that the heliograph is one of the instruments used in establishing communication between two parties at a distance from each other. The heliograph possesses several advantages, viz., portability, range, secrecy and rapidity. It is easily carried, being strapped round the waist or slung over the shoulder; with a 5in. diameter mirror it is possible to transmit a message seventy miles; the lateral range at six miles is only 50 yds. on either side, which equals about 8 yds. in a mile; it has great rapidity and it is possible for the signaller to keep up a high rate of speed; the bright flash of a heliograph can be readily picked up by any efficient reader of Morse, and it is easy with which to open up communication.

But for success in using the heliograph, sunshine is required, thus it is no good for a cloudy day; then it requires a fair amount of skill and continuous watchfulness to manipulate the mirror so that the "spot" is kept on. It is important to note in this respect that the beat must be kept regulated; you require a bigger beat for short distance, and a smaller beat for long distance.

The Theory of Heliography

The theory of the heliograph is simple enough to understand. It must be remembered that light travels in straight lines, called rays, and the first law is that the angle of incidence is equal to the angle of reflection; the second law is that the incident ray, the normal, and the reflected ray are always in the same plane. A ray from the sun striking the helio mirror will leave the mirror at the same angle. The incident ray is the line along which the light travels before striking the reflecting surface of the mirror and the reflected ray is the line along which the light travels after striking the reflecting surface; the normal is the line at right angles to the reflecting surface at the point where the ray strikes it. (See Fig. 1.)

The greater the angle of incidence and reflection, the less light you can get from your mirror. At early morning light travels through more atmosphere than at noon when

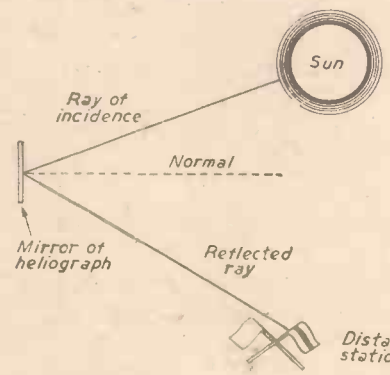


Fig. 1.—The principle of the heliograph shown diagrammatically.

the sun is directly overhead; thus you see that it is necessary to keep continually adjusting the mirror as the sunlight shifts onwards during the day. To keep this necessary adjustment, there is, in the centre of the reflecting mirror, an unsilvered spot, and the shadow of this spot must be kept aligned correctly.

Aligning

When using the jointed sighting rod, place the heliograph so that the signalling mirror is roughly half-way between the sun and the distant station with which you are communicating. Place the sighting arm in line with the distant station and clamp up tightly. Now, keeping your head quite still, move the jointed rod until the centre of the unsilvered spot, bisection of cross wires of the sighting rod, and the reflection of the distant station are in one line. When the sun and the position of the distant station are at such an angle to each other that it is impossible to use a single mirror and the sighting rod, another mirror, called the duplex mirror, is used in place of the sighting rod. The reflected ray is carried from the signalling mirror on to the duplex mirror and again reflected from that on to the distant station. (See Fig. 2.)

The signalling mirror is worked by a key, under which is a spring which forces the key back after it has been pressed by the signaller. The adjustment of the "spot," necessary to keep correct alignment, is made

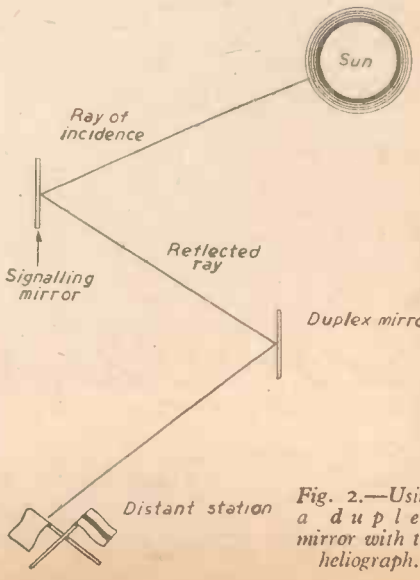


Fig. 2.—Using a duplex mirror with the heliograph.

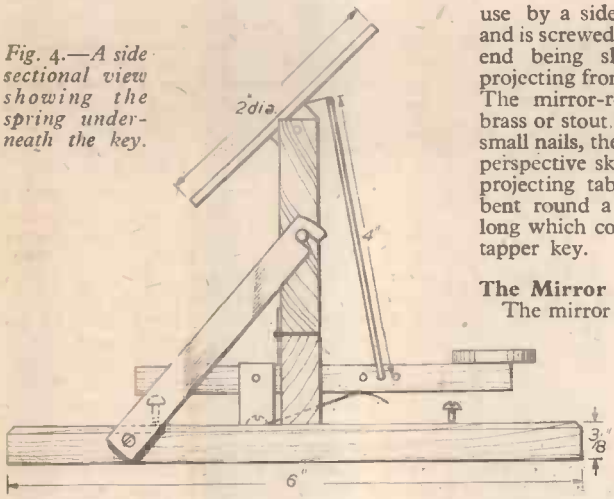


Fig. 4.—A side sectional view showing the spring underneath the key.

by an adjusting screw; and there is a beat-regulating screw for adjusting the beat of the key.

Making a Portable Heliograph

By means of a heliograph, messages in morse may be sent, during sunshine, over distances of many miles. The instrument described here is simple to make, and when not in use, may be folded and carried in the ruck-sack, etc.

Begin by cutting the base from ⅜in. wood to measure 6in. × 3¼in., as shown in Fig. 3, and the tapper key to the measurements given in Fig. 5. Glue a 1in. disc of wood at one end of the key, and at 1in. from the other end insert the pivot. This is a piece of nail having the head and point cut off. It fits tightly in the key, and projects ¼in. at each side. To the right of the pivot will be noticed three small holes. These are 3/16in. apart and should be drilled to admit a piece of stout wire easily but without shake. Fig. 5, also gives the measurements of the double bracket by which the key is fixed to the base. Cut it from stout brass, drill it and bend it at the dotted lines. The spring below the key (see Fig. 4) is a piece of clock spring. Soften one end by heating until red, then drill it to admit a round-headed screw which secures both the spring and the double bracket to the base. Two other screws project from the base, one below each end of the key. These regulate the movement of the key, the front screw being 3/16in. lower than the back screw.

The Mirror Support

The mirror support (Fig. 6) is made from two pieces of ⅜in. wood, hinged together. The lower piece, which is glued to the base, has a gap 1in. by ⅜in. cut out to allow it to bridge the key. The upper piece is held erect when in use by a side strut. This is cut from brass and is screwed to the side of the base, the upper end being slotted to engage with a nail projecting from the side of the mirror support. The mirror-rocker (Fig. 7) is made from brass or stout tin. Drill the ends to admit two small nails, then bend the strip as shown in the perspective sketch in Fig. 7. The end of the projecting tab at the middle of the strip is bent round a piece of stout wire about 5in. long which connects the mirror-rocker to the tapper key.

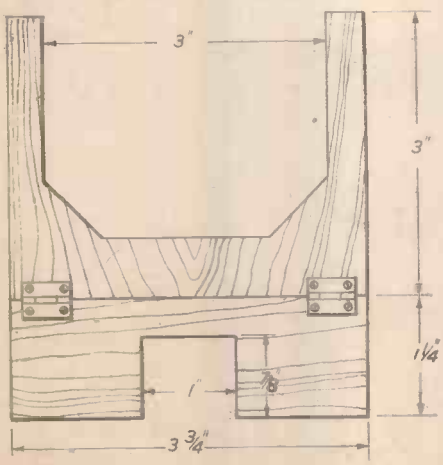


Fig. 6.—The mirror support.

The Mirror

The mirror is one of the tin-backed variety measuring about 2in. in diameter which may easily be obtained. Solder it to the rocker strip, but be careful not to use too much heat or you will crack the glass. Drill the ends of the uprights of the mirror support and insert two thin nails which form the pivots of the mirror. Hold the mirror at an angle of 45 degrees and bend the end of the connecting wire so that it will enter the middle hole of the three. Upon operating the key, the mirror will be "flicked" and in sunshine a distant observer will see a flash the duration of which denotes dash or dot. If the end of the wire is removed to either of the holes in the key the angle of the mirror is altered.

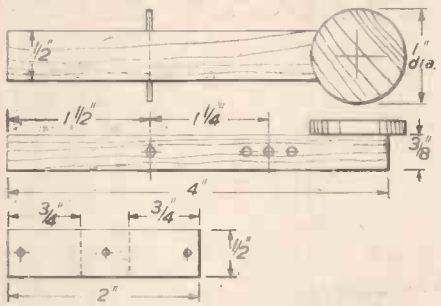


Fig. 5.—Details of the tapper key.

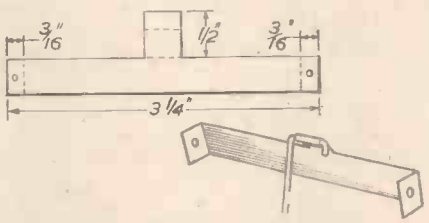


Fig. 7.—The mirror rocker.

New Printing Method

THE Standard Register Co., Dayton, Ohio, have recently announced a "revolutionary new method of printing, expected to have far-reaching effects both in reproduction of office records and in the graphic arts field."

A "Photronic Reproducer" has been developed, combining the principle of photography and electronics, to print instantaneously without physical contact with the paper. The paper used by the machine requires no special coating or treatment before or after reproduction.

Basically, the process consists of the use of a dye in the form of a mist which is propelled by electrostatic force on to the surface of the paper in the form of the image which is projected on to the paper by the apparatus.

Briefly, the light energy is converted into electrical energy which causes the dye to be deposited on the paper in relation to the amount of light which is projected on to it.

The Newton

THE International Electrical Technical Commission adopted in 1950 a new unit of force—the Newton. It has been recommended by the Institution of Electrical Engineers for use in universities and technical colleges. It is defined as a unit of force in the M.K.S. system (metre-kilogram-second) and is the force which causes 1 kilogramme to accelerate at 1 metre per second per second.

Iron That Bounces

ALTHOUGH it may sound incredible, iron that can twist, bend and bounce is now being produced in Britain.

It is made by adding small amounts of magnesium and nickel to ordinary iron. The iron is wear and heat resistant, and it bridges the gap between cast iron and steel.

New Insulating Material

A NEW insulating material that is inexpensive and provides excellent insulation against heat, cold and sound is now being manufactured in Scotland.

It is silky in appearance, and is made from a rock known as dolomite and a type of clay.

Petrol-saving Device

AN ingenious petrol-saving device is being experimented with by Polish motor-car engineers. The device, called the "Ozonisator," sends out ultra-violet rays, which convert part of the air taken in by the engine to ozone. Ozone causes complete combustion of the petrol and air mixture.

The "Ozonisator" is stated to save about 10 per cent. in petrol, which otherwise is not completely burnt in the engine.

The Profiloscope

A NEW profiloscope for measuring and inspecting the bores of dies down to 1-500in. in diameter has been developed by the Longworth Scientific Instrument Co., Ltd., Abingdon, Berkshire, in collaboration with the British Iron and Steel Research Association.

New Photographic Process

EASTMAN KODAK (U.S.A.) announce that they have recently developed a new technique by which sharply detailed negatives can be converted into effects like pen-and-ink drawings without extra art work.

Electric Buzzers, Bells and Chimes

Details of Some Simple Warning Devices

By "HOME ELECTRICIAN"

THE construction of buzzers, bells and chimes, such as those of two- or more note type, is interesting and does not present undue difficulty. Buzzers and bells have many applications, both in models and as signal or warning devices. They can also be used for code practice and similar purposes, and various methods of employing them will come to mind. Chimes of the simpler type are also well known, and often found instead of the buzzer type of doorbell because of their less strident characteristics. It is also comparatively easy to make up units which will ring a series of chimes, either for this purpose or for addition to clock circuits.

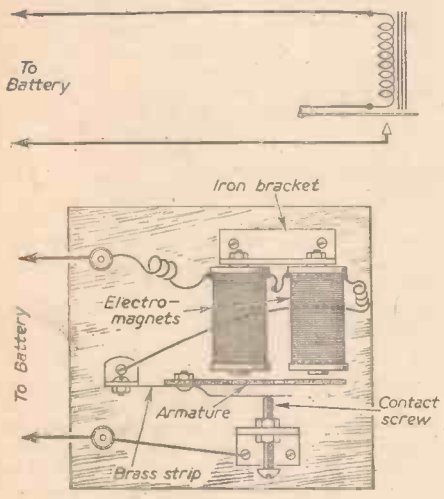


Fig. 1.—Circuit and plan of buzzer.

The circuit and layout of the usual type of bell and buzzer are shown in Fig. 1, and this type lends itself very readily to home construction. The circuit to the magnet windings is completed by the contact screw and strip to which the armature is secured, and is therefore broken when the armature is attracted towards the magnets. This sets up a very rapid vibration of the armature, the degree of movement being adjustable by altering the position of the contact screw and armature. With an electric bell a further flat spring strip projects from the free end of the armature, terminating in a small hammer which strikes a fixed gong or bell each time the armature vibrates.

Such a unit, either as buzzer or bell, can readily be made from odd parts. A single magnet may be used, but two are preferable. The cores may be made from iron bolts fitted with cheeks of any insulating material. For 3 volt to 6 volt operation 24 s.w.g. wire is suitable for the windings, each bobbin being wound to capacity. The ends of the windings must be so connected that the free ends of the cores have opposite magnetic polarity, and this will be so when the turns are wound on in opposite directions, the end of the first magnet winding being connected to the beginning of the second winding. A layer of insulation is required over the cores, to prevent possible shorting, if enamelled wire is used. For higher voltages or economical operation, 28 to 30 s.w.g. wire is satisfactory.

The armature must be of iron or other ferreous metal, and a suitable size is about 1¼in. to 2in. long, ¼in. to ½in. wide and 1/16in to ⅛in. thick. All other details of construction are apparent from the diagram.

Mains Operation

When a bell or buzzer is fitted up for regular use, mains operation is an added convenience, as battery replacements are avoided. The correct connections for such a circuit are shown in Fig. 2, and a few points require note if maximum safety and reliability are to be achieved.

The transformer should be of the proper "bell" type, or one equivalent to it. Wiring to the primary will be at mains voltage and should be installed accordingly, insulated cable of suitable type being used. The transformer may frequently be adjacent to the main distribution board and primary wiring is then very short. No means for interrupting the primary circuit is provided, since a correctly designed mains transformer consumes virtually no current when no load is applied to the secondary.

Wiring to secondary, bell and bell-push is of low-voltage type, and thin "bell wire" can be used. As with all such low-voltage circuits, the wiring should not be adjacent to mains voltage wiring, or run in the same conduit or channels as the latter. In order that the secondary circuit cannot become alive at mains voltage under conditions of fault, the core, frame and secondary of the transformer are wired to the mains earth point. If the secondary is not centre-tapped, one end is thus connected instead. The fuse in the secondary circuit can normally be of 2 to 5 amp. rating. If fuses are added in the primary circuit, they should be of low rating—½ amp. to 2 amps.

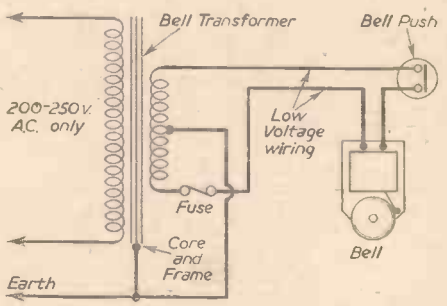


Fig. 2.—A.C. mains operation of bell or buzzer.

The usual output of such transformers is about 3, 5 and 8 volts. The higher voltage tappings are used to compensate for the voltage drop arising when leads to the bell or push are long. Transformers cannot be operated from D.C. mains.

Simple Door-chimes

The construction and operation of the simplest form of chime will become apparent from Fig. 3. The hammer is attached to a thin flat spring and is not normally in contact with the left-hand gong tube, the stop preventing further movement of the armature in this direction. When the push is depressed, the armature is drawn smartly to the right, so that the hammer strikes the right-hand gong tube. When the push is released, the armature springs to the left and the second tube is struck. As such pushes are usually depressed briefly this gives a two-note chime with the advantage of no electrical contactor or similar moving parts.

For a brisk movement, a strong magnet is necessary, and 18 or 20 s.w.g. wire can be used. Overheating of windings or transformer is unlikely because the circuit is completed very briefly. With a little adjustment, a strong action may readily be achieved.

The tubes should be of suitably resonant type, and these are usually best when freely suspended from one end. For a small chime, substitutes such as two cycle-bell tops of dissimilar note are quite satisfactory. This form of movement is also suitable for a "single note" bell, the bell being fitted in place of the right-hand gong tube. Such a bell strikes once only when the push is depressed and is preferable in some cases to the buzzer (continuous ringing) type.

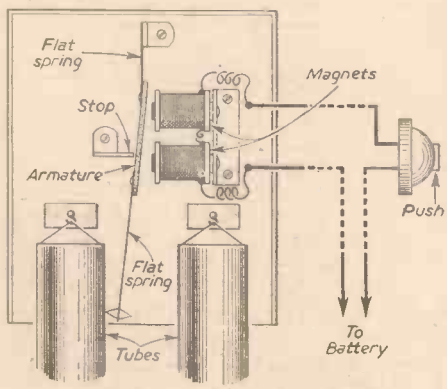


Fig. 3.—2-note door chime.

Sequence Chimers

These are most easily constructed by employing a small electric motor as illustrated in Fig. 4. Such chimers may use four, five, or more tubes of different note, and are set in operation by a momentary contact in the control circuit—which may be that to a door bell-push. The sequence arranged is then rung through to its end, even if the push is released.

The motor drives a long axle through worm

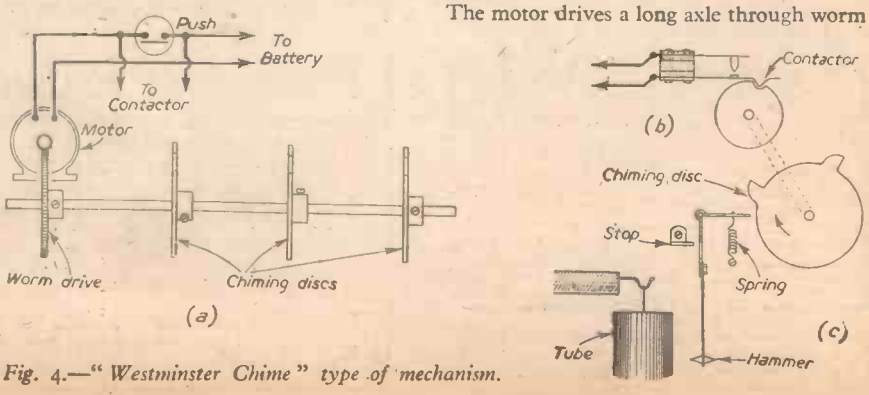


Fig. 4.—"Westminster Chime" type of mechanism.

or other gearing, as shown at A in Fig. 4. The number of chiming discs will depend upon the number of gong tubes, and each disc will usually have a different shape so that the tube is struck the desired number of times when the disc revolves.

The contactor, shown at B, is wired in parallel with the bell-push, the contacts normally being open because the notch in that near the disc shown fits in a similar notch in the disc. Immediately the push is operated, the contactor disc turns, thus bringing the contacts together. The motor, therefore, continues to run until the disc has rotated the full 360 degrees and has reached its original position, when the circuit is interrupted.

A suitable arrangement for the chiming discs, hammers and gong tubes is shown at C, two projections for two strokes of the hammer being shown. The other discs require to be made according to the timing and number of strokes for the sequence to be played. The correct position for all the projections may easily be found by drawing a large circle and dividing it into slightly more segments than the sequence of notes to be played. The notes may then be marked round to agree with the direction of rotation; e.g., C, C, E, E, A, C, B, and the position for the projections on each disc marked off. (Some free space is left for the zero or stopping position of contactor disc and chiming discs.)

The power required to turn such a chimer is not great and the motor may be battery or mains operated. In the latter case it should be of the type with a wound field and armature, drawing current from a suitable transformer. Permanent magnet motors may, however, be used with batteries, or from A.C. mains transformer with rectifier.

If two or more dissimilar sequences of chimes are wanted, the contactor disc should be notched accordingly and extra projections provided on the chiming discs. For example, with four notches in the contactor disc and suitably shaped chiming discs, four sequences may be played, separately, for each revolution of the shaft. This is suitable for ¼ hour, ½ hour, ¾ hour and hour positions with a clock. But for a door chime the arrangement adopted can be that in Fig. 4.

An ex-Government altimeter with millibar scale visible through window in dial.

An Altimeter/barometer Conversion

Converting an ex-Government Altimeter to Give Barometer Readings

By C. W. TINSON

INSTRUMENTS of the "sensitive" type are quite suitable for conversion to barometers, but the ordinary altimeter is not so good, as will be appreciated from what follows.

Altimeters of the sensitive type are:

Mark 19A ... —1,000ft. to 60,000ft.
Mark 20A ... —1,000ft. to 35,000ft.
Mark 20C ... —1,000ft. to 50,000ft.

and the dial calibrations are sufficiently open to permit reading an altitude difference of 25ft.—a difference of about .03in. of mercury.

Zero Adjustment

Zero adjustment can be obtained through a knob which is geared also to a rotating scale of millibars seen through a window in the dial, so as to permit altering the indication of pressure in millibars at which the pointers register zero. It follows, therefore, that if the millibar scale is set to register the pressure obtaining at a given place (the pilot radios onwards to ask control to ascertain what the millibar reading is at that aerodrome) the pointers will then show the height of the aircraft in relation to that particular place. The long pointer makes one revolution for every 1,000ft. of altitude, about 1in. of mercury.

For a barometer application it is usually required to register changes of pressure with reference to a standard pressure of 29.921in. (760 mm.) of mercury at a standard air temperature of +15 deg. C.(59 deg. F.), these conditions corresponding to "standard sea level." The millibar equivalent of this pressure is 1,013.3.

It is desirable to make a new dial face to show inches of mercury instead of altitude in feet, otherwise a conversion table must be used to give barometer readings. The accompanying table, taken from N.A.C.A. Report No. 218 on the International Standard Atmosphere, will enable you to calibrate a new dial, make a paper face to stick on the existing dial, or to prepare a conversion table.

The bezel is secured to the instrument case by eight countersunk-head screws and nut plates and the adjusting knob to its square-ended arbor by a screw.

To keep dust out of the instrument it is as well to plug the static connection with a plug having a tiny leak-hole in it, so that the instrument is able to breathe, for if the static connection were completely blocked, false readings would result.

CONVERSION: MILLIBARS TO INS. MERCURY

Mb.	ins.	Mb.	ins.	Mb.	ins.	Mb.	ins.	Mb.	ins.
984	29.06	998	29.47	1,012	29.88	1,026	30.30	1,040	30.71
985	29.09	999	29.50	1,013	29.91	1,027	30.33	1,041	30.74
986	29.12	1,000	29.53	1,014	29.94	1,028	30.36	1,042	30.77
987	29.15	1,001	29.56	1,015	29.97	1,029	30.39	1,043	30.80
988	29.18	1,002	29.59	1,016	30.00	1,030	30.42	1,044	30.83
989	29.21	1,003	29.62	1,017	30.03	1,031	30.45	1,045	30.86
990	29.23	1,004	29.65	1,018	30.06	1,032	30.47	1,046	30.89
991	29.26	1,005	29.68	1,019	30.09	1,033	30.50	1,047	30.92
992	29.29	1,006	29.71	1,020	30.12	1,034	30.53	1,048	30.95
993	29.32	1,007	29.74	1,021	30.15	1,035	30.56	1,049	30.98
994	29.35	1,008	29.77	1,022	30.18	1,036	30.59	1,050	31.01
995	29.38	1,009	29.80	1,023	30.21	1,037	30.62	1,051	31.04
996	29.41	1,010	29.83	1,024	30.24	1,038	30.65	1,052	31.07
997	29.44	1,011	29.85	1,025	30.27	1,039	30.68	1,053	31.10

CONVERSION: HEIGHT TO INS. MERCURY

Height ft.	Pressure ins. Mercury		Height ft.	Pressure ins. Mercury		Height ft.	Pressure ins. Mercury
−3,000	33.31		200	29.71	CHANGE	3,400	26.42
−2,800	33.08		400	29.49		3,600	26.23
−2,600	32.84		600	29.28		3,800	26.03
−2,400	32.61		800	29.07	RAIN	4,000	25.84
−2,200	32.38		1,000	28.86		4,200	25.65
−2,000	32.15		1,200	28.65		4,400	25.46
−1,800	31.92		1,400	28.44	STORMY	4,600	25.27
−1,600	31.69		1,600	28.23		4,800	25.08
−1,400	31.47	VERY DRY	1,800	28.02		5,000	24.89
−1,200	31.24		2,000	27.82			
−1,000	31.02		2,200	27.62			
− 800	30.80		2,400	27.41			
− 600	30.58	FAIR	2,600	27.21			
− 400	30.36		2,800	27.01			
− 200	30.14	RANGE	3,000	26.81			
S.L.=0	29.921		3,200	26.62			

The usual inscription on a barometer is given here.

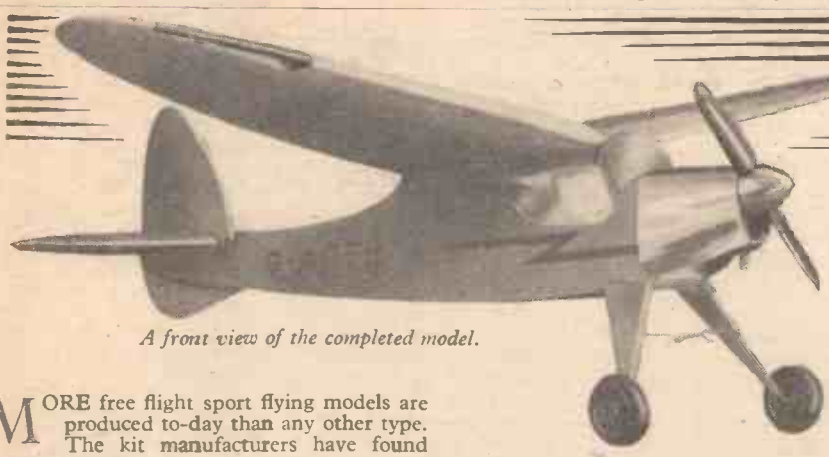
BRITISH STANDARD

THE British Standards Institution has just issued a revision of B.S. 771 "Synthetic resin (phenolic) moulding materials," which was originally published in 1938 and the first revision of which was published in 1948. The present revision involves only small changes in levels of quality, generally towards high quality. It also prescribes for the following properties of eight types of phenolic moulding materials:—Impact strength, surface resistivity after immersion in water, volume resistivity, heat resistance, power factor, permittivity, tensile strength, water absorption.

Copies may be obtained from the British Standards Institution, British Standards House 2, Park Street, London, W.1, price 6s.

THE PM M

A Power-driven Model Aeroplane for



A front view of the completed model.

MORE free flight sport flying models are produced to-day than any other type. The kit manufacturers have found this to be true.

Sport flying, or flying for fun, requires a model that should possess three main factors, which are, realistic appearance on the ground and in the air consistent with good and realistic performance, great stability and robustness for a long life.

The little "Meteorite" was designed around these considerations to suit the highly popular class of 1½ c.c. to 1 c.c. diesel engines available on the market to-day. This size of engine is cheap to buy, well developed, and provides a model of small proportions that is simple to transport.

The discerning modellist will note that although the wingspan is only 45½in., the elliptical wing has a large centre-section chord, and gives a large area, that, in turn, provides reasonably slow speed flight. This low wing loading makes a low-powered engine's task easy, rather on the powered glider principle. It also makes it possible to employ more robust construction than is normally used. The "Meteorite" has proved itself by many hours flying in all sorts of weather. It is exceedingly stable if built and rigged correctly. Last year I fitted a very light E.D. "soft" valve Mark III radio receiver into the model, which performed well, powered by a Mills 1-3 c.c. diesel motor and a low pitched propeller.

In order to provide a long life, the fuselage is covered with sheet balsa and finally with silk or nylon. It is possible to cover the balsa with paper, but it is not so robust. The system of building is exceedingly simple, making up the fuselage sides on balsa sheet. The "Bowden type" wing tip slots, introduced a number of years ago in the model field, make for exceptionally stable flight in windy weather. They permit slight over-elevation of the model, which can then glide down and land nose well up very lightly. The engine mount is detachable and can be altered for length if necessary to cope with varying engine weights. I have found that the model flies very nicely powered by a Mills 1-3 c.c. diesel, or an E.D. 1½ c.c. diesel. It has also flown a lot on the old Frog 1 c.c. diesel, and a 1 c.c. E.D. Bee. Naturally, the 1 c.c. motors have a lower rate of climb and the propeller must be a good one with thin blades, approximate diameter of 8in. to 9in., and a 4in. or 5in. pitch. Strangely enough, one of the best performing motors on this model, that has reached some tremendous altitudes has been the old 1 c.c. Frog.

The Bowden "Meteorite," diesel powered, sport flyer of 45½in. span is a robust, very stable, all-weather aeroplane that can be powered by any of the good 1½ - 1 c.c. motors, and is shown in the left hand heading photograph. On the right is a rear view of the little "Meteorite," showing the simple but practical realistic lines of the model. Should the reader later wish to fit this machine with radio of the light-weight type, the receiver and batteries can be arranged on sponge rubber over the centre of gravity position, so that the model balances, as shown on the general arrangement drawing Fig. 1.

Building the Fuselage

If the fuselage is built with the exact side elevation lines, shown on the general plan, Fig. 1, the correct angles of mainplane and tail will automatically be built in, thus providing good longitudinal stability. Only very slight adjustments will then be required to cope with slight differences in building weights produced by different people and grades of balsa wood. No two model aircraft ever seem to come out exactly the same, built on a kitchen table. For one thing, balsa wood of certain specified dimensions that is purchased has slightly different weights. Furthermore people use different amounts of cement, plastic wood, engines, and so on. However, as long as the side elevation of the model is faithfully copied, and all wings, tail surfaces and fin are not twisted or warped, and are set up in alignment, there should be no difficulty in flight. Let us study the outline drawing, Fig. 1, and the sketches and photographs showing fuselage construction stage by stage.

The E. D. Mark Diesel En

First, place the three-times enlarged drawing on a table or building board, then below the fuselage drawing, place ⅛in. thick sheet balsa, carefully butted up at the edges of each plank. Generally, it is possible to purchase planks 3ft. long by 3in. wide. Now insert sheets of carbon copying paper between the balsa sheet and the plan and carefully trace the outline of the fuselage on to the balsa sheet. If this outline is correct according to plan, the angles of attack of wing and tail will be built into the machine. Should any difficulty be experienced in enlarging the plan, this and a kit can now be obtained from

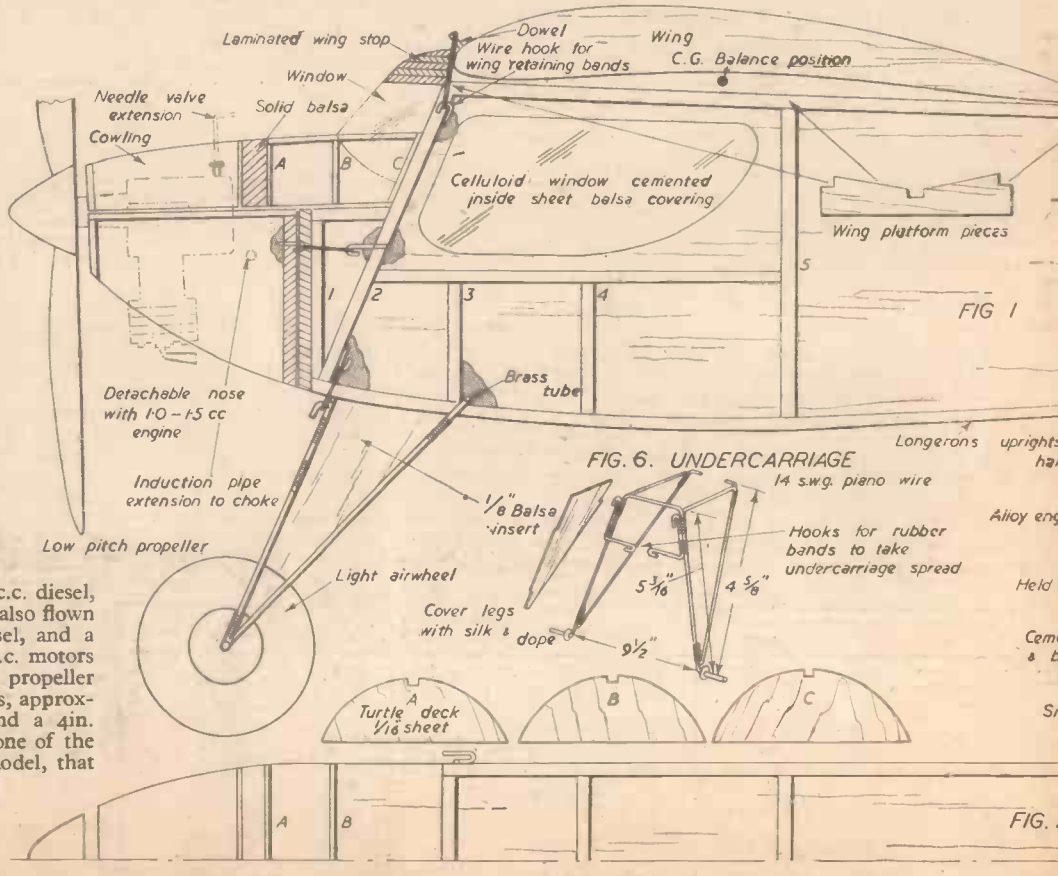


Fig. 1.—The general arrangement drawing. Fig. 2.—Plan view of the top and bottom of fuselage. Fig. 8.—The engine mount.

Meteorite

the Popular Small Diesel Engines

By C. E. BOWDEN

"B" 1 c.c. engine.

A rear view of the "Meteorite."

Messrs. B. M. Models, 43, Westover Road, Bournemouth.

Now cement the edges of the butt-jointed planks and let the cement dry, after which cut around the drawn-out side of the fuselage with a safety razor blade of the type that has one edge protected, such as the "Valet." You then have a fuselage side with window made in thin 1/16 in. sheet balsa. Make a second side. Lay these on to the building board, as shown in Fig. 7 and Fig. 7A, being careful to place the two sides looking inwards at each other.

Now cement longerons of 3/16 in. by 1/16 in. balsa (and uprights where shown) around the edges on to the balsa sheet sides. Fig. 7A shows one side completed in this manner, and the other side waiting for attention, with its belly facing the first side's belly, so that when completed it will have its longerons facing "inside" the fuselage. Whilst the cement is drying use women's household pins to keep the balsa sticks in position. These pins are removed when the cement is set. Crack the balsa sticks where they curve sharply. The cement and balsa sheet backing strengthen up the cracks. In this photograph do not get confused by the greater number of uprights visible than on the plan. The photograph was taken of a slightly longer model made on the same lines, although the principle is the same.

The next action is to place the two sides upright side by side, after having cemented in celluloid windows (temporarily retaining the celluloid with pins on a flat table until dry). If you have no eye for squaring things up, a rectangular template can be made of cardboard. Cement in the top and bottom fuselage crosspieces of the same section balsa as the longerons, see Fig. 2, fully driving home the pins through the longerons into the crosspiece ends to keep the two sides firmly joined together. I always leave these pins in, but withdraw all other pins during construction. Pins form a wonderful way of holding balsa structures in position until the cement has set. (See sketch Fig. 7 and photograph Fig. 7B.)

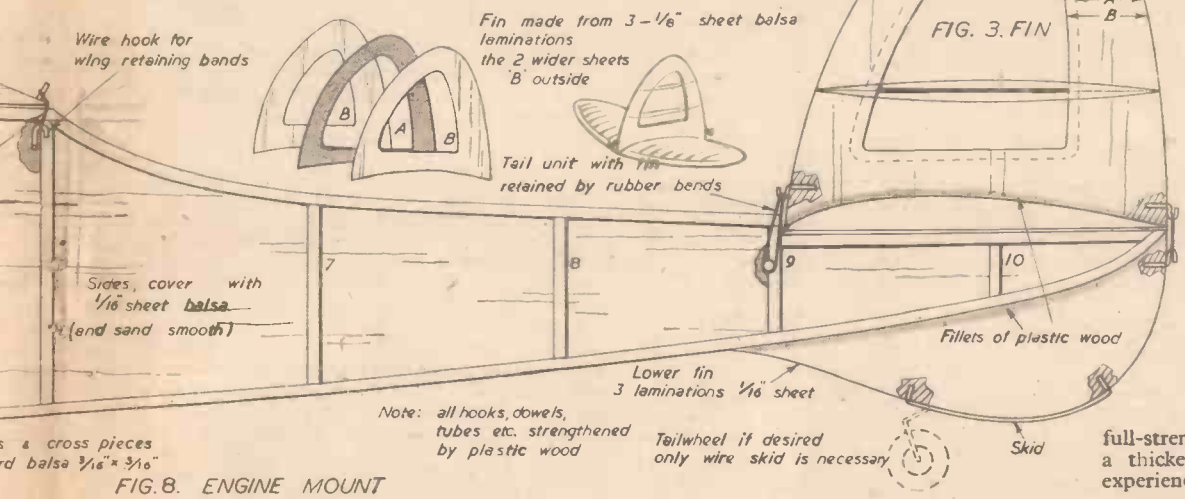
Now cover the top and bottom of the fuselage with 1/16 in. lightweight balsa sheet, temporarily pinned, as seen in Fig. 7C. Then cement in all wire hooks, as shown in the main drawing, Fig. 1. *These hooks must have plenty of plastic wood smeared around their intersection points with the fuselage sides.*

The greater the spread of plastic wood, the better the local load is spread on to the fuselage sides. Wire hooks take stresses and blows as they hold on wing, tail and engine nose, etc., by rubber bands. Do not spare the plastic wood at these highly-stressed points if you want a long-life model. My particular "Meteorite" has flown for several years now without any trouble, having landed in some queer places, and I know of a local club member who has won several competitions with a replica that has flown for four years without any repairs worth mentioning. The model can be almost indestructible when flown if reasonable care is given to the trim before flight, and if built properly, which is more than can be claimed for any of the normal type of models with open work paper-covered fuselages!

Now withdraw all pins and sand down smooth, as seen in Fig. 7D. Then build on the turtle deck and "ledge," as seen in Fig. 7 (stage 3), and also in Fig. 7E. One point I should have stressed is the importance of giving a very adequate amount of plastic wood reinforcement to the rear undercarriage brass tube, and the hooks of 14 s.w.g. wire, because this is an obviously highly stressed fitting. I find that it is always best to make each pair of wire hooks from one piece of wire that carries across the fuselage to the other side, and not in two separate hooks. This system stiffens the fuselage because the plastic wood reinforcement creates a rigid structure.

The fuselage can now be covered with thin silk, thin nylon, or even thin butter muslin, using photopaste as an adhesive smeared lightly on to the balsa sheet covering. Then dope with one thick coat of clear *full-strength* Cellon tautening dope, well flowed on.

I never use any "model dope" on any of my power or radio models. It does not provide sufficient rigidity, or weather-proofness for my purposes. Some model firms sell what they term full-strength dope, which is, in reality, a thicker model dope. It is not in my experience suitable for power models of



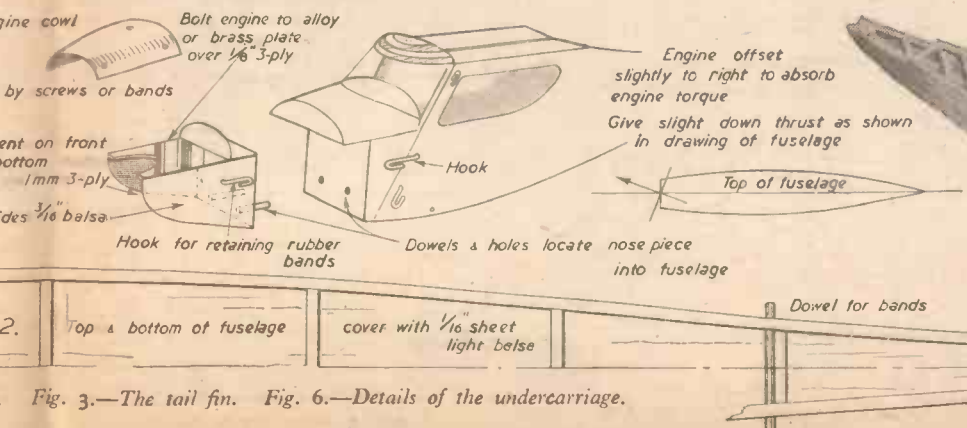
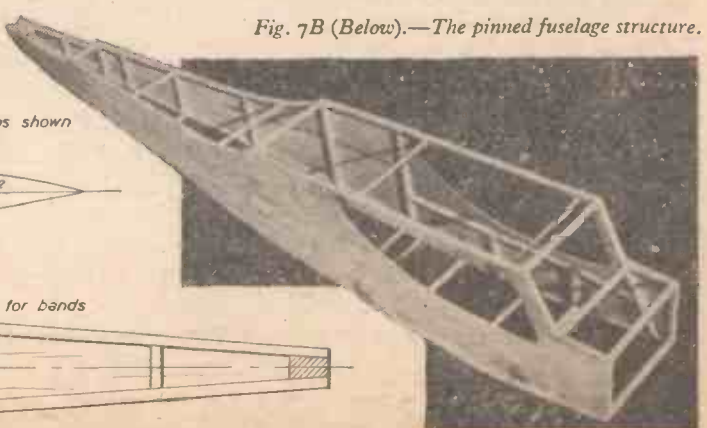


FIG. 8. ENGINE MOUNT

Fig. 3.—The tail fin. Fig. 6.—Details of the undercarriage.

Fig. 7B (Below).—The pinned fuselage structure.



the more robust fabric covered type that I design. The correct dope is Cellon tautening dope, No. D.L.5141. This is also magnificent stuff for weatherproofing powered seaplanes. Large radio models are as weatherproof as full-size machines, although considerably less dope is used. You can then use one or two coats of Cellon coloured dope to suit your tastes. I use white colour, for it is distinctive and shows up well in the air.

Make the undercarriage of 14 s.w.g. piano wire as shown in Fig. 6 and Fig. 7E. It will be observed that the undercarriage rear leg prongs slide into a brass tube located in the fuselage, whilst the front of the undercarriage rests up against the bottom of the fuselage, being held in position by rubber bands to wire hooks. It can therefore spring backwards against the rubber tension on landing, and the central rubber bands across the tie bar between the two front legs allow for controlled lateral spread. If the rubber tensioning is correct, this undercarriage can absorb a lot of punishment should hard landings occur through poor glide trim by a learner owner. Fill in the wire legs with balsa sheet, sand smooth, cover with silk and dope well. Use light M.S. or Caton airwheels.

I usually add a small piece of 1 mm. three-ply to the bottom of the fuselage just where the wire crossbar bears against the bottom planking. On large models I have recently covered the forward bottom of the fuselages with fibre-glass which provides a light but terrifically strong armoured bottom to the fuselage.

Covering Material

I stipulate silk, nylon, or butter muslin (light weight) for covering even this small model, because experience has shown me what a great lasting value such coverings impart, and the model was designed to carry the slight extra load. I have no use whatsoever for paper covering for powered models, and particularly is this true in the case of radio models. I always build to last for years instead of risking disintegration by overpowering and under-covering the models I designed. Light silk is the best for little models like the "Meteorite," whilst nylon or butter muslin is best for larger models. Photopaste is used for an adhesive for all coverings of fabric.

Silk is covered damp, and so is nylon, whilst butter muslin is put on dry. Nylon has the disadvantage of slacking off slightly in damp weather and rain even when well doped.

Building and Covering the Wings and Tail Unit

The wings and tail are made up on similar lines and are both elliptical in shape, thus providing a large area for a short span. Let us look at the tail unit first, for its construction forms a lesson to the beginner before launching into construction of the larger wing. Refer to the detailed drawing, Fig. 5, for rib shape and tail dimensions.

First, cut out all ribs, numbering them in pairs, by tracing their shape

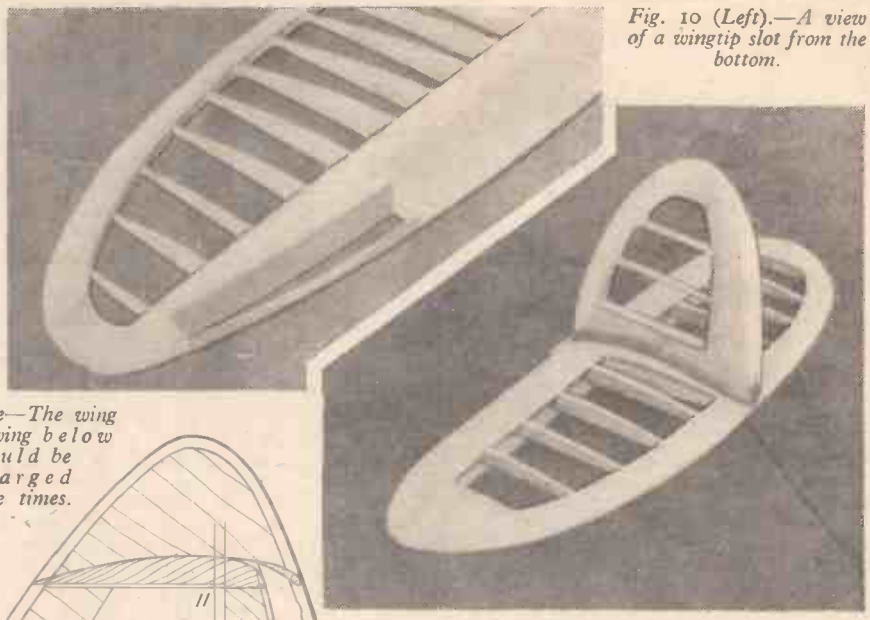


Fig. 10 (Left).—A view of a wingtip slot from the bottom.

Note—The wing drawing below should be enlarged three times.

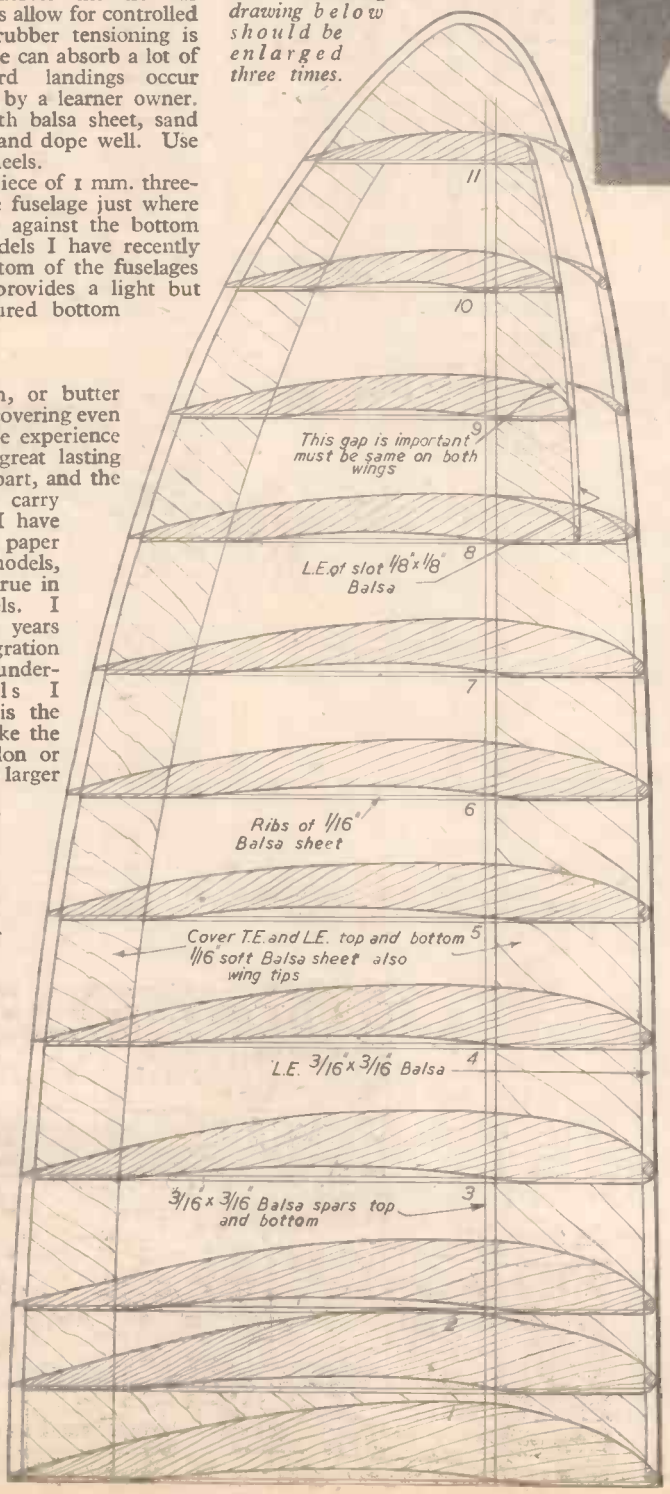


Fig. 9. (Above).—The completed tailplane.
Fig. 4 (Left).—Constructional details of the wing.

on to 1/16in. sheet balsa. Then trace the trailing edge sheet covering and cut out. Now cement the ribs on to this outline over the plan, with a piece of greaseproof transparent paper interposed between plan and work. Then cement around the edge of the elliptical shape, the leading edge spar and trailing edge spar, using the usual temporary pin retention.

When the cement is dry, shape the leading edge and trailing edge by razor blade, and sandpaper smooth. Then cement on the top covering of sheet balsa that can be seen in the photograph, again using pins to keep the sheet in position until the cement sets, then withdraw. You now have a tailplane as seen in Fig. 9, after sanding smooth all over.

The fin is laminated as described in the insert sketch on the main drawing Fig. 1. It is cemented on dead fore and aft, and vertically upright, to the top of the tailplane as seen in Fig. 9, with a little filleting of plastic wood along the bottom of the fin. We now have a complete detachable tail unit which, after covering with silk, can be held to the fuselage tail platform by rubber bands. Cover with damp silk, water sprayed, allow to dry and tauten up, and then apply one thick flowing coat of glider full-strength dope. Do not work the dope heavily, flow it on and leave. If the silk is gently pulled tight, *but not taut*, the water spraying will take up any little wrinkles as it dries. If over-stretched, as some people try to do, distortion and folds occur. Covering is a very simple art, but one many people fall down on because they set about it the wrong way. First, smear the outline structure with photopaste. Lay on the silk dry, and gently pull up quite evenly, lightly sticking down to the framework. Now snip a small edge all

Fig. 8A.—The completed engine housing.

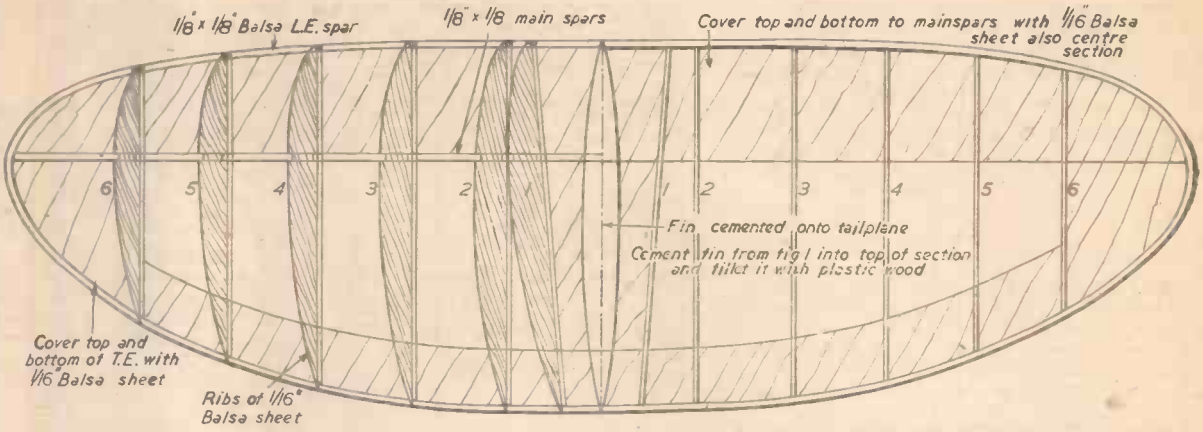


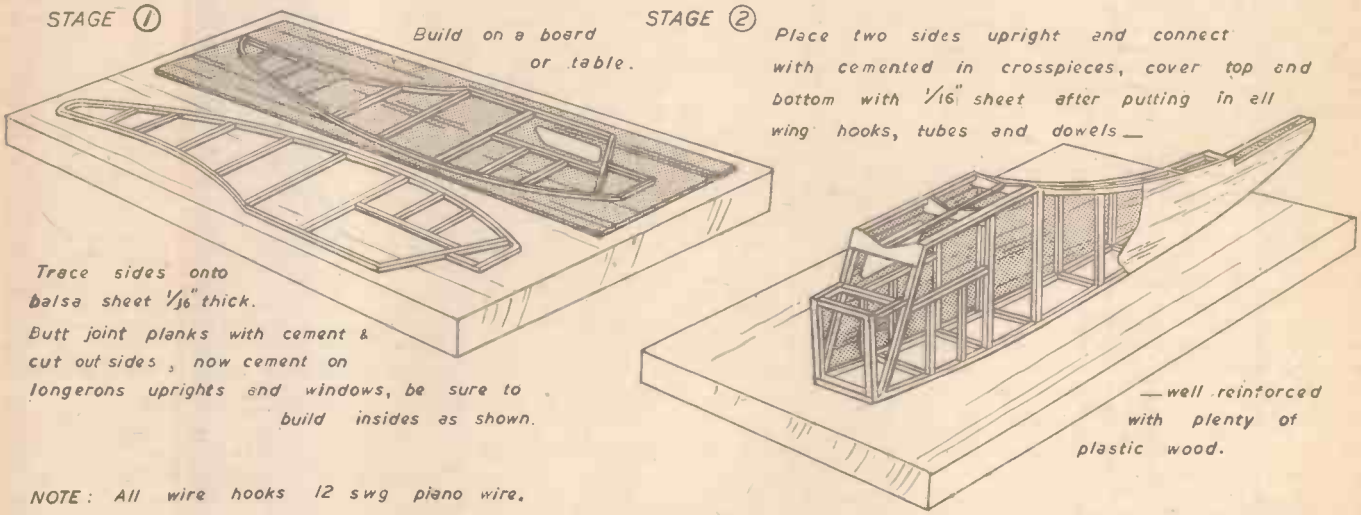
Fig. 5.—General drawing giving rib shape and dimensions. This drawing is one-third full size and must be enlarged three times.

round for overlapping. Then spray water on to the silk evenly from a scent spray. Then *gently* repull up the silk quite evenly all round and, with adequate photopaste, stick over the edges around the tail unit. Leave the tail to dry out, and the water will rectify any little mistakes you have made as it tautens the silk up, as it dries off.

Whilst this is going on, watch that no twisting takes place, and weight down to a flat board if necessary just before the final dry off. Now dope as already described when absolutely dry. It is the smooth flowing on of the dope without working in unduly that gives the final finish. Light hands are required here and a softish brush of wide shape. Put weights on and leave overnight as the final setting of the dope takes place. Leave for about 24 hours and you have a real long life surface. The full-strength dope will give you a surface that is durable, as on a real aeroplane.

The wings are built in the same general manner as the tailplane, after cutting out the ribs as shown in Fig. 4, the detailed drawing. Build over the drawing in two halves, with greaseproof paper interposed between work and drawing. I cement the trailing edge spar of $\frac{1}{4}$in. by $\frac{1}{8}$in. balsa to the rear of the balsa sheet bottom trailing edge covering, and then cement the ribs into position over the plan on to the lower main spar and then this trailing edge covering, butting up to the T.E. spar. I then cement in the leading edge balsa spar and the top main spar. The fore balsa $\frac{1}{16}$in. sheet covering top and bottom is cemented on last from L.E. to main spars.

(To be continued)



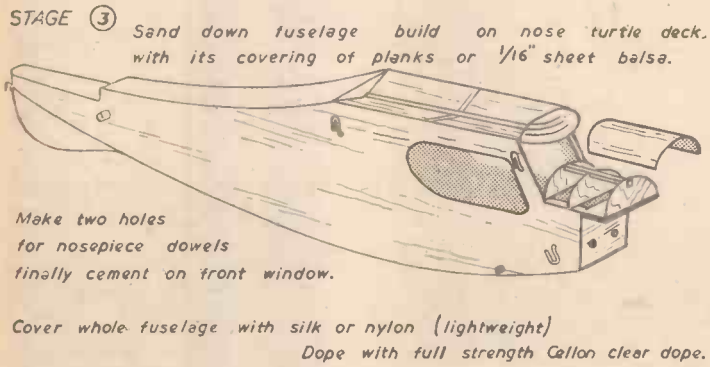


Fig. 7. (Above and left).—Three stages in assembling the fuselage.

Fig. 7A (Below).—Constructing the sides of the fuselage.

Fig. 7E (Left).—The turtle deck and ledge.
Fig. 7D (Below).—The fuselage sanded down smooth.

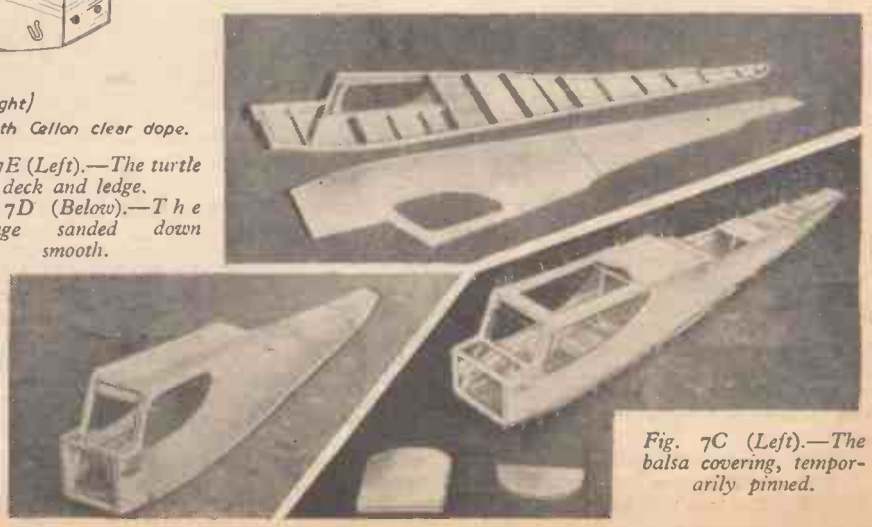


Fig. 7C (Left).—The balsa covering, temporarily pinned.

ASTRONOMY

1.—The Origin and Evolution of the Solar System

By E. W. TWINING

(Illustrated with Drawings by the Author)

FROM the time that the French astronomer Laplace propounded his theory of the birth of our Solar system, that theory has been accepted and believed in, until comparatively recent times. It was certainly accepted until twenty or thirty years

Fig. 1.—The great nebula in Orion.

ago. The theory is that a vast mist or gas extended for millions of miles into the limitless space of the heavens and glowed with incandescent heat; that this mist, due to shrinkage, began to revolve, cooling as it spun and still shrinking towards its centre as it cooled. This continued shrinking caused a still more rapid spinning, and then the enormous centrifugal force generated overcame the shrinking action, and a ring, or sometimes a portion of a ring, was flung off from the mass. Continued shrinkage, coupled with accelerated velocity, caused still other rings and masses to be thrown off. Each of these rings contracted and, in time, formed globes about the densest parts. These globes have spectroscopically all the characteristics, as they would naturally have, of stars, since they are formed from the same material as the central nucleus. The globes were surrounded by stray, cooling and spinning, masses and these masses revolved around their parent globes and, in short, became satellites to the globes which with continued shrinkage and cooling became planets. On a scale far more vast than our own, other solar systems are being formed in regions of the heavens millions on millions of miles away.

Modern Ideas

Such was the theory that was once held and, up to a point, is held by modern astronomers today. But the point at which modern thought breaks away from the old theory is that many scientists no longer believe that the spirals are members of our own galaxy of stars. They believe that far beyond the stars which we normally see on a clear frosty night, and which we refer to as the star galaxy, there are other galaxies, hundreds of them, and that all the objects which we used to call "spiral nebulae" are these other star galaxies. They rather naïvely, as I think, admit that our own galaxy is one of the largest, if not the largest.

This article is not concerned with stars in general, either single or binarics, nor with their structure. I shall ignore the atoms, the helium, carbon and the hydrogen, of which they are composed and on which they continue to exist. Stellar evolution is also outside the scope of this article, except in so far as our sun and similar suns with planetary systems are affected.

Whether there are other galaxies besides our own I do not know, but if there are any, I do not think they can be seen, nor yet photographed. I can see no reason to suppose that there are any others. I believe there is only one galaxy, and that it lies in a flat plane, extending out to the Milky Way and to the remote confines of the universe, which means that all spirals and star clusters are in our own galaxy.

The present-day astronomers tell us that all the spiral formations, which were once known as spiral nebulae, are galaxies, although each one has a large and brilliant nucleus

Fig. 2.—The great spiral in Andromeda.

which must be one star or a mass of stars. If these are galaxies, where is the nucleus of our own galaxy? We do not appear to have one. And what of the Milky Way? All the spirals seem to be very much nearer to us than the myriads of stars composing it. Can anyone looking at the great spiral in Andromeda, Fig. 2, or an accurate drawing or photograph of it, see any similarity between it and our own galaxy of stars? There is in its centre a great glowing star or cluster of stars the like of which is, apparently, entirely absent from our galaxy. Then beside this there is the obvious fact that the whole disc in Andromeda (it is a disc seen obliquely) is in violent whirling motion. If we look in either direction at right angles to the flat plane of the Milky Way, we see only a comparatively few stars; they are more numerous in the line of the plane, but nowhere is there seen a nucleus such as we see in the great spiral in Andromeda. It has been said that the nucleus of our galaxy is hidden by clouds of dust, haze and interstellar smoke, which lies thick in or near the centre, but I cannot accept this, neither do I believe that our sun is moving in a main "traffic-way" which is forming a part of a circular path, as we see is happening with the outer components in the Andromeda spiral. If we had such a nucleus to our galaxy, as the Andromeda spiral has, there would be some visible evidence of it, and no such evidence exists. If a nucleus existed, it would be so vast that no accumulation of dust could completely hide the whole of it. As regards the belief in a curved traffic-way, astronomers only fancy that they find evidence of spiral arms in the lay-out of the stars; they have, up to the present time, no reliable evidence.

The foregoing are my arguments for returning to, or not departing from, the theory that the spirals are the origin of planetary systems and that they are not nearly so remote as regards distance as the modern astronomer thinks they are.

By such a process do I believe that our sun, and the planets revolving around him, became evolved. In only one respect do I think that the old spiral theory for accounting for the evolution of planetary systems was in error, and to that I will refer presently.

The Formation of our Solar System

Going back to the commencement of the process, we have a vast expanse of gas, in parts only, glowing with an intense heat; not the whole of it, as was once thought. In other

(*Continued on page 539*).

Fig. 3.—The spiral in Canes Venatici.

parts it is without very much heat, but the whole is without definite form, so that it would, or might, resemble the great nebula in Orion, which is illustrated in Fig. 1. I theorise that this gas had its origin in a collision between two stars. Such a collision, even if it were between two dead stars, would generate such heat that the debris would form a mass glowing near the centre and extending to a tremendous distance into space. The combined original stars, or what remained of them near the centre, would form the nucleus of the new system or, it may be, form several nuclei, for there are masses of gas with more than one nucleus. Indeed the Orion nebula may have several. Much, in the form of the resulting system, depends upon the angle of impact of the colliding bodies. There is the dumb-bell nebula in Vulpecula which evidently owes its form to a glancing blow being struck in the collision, so that two glowing masses were formed, joined together by an attenuated piece between the main portions.

The nebula from which our sun and his planets was formed was not nearly so great as that of Orion nor, as it shrunk and set up rotation, was it so large as the Andromeda spiral; I merely give illustrations of these in order to show the states through which our system must have passed.

Fig. 3 shows the spiral in Canes Venatici which was one of the earliest discovered and was for a long time looked upon as an astronomical anomaly. Here we have a spiral much further advanced than that shown in Fig. 2.

Here I want to say a few words in criticism of the old theory, where it states that continued shrinkage coupled with accelerated velocity caused rings to be thrown off by centrifugal action. Although the spiral shown in Fig. 3 certainly looks as though it is throwing off one big mass I do not think it is being thrown. The spiral appears to be winding itself up, leaving the big mass at the bottom where it always was and where centrifugal force will always keep it in balance with gravity and remain as a very big planet, probably with satellites. No, nothing is thrown off; at all periods and at all stages in the contraction of the masses and rings, the radius of gyration automatically adjusts itself to the forward velocity so that the centrifugal forces and speed balance the pull of the central body.

The beautiful object shown in Fig. 4 is a splendid example of a typical planetary spiral in a fairly advanced state. It is beautifully situated for photographing, for it lies in a plane normal to the line of vision, which is to say: we are able to view it in plan and not at an angle as we do the Andromeda and Canes Venatici spirals. I think that most of the bright points in this Great Bear spiral would give a continuous, or bright, spectrum as do the stars, but they are all cooling and the nucleus which will be a sun (star) like ours will have a very large number of planets revolving around it, though only one will be a great one, like our own Jupiter.

The centre Illustration, Fig. 5, shows our own planetary system when it was in a more advanced state than the spiral, Fig. 4, say about ten thousand million years ago (the age of the crust of the earth has been placed at 3,000,000,000 years). I have shown the orbit of Neptune as the outermost, although there is at least one planet, Pluto, beyond this, but it is so distant that little is known about it and it is probably small and insignificant. Inward from Neptune we have Uranus, then Saturn, then Jupiter, next come the Asteroids, many very small bodies, then comes Mars, next the Earth, with the Moon just indicated, then Venus and, lastly, Mercury and so we have the solar system. The Asteroids are shown as a mere mist in Fig. 5.

The immensity of the abyss that separates us from the stars, about which planets might revolve, prevents us from gathering evidence of the existence of other solar systems; some stars are so large and so brilliant that, compared with them, our sun, if moved to the same distance from the earth, would probably appear as a star of the eighth or tenth magnitude. Even telescopes more powerful than the famous 200in. reflector in America would not enable astronomers to see such possible planets, when the distance between him and the hypothetical centre of a remote system is such that the light of that centre, travelling at 186,000 miles per second, reaches us only after a lapse of centuries. We can see the star but we shall probably never see the planets because they, after they pass the spiral stage, have expended all their hydrogen atoms and are no longer self luminous and only shine by reflected light of the central star.

Fig. 4.—The spiral in the Great Bear.

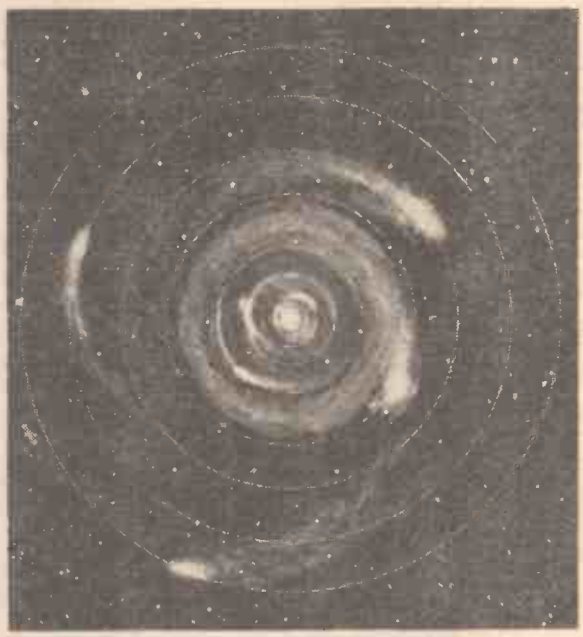


Fig. 5.—Our Solar System in formation.

The Size of the Planets

For the interest of the reader, I have prepared a drawing, Fig. 6, showing the comparative sizes of the principal planets of our solar system. This has largely been copied from the diagram contained in Sir Robert Ball's "Atlas of Astronomy," published many years ago by George Philip and Son. This diagram brings home to us very vividly the tremendous sizes of both Saturn and Jupiter, as compared with the Earth on which we live. Jupiter has an equatorial diameter a little more than eleven times as great as that of the Earth.

It is rather interesting to note that Jupiter must have a circumference of no less than 274,890 miles and, as he makes a complete revolution in practically ten hours, a point on his equator travels at the rate of 27,490 miles an hour. The mass of Jupiter is greater than that of all the other planets combined.

The drawing shows two views of Saturn: one a view in plan, looking down on one of his poles and showing the three rings: the outer Bright Ring, the inner Bright Ring and the Dusky or Crape Ring. The other view is an elevation in line with the equator and viewing the rings edgewise. From this, it will be seen that the rings have no great thickness. In spite of the fact that the extreme outside diameter of the outer ring is 170,000 miles the thickness of them cannot be more than a hundred miles, possibly much less. They are wholly composed of myriads of small bodies, each so tiny that no telescope that we can turn on them will resolve their particles. They must be in the nature of little moons all swinging along in their orbits at tremendous velocity; but so densely packed are they that when the planet assumes certain positions they cast a dense black shadow on the body of the planet.

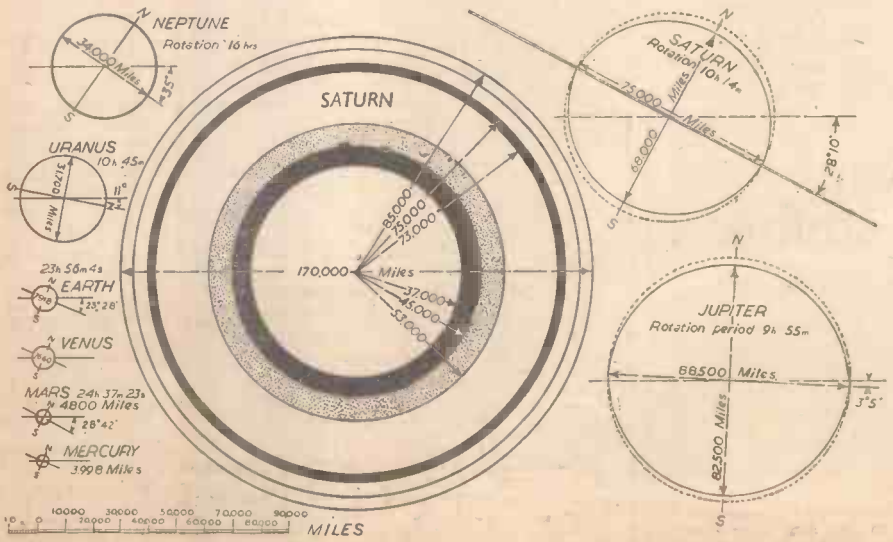


Fig. 6.—The comparative sizes of the planets.

The table on the right gives some interesting data. One fact which is particularly noteworthy is the inconceivable size of the solar system as a whole, for the orbit of Pluto has a mean diameter of seven thousand two hundred millions of miles, so that light rays travelling at 186,000 miles per second, would take 10¾ hours to cross the diameter of the system and it takes 5 hours and 20 minutes for the light of Pluto to reach the Earth.

Name	Diameter in miles	Rotation around Sun	Mean Distance from Sun, miles	Satellites	Mass and Revolution of Sun.
Sun	864,000	—	—	—	about 700 times
Mercury ...	3,900	88 days	36,000,000	—	united mass of
Venus	7,600	225 days	67,000,000	—	all the planets.
Earth	7,927	365¼ days	92,900,000	1	Revolution, mean,
Moon	2,160	—	—	—	27 days.
Mars	4,800	687 days	141,500,009	2	
Asteroids ...	—	—	—	—	
Jupiter	88,500	12 years	483,000,000	9	
Saturn	75,100	30 years	883,000,000	9	
Uranus	31,700	84 years	1,782,800,000	4	
Neptune ...	34,000	165 years	2,793,500,000	1	
Pluto	?	249 years	3,600,000,000	—	

Recent Advances in Science

Ergonomics : A New Metal : Termite Research

By Prof. A. M. LOW

THE most far-reaching research in science is still that dealing with atomic power. The "breeding" of fissile material, advanced in America and more recently developed in Britain, marks a forward step of considerable importance.

Striking though such an achievement is, there are few details that can be revealed and little that is immediately serviceable to ordinary people. What advances are there that help us personally ? One of them, also atomic, is the increased development of radio-active isotopes at Harwell.

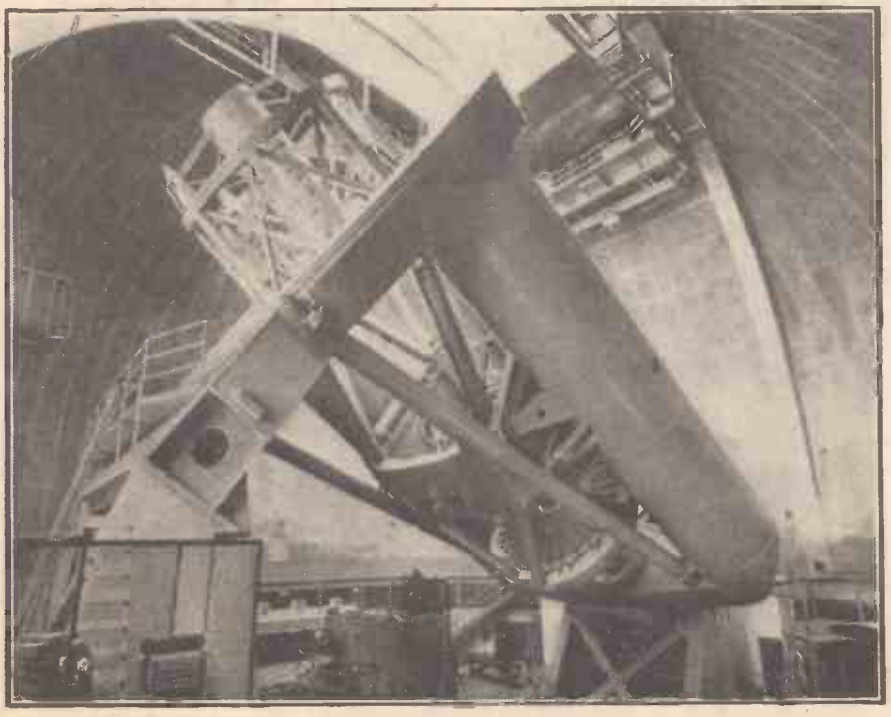
These twin-brothers of ordinary chemicals, activated with radio-activity, are used in checking illness, combating disease, testing manufactured products, monitoring machines, and many other applications. The latest figures show that we now export 9,000 shipments a year to 37 foreign countries—a great increase in range and production over last year.

Ergonomics

Another branch of science making great strides is the newly-named Ergonomics—the science that measures the limitations of human performance.

This is more than Time and Motion study, for it takes into account the comfort of the worker and the suitability of the atmosphere in which he or she works. At Oxford this year the third symposium of reports by Ergonomic scientists from several parts of the world was heard. They varied from the "Physiological measurements of work load and work conditions in a steel factory" (from a Swedish investigator) to "The measurement of energy expenditure of military cadets" (a series of tests by a London scientist).

Not the least important new developments arising from Ergonomic research are the specially delicate instruments designed to measure energy expenditure. Notably, these are the Kofranyl-Michaelis respirometer and the Muller photo-electric pulsometer. The former was used in difficult surroundings underground to assess the energy rates of miners. How much sweat and toil per ton of coal ? Is it necessary ? The progress of true science is rarely spectacular but the Ergonomic approach is making life and work easier by the elimination of extra stresses imposed by unsuitable postures or the adverse environment of temperature. Rest periods at scientifically arranged intervals will enable a worker to do his best with the minimum fatigue. A very different solution from the usual "let us see how much production we can obtain, without regard to the human element," attitude.



The 200in. Hale Telescope, built since the war, the lens for which took eleven years to grind, is now in regular use by the astronomers working for the Carnegie Institute and the California Institute of Technology.

A New Metal

Yet, to deal with the advance of science is not easy. The news of to-day may well have been ten years in the making—and the modest monograph hardly noticed in a scientific journal this month could be an astonishing revelation to our children's way of life. The former case is well exampled by Terylene, the artificially created fabric recently released for public use ; and a second example might well be the modest achievements to date with the use of titanium.

The ore of this metal was first found in 1791, in Cornwall, by one of those enquiringly scientific clergymen with which this land was once so rich. Since that time titanium compounds have been widely applied, but the pure metal has been a somewhat elusive substance. The major problem was that, when liquid and at high temperatures, the molten metal "sucked up" oxygen and became brittle when solidified. When molten, it dissolves almost every substance with which it comes into contact.

Can Stand Great Heat

Both these riddles were solved and 99 per cent. pure titanium metal was made in ingots by Imperial Chemical Industries! Here is a metal of the future, which may prove rustless, stainless, less than twice the weight of aluminium and twice as strong as steel. It can stand great heat and its first practical use will be in jet engines—later, who knows, space ships !

How did the chemists keep it molten while preventing it from "eating" its container ? The answer is one of those simple but ingenious devices of physical chemists. They processed molten titanium at 1,700 degrees in a copper crucible that melts at 1,100 degrees—by using an electric arc inside the molten mass and constantly running cold water round the outer jacket.

News has just arrived that the Australian Scientific and Industrial Research Organization is forecasting an immense titanium industry for Queensland. The rutile sands lying along the Queensland coast contain a wealth of the metallic ore. This organisation

(*Continued on page* 543)

is now perfecting an electrolytic method of producing the metal—said to be quicker and cheaper than present chemical processes. From this we may receive crash-proof cars, lighter ships, stronger cycles. And not a spot of corroding rust in all.

Termite Research

Let us turn to another branch of science—the study of Nature itself. At a conservative figure we might say that £50,000,000 worth of damage is done annually in the world by termites. It is a problem worth tackling and its investigation reveals an organisation in incredible totalitarian order, workers, soldiers, kings and queens keeping strictly to their individual tasks. Now Dr. S. H. Skaife, President of the Royal Society to South Africa, has made a film of termites at home ; a film made entirely in the dark of termite colonies.

Dr. Skaife holds the theory that the queen lays only one type of egg, but the varied members of a colony grow from this one type by specialised feeding. Here is a secret of Nature—breeding by diet—of great scientific interest, and the film (televised July 3rd, 1953) may open the way for us to learn something basically constructive as well as a means of destroying the termite which causes the damage.

From these minute creatures to the astronomical—science is advancing on all scales. The most recent research at Mount Palomar, where the 200in. telescope was brought into use in 1950, reveals that the observable universe has been doubled since 1948. We can now "see" a distance of 2,000 million light-years. This fact, astonishing as it is—perhaps too vast to be appreciated—will mean little except to another astronomer. Yet perhaps a glance at the heavens now and again would remind all of us that time and space are so infinite that this little earth might well be more humble.

The Advance of Science and Its Cost

Practical science is also stepping forward—expanding like the universe. The Hydraulics Research Station has larger premises at Wallingford, for the National Physical Laboratory at Teddington is proving too small for the testing of tidal and river experiments. There are now two wave-basins, 125ft. by 80ft., both larger than that at the original N.P.L. In one of them a model of Lyttleton Harbour, New Zealand, is being studied. This harbour requires to be enlarged : the model in the tank will provide all the answers. Nearby is another item of wide interest to this country—a pilot model being built as the first stage of investigation by the Severn Barrage Scheme.

One more condition which advances with science is cost. The first "atom smasher" built at Cambridge cost a few hundred pounds ; the most modern, £2,000,000. This figure will be easily surpassed by the ten-nation Nuclear Research Laboratory now being built near Geneva where international science and research will be the responsibility of the ten governments concerned. That is the ideal of science—advancement for the benefit of all.

Germanium Research

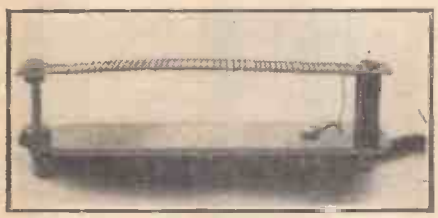
Mention should also be made of germanium research in all its branches. The new transistor will play a vital part in radio, T.V., hearing aids and innumerable cases where the normal valve can be replaced, with a saving in space and current consumption. There is also the Boron-silicon Solar battery with its 50 watts output for an area of one square yard ; possibly an important contribution to the small-scale production of power in remote areas.

Little need be said of the improvements which science is making in the everyday items of our life. Three-dimensional pictures, colour television, broadcast receivers without normal valves, innumerable discoveries in modern science, new synthetics, better aviation, guided missiles, food processing, and a host of inventions destined to bring safety or greater comfort to our labours. All of these are in the future as the task of science.

A THERMAL FLASHER

A Simple Automatic Switching System

By F. G. RAYER



The completed flasher.

THIS unit provides automatic on/off switching, at regular intervals, for one or more low-voltage lamps, or for similar equipment such as buzzers or bells. Though possibly most suitable for decorative lighting, it has various other applications in models of many kinds. If required, a change-over relay can be connected so that when one series of lamps is extinguished a second series (usually of a different colour) is illuminated. Made as described, it was found that the unit could be adjusted to provide cycles of operation between about two seconds and five seconds, any particular adjustment being well maintained during a period of operation. This is suitable for "blinking" signal indicators and many similar uses in models.

Arrangement of Parts

The arrangement of parts is clear from Fig. 1 and the construction of the bi-metal strip needs reasonable care. Two readily obtainable metals found to have suitable degrees of expansion when heated were aluminium and iron—the latter taken from a "tin" can (these really being thin tinned sheet-iron, in most cases). The strips must be quite flat and cut with reasonable accuracy. The metal for the second strip was also taken from a domestic container—this time from the lid, which was found to be made from a light aluminium alloy.

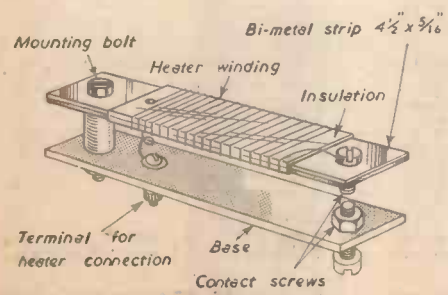


Fig. 1.—Constructional details of the flasher.

Both strips are drilled at one end, filed flat at this point, and tightly bolted together with a 6 B.A. bolt and nut. The insulation shown was then put on, and consisted of two thicknesses of cellulose tape. The two metal strips must be tightly together throughout all their length. A second hole, for the mounting bolt, was then drilled through both strips. The strip is subsequently fixed as shown, a metal bush being used to provide spacing from the paxolin base.

The winding consisted of approximately 45 turns of 32 s.w.g. resistance wire. Thin iron wire would be suitable. The turns are spaced evenly along the insulation, being wound on tightly. One end goes to a small terminal ; the other is soldered to the small bolt at the free end of the strip. This winding, with a bi-metal strip made as explained, was found to give a maximum movement of 3/16in. at the contact points, when an operating current of ½ amp was used.

Adjustment and Circuits

Both bolts which pass through the bi-metal strip must be absolutely tight. For an initial test, leads may be taken to the terminal shown in Fig. 1, and to the mounting bolt. With ½ amp the free end of the strip should move at least ⅛in. in about 10 to 15 seconds. If it is desired that the circuit be *broken* when the strip heats, as is usual, the strip is mounted so that the iron is on top, and the aluminium underneath.

The circuit for ordinary operation is shown in Fig. 2, the lamps being of such type, or so wired in parallel, if required, that a current of about ½ amp is obtained through the flasher winding. The lock-nuts of the lower contact screw are adjusted so that the contact surfaces meet with moderate pressure when the strip is cold. This completes the circuit. The strip heats until contact is broken, thus interrupting the current, and the lamps are extinguished. As no current is passing, the strip then cools until the contacts touch, when the sequence is repeated. The interval may be adjusted to some extent by means of the lower contact screw. As there is virtually no inductance in the circuit, sparking was found to be extremely small with voltages up to 12.

When wiring up a circuit it is necessary to allow for the voltage drop in the heater winding of the flasher. If more current is available, at lower voltage, then it would prove helpful to use a winding of lower resistance—for this, 24 to 28 s.w.g. wire could be used. The contact surfaces should be filed flat and smooth. In use, a make-and-break movement of only about 1/20in. or less will arise.

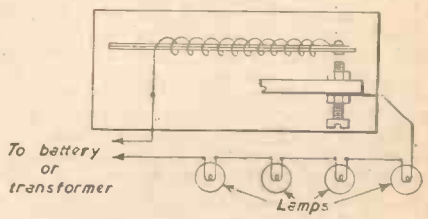
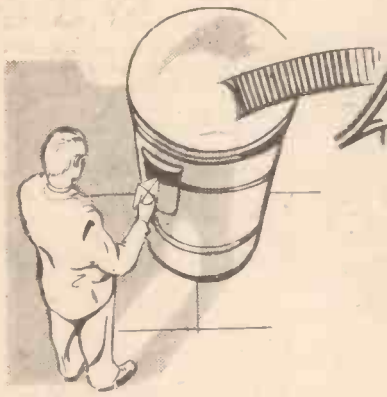
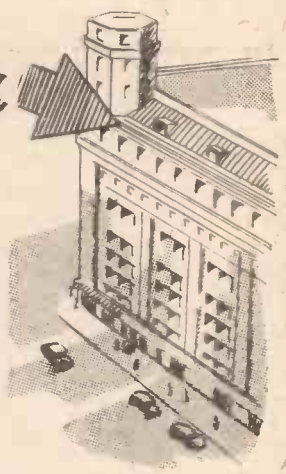


Fig. 2.—Circuit for flashing lamps.



Letters to the Editor



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

Chemical Soot Dissolvers

SIR,—With reference to a query raised by G. R. Mahy (Notts) in your June issue, on the question of chemical soot dissolvers, and to your answer to that question contained in the same issue, may we take this opportunity of agreeing with you up to a point. For years past the type of soot destroyer that has been available on the domestic market has been of the type you mention, whereby removal of soot is effected by heat. As you know, on an open fire, these soot removers require the use of a draw plate to be placed against the fire, to produce the necessary draught to clear the chimney of the " surplus " soot.

Since the winter season 1952-53, however, there has been available a new type of soot disperser, which has an entirely different action than has hitherto been accomplished by any other. Marketed by this company in association with the holders of the American rights for this formula, this material is in powder form and carries six applications in the small container and 12 in the large. It is *absolutely* safe in use, being non-inflammable and non-flaring, and does *not* require the use of a draw plate when applied to the open fire.

The action of this material is one which is volatile, and the gases given off act upon the soot and firescale binders, breaking up the formations and dispersing them. The ignition temperature of soot is reduced by 500 deg. and so allows the fine particles to be consumed safely. Also, these gases remain active on the sides of the flues for some time and prevent soot from forming.

Industrially, this material has been used in this country for four years, and for 18 years in America, and it has been conclusively proved that no deterioration of brick or metal flues is experienced.

We have on our files letters from all parts of the country praising this commodity and vouching for its safety in use. Chimney fires have successfully been extinguished by applying three-quarters of a carton on the fire bed, and the success on domestic water heating boilers of this material is quickly shown by the greater heat output at the hot taps than has ever before been experienced. —WILSON AND WOODS, LTD. (Rayners Lane, Middx).

Liquid and Powder Plating Preparations

SIR,—I feel I must add to the reply of your advice bureau in the matter of the reply given to D. E. Challis (Enfield) on the subject of liquid and powder plating preparations in the July issue of PRACTICAL MECHANICS.

I entirely agree that any preparation which purports to deposit a coating of nickel or chromium from powder or liquid without the aid of electric current is spurious; these preparations invariably containing mercury. I feel that the generalisation made is a little unfair and misleading as the inference is likely to be drawn from your reply that liquid or plating powders are useless.

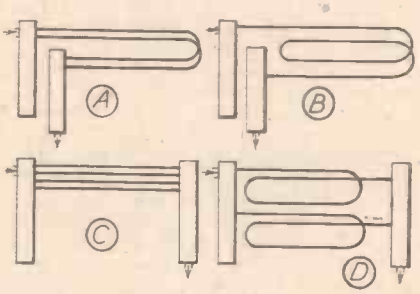
I think that you will agree that the deposition of a film of silver either from a powder or liquid has been practised for over half a century in the silvering of clock and watch dials. Admittedly such deposits are thin, but nevertheless they are permanent silver deposits; not fugitive deposits as with the mercury preparations.

Any-text book on electro-plating will give the formula for such " rub on " or immersion silver plating, one in particular being: " Electro-plating," Field and Weill, page 265. Another being " Electro-plating and Refining," Watt and Philip, page 239. Silvering, in such cases, is by the well-tried paste or liquid comprised of silver, common salt and cream of tartar, etc.—G. BURFORD (Battle).

Cupboard for Drying Clothes

SIR,—With reference to Mr. Hart's request for information on the construction of a drying cupboard, I would remind him that it is not heat which dries clothes so much as air, and the air is warmed because it can then absorb more moisture.

Since he has the flow and return pipes of the hot water cylinder running through the cupboard the best thing would be to use the hot water to heat the cupboard rather than an electric heater. However, since the tank has flow *and return* pipes I presume it is the central heating system and this would probably not be on in summer.



Suggested arrangements of pipes for drying cabinet.

Whatever the system the idea is to install a radiator of some sort horizontally in the bottom of the cupboard and then arrange a flow of water through it. The radiator could be an ordinary midget central heating radiator such as is used to warm closets; a discarded car radiator; or a homemade one consisting of several loops of copper tube in the form of a battery of copper loops linking two " busbar " pipes of larger diameter. The greater the area of copper pipe the more air will be heated. The larger the number of coils in a pipe the more the water will be cooled. Probably the forms shown in A or C would be best. To avoid flattening of the pipe when bending, it should be filled with Wood's metal, if obtainable, which melts in boiling water, or a low melting point solder.

If the hot water tank is that for the central heating, all that is needed is a " tee-in " to the " flow " pipe for the hot inlet on whichever " busbar " pipe is the higher, and another in the return pipe for the outlet, with a tap so that the heater can be turned off when not in use.

If the tank is for the domestic water supply the task is not so easy. If the radiator can be placed above the tank, then a pipe from the top of the tank to the inlet, and another from the bottom to the outlet will provide the circuit necessary for convectional circulation. If this is not possible then the only other method open using the hot water is to have water running through slowly and then going to waste; alternatively, if the mains pressure is so low as to warrant there being a reservoir tank, the outlet should be run back into the top of the reservoir tank.

As for the ventilation of the cupboard, it should be completely open top and bottom, and with the radiator covering all the bottom end area and not too many clothes in it. No fan should be needed. On the other hand with a fan, drying would be faster and efficiency improved.

If the hot water system of heating will not work, then a suitable length of heating cord supported by a perforated zinc sheet would be suitable. Heating cord can be obtained from The Technical Services Co., Shrubland Works, Banstead, Surrey, and probably also hints and advice as to the length and gauge of cord most suitable. This should be protected by at least one or two spaced zinc sheets above it, with all zinc earthed. Connection between the heating cord and power lead should be made *outside* the cupboard in a junction box, and the power lead (three-core) connected to a bakelite switched wall plug, with a three-pin plug. It is essential that the zinc sheets are properly earthed, and not just connected to the pipes running through the cupboard, as this could be dangerous in the event of a failure.—C. F. Cox (B.A.O.R. 15).

Flying Saucers

SIR,—I would like to comment on one or two points in J. W. Selwood's letter to you (May issue).

One is, I do not quite understand what he means by asking if we had tried photographing any certain part of the moon while that part of the moon is moving. I have taken many photographs of certain parts of the moon, and received wonderful results.. If he is referring to the same photograph as I, which appeared in PRACTICAL MECHANICS some months ago, then from what I could see the portion of the moon was quite considerable.

The second point is why Mr. Adamski should leave his companions behind just before he made contact with the man from the " Flying Saucer." Mr. Selwood's explanation of this was: " Old records show that ' Flying Saucers ' had landed and taken off again with earth inhabitants inside. Then if he and his five companions were taken off, nobody would know the ' Flying Saucers ' had landed. But if Mr. Adamski had been taken off alone, then his five friends could have told the world what had happened." Now this, to my mind, is a rather weak explanation, because I think that if Mr. Adamski had taken one or two friends with him as witnesses, three people would have been sufficient to tell the world what had happened.

(*Continued on page 547*)

READERS' SALES AND WANTS

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

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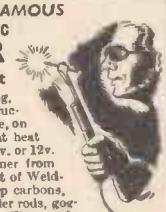

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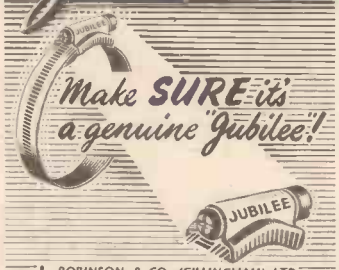

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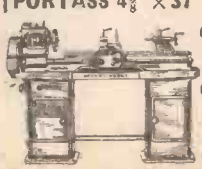

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Mr. Selwood also stated that Mr. Adamski had devoted his life to "Flying Saucers," but I think I am correct in stating that Mr. Adamski only became interested in "Flying Saucers" in 1945.—M. R. OLLIER (Catterick Camp).

SIR,—Reports are still coming in of the appearances of Flying Saucers, and your Editorial Comment of last month was, as usual, fair and unbiased regarding the many claims put forward. As you say, after several years of Flying Saucer stories we are still no nearer an accurate explanation.

Obviously these objects (and who can doubt their objectivity) are one of two things, terrestrial or extra-terrestrial. If the former, we could believe them to be something very much on the secret list of one of the nations; if the other, then it seems that they must be directed by beings from the planets, or further away in space.

To my mind there is nothing surprising in the fact that space ships, if such they be, should be elusive and avoid contact with earth dwellers. Would not *our* space ships, manned by earth men, adopt very similar tactics when reaching out in the not too distant future to explore our family of planets? I think that caution would be the watchword every time; landings and subsequent communications being attempted only after a considerable amount of information had been acquired regarding the physical conditions of the planet to be invaded, not to mention the nature of its inhabitants, their defensive armament, and dangers of microbic infection. We should, so to speak, spy out the land. Today, it may be that our own land is being spied out and reported on, so that adequate measures can be made to deal with whatever contingency is likely to arise in the event of a proposed invasion.

Surely, if these saucers contain space travellers, we must credit them with at least the amount of caution we ourselves would employ on such a mission.—C. J. WILLIAMSON (Scalloway, Shetland).

Effect of Atomic Explosions on Weather

SIR,—A recurring topic is that of the effect of atomic explosions on the world weather.

I believe there has been no categorical scientific statement on the problem, and as a layman I have found it difficult to visualise. I would appreciate readers' opinions on my amateur attempts set out below to reduce the scale of events to something which can be more readily imagined by the lay mind.

I have endeavoured to reduce the world and its weather to a small scale model on which the flare of a match would be equivalent to an atomic explosion. The figures are approximate only.

Assumptions for the calculation are:—

a. Match flare 1in. in diameter.

b. Weather 8 miles high.

c. I have no information on the diameter of atomic explosions but have worked out calculations for two guesses—5 miles and 10 miles diameter.

The reduced scale for the smaller explosion is the equivalent of a match flare on a globe 130ft. diameter with a weather layer of air 1⅛in. thick, and for the larger, a globe 65ft. in diameter with a ⅜in. thick weather layer.

If there is any semblance of accuracy in the analogy it does not appear likely that from an explosion and heat generative point of view the bomb has any effect at all.

Whether radio-active particles carried great distances in the atmosphere would have any effect I cannot imagine, and is I think beyond the scope of popular illustration.—H. H. PORRITT (Newcastle-upon-Tyne).

Petrol Engine Conversion

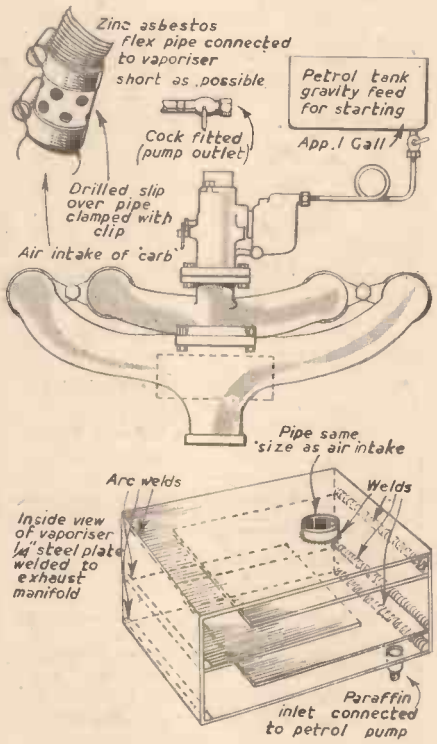
SIR,—With reference to Mr. Campbell's request for information concerning the running of an engine by paraffin, may I suggest the following conversion.

Fabricate a box out of ¼in. steel plate, any size to suit an exhaust manifold; before welding the lid and side insert and weld the plates as shown in sketch. These will act as vaporised baffles.

Preheat the manifold over a coke fire and, when hot, arc weld the box to the side. Cool slowly by letting the fire gradually die out.

Connect the outlet of vaporisor to aid intake of existing carburettor, but first allow for air by fitting an extension and drilling ¼in. holes closely together round the circumference. Suitable zinc-asbestos flexible piping can be purchased quite easily complete with pipe clips. Fit an auxiliary tank higher than the carburettor fed petrol. The existing petrol tank is now filled with paraffin.

To start, switch off the paraffin cock on the pump; switch on the gravity fed petrol cock. The carburettor is now acting in the normal



Details of petrol engine conversion.

way. When the engine is hot (also, of course, the vaporiser) switch off the petrol and switch on the paraffin.

If the petrol is switched off first, the petrol in the float chamber plus pipe will carry over the flat spot until the vaporiser gets filled with paraffin vapour.—R. G. COOK (Slough).

Building a Catamaran—Correction

SIR,—I am most interested in building the Catamaran described in the July PRACTICAL MECHANICS. To me it seems an ideal craft and bearing in mind the safety element, most suitable for the Senior Scouts. For river cruising the cockpit can so easily be made into a shelter for the night with a simple frame and cover.

Consequently, I have studied the drawings quite closely and have discovered two or three discrepancies. I think these can be easily remedied, but I hope you do not mind me pointing them out. They are:

Fig. 5 "B"—Should not the base of the Frames 2 and 3 read 4in. x 1in. (not 1in. x 2in.)?

Fig. 6—"Bow knee" ⅛in. ply seems rather thin, especially to be screwed into.

Fig. 6—The height of the knee is not given. I take it to be 10½in.

Though I must say how interesting and detailed I found the instructions, there was one point I could not see. How does the bottom of the mast fit into the mast step plate?—J. K. BEAUMONT, Scoutmaster (S), (Huddersfield).

[*The author replies as follows:*

Regarding the "Catamaran," the detailed points you mention have been looked into.

Frames 2 and 3 should read, as you say, 4in. x 1in., the Bow knee should be ⅜in. ply and not ⅛in. as stated, and the height 10½in.

The mast foot is squared to suit the square recess in the step and is retained upright solely by the three wire shrouds.

A simple and common method of making a cockpit cover is to use the boom as the ridge for a bivouac style of cover. All that is then necessary are a few fixings along the sides of the cockpit.]

Marking the Sundial—Correction

SIR,—I am a regular reader of your interesting and helpful journal and on looking up a back number for some information I came upon your treatise on the construction of a sundial in August issue, 1953.

To the best of my belief, there is an error in the column headed "Marking the Dial."

The two concentric circles have a radius of AB and BC, and not AC, AB.

I have made a few of both horizontal and vertical dials, and have checked up the methods from several formulæ I have to hand and also geometrically, and so to avoid disappointment I am writing this correction.—B. GRETTON (Derby).

BOOKS Received

Carburetters and the Fuel System (The Modern Car Easy Guide Series No. 5). 4th Edition. By E. P. Willoughby, B.Sc., M.I.Mech.E. Published by Temple Press, Ltd. 56 pages. Price 2s. net.

THIS volume deals authoritatively with carburetters and the fuel system, comprising Carburetter Requirements; Why Carburetters Work; Mixture Control; Variable Jet; The Float Chamber; Downdraught; The Zenith, Solex, S.U., Stromberg, and Weber Twin-choke Carburetters; Petrol Injection; and Petrol Gauges, etc. It is well illustrated and should appeal to students in so much as it will provide them with the kind of information they require.

Spare Time at Sea. By Ronald Hope. Published by The Maritime Press, Ltd. 192 pages. Price 12s. 6d.

PUBLISHED under the auspices of the Seafarers' Education Service, it has been written for the seafarer, and it will be sought out by all those concerned with the right use of leisure-time. The chapters on keeping fit, indoor games, social entertainment, reading and writing, news and hobbies are every bit as relevant to life ashore as they are to life at sea.

The World of Oil.. Published by The Petroleum Information Bureau, 29, New Bond Street, London, W.1.

THE above firm have sent us a copy of a new booklet which they, as a non-profit making oil industry public relations organisation, have just produced for distribution to the "man in the street" with a lively interest in science, industry and world affairs in general. Its purpose is to give the very many users of oil products, who may nevertheless have only a very slight understanding of the way in which those products are made available to them, an insight into the long sequence of operations between the discovery and production of crude oil and its subsequent conversion into refined products. Readers who are interested should apply to the Bureau for a copy, which will be sent free of charge.

Your Queries Answered

RULES

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

Wooden Floor Filling

I HAVE a ground floor of soft wood blocks about 8in. × 2in. × ¾in., laid on concrete with some adhesive. These blocks have shrunk, particularly near the fireplace and in areas where the sun can reach, and there are now gaps as much as ⅜in. in the worst places.

I am informed that the only remedy is to relay the floors, costing about £50, but I should like to try filling these spaces with some suitable plastic material or some material in liquid form.

Can you please suggest any methods and materials ?—C. R. Revans (Glasgow).

THE trouble with your wooden flooring appears to be that the blocks have been made in unseasoned, or badly seasoned, wood and probably that the floor has not been sufficiently levelled for their reception. It would, as you say, cost about £50 to have the floor stripped and relaid and, even in this case, you would have no guarantee that the trouble would not reoccur.

Our advice is that you allow the existing floor to remain undisturbed for as long a time as possible in order to give the wood blocks ample time to warp and shrink to a maximum extent. We suggest, for instance, that the floor should not be disturbed during the whole of the summer and autumn. At the end of this period the gap between the floor blocks should be filled in with a waterproof plastic mixture made as follows :

Obtain from Shawnigan Ltd., Marlow House, Lloyd's Avenue, London, E.C.3, a quantity of " Gelva resin No. 7 " (which is a clear polyvinyl acetate resin). Half a pound of this material will be sufficient for your use. Dissolve 20 parts of the resin in about 80 parts of warm methylated spirit to produce a solution of varnish-like consistency.

Now make up a mixture of ordinary sawdust and wood flour (about equal parts). To this add a very small quantity of yellow ochre and umber (pigments which are obtainable from any paint shop or colour merchant) so that the colour of the resulting mixture approximates to that of the wood blocks. Then work this dry mixture into a little of the resin solution until you obtain a thickish paste. This should be at once packed into the interstices between the wood blocks and rapidly levelled off with a small trowel. The paste will set hard overnight. It will be reasonably waterproof and not brittle. It will probably require a little subsequent sandpapering in order to give it a perfectly smooth surface comparable with that of the adjacent blocks, but after all this treatment it will take a good wax polish and will be very little distinguishable from the blocks themselves, provided that a good colour-match has been made.

Treating Buckskin Boots

I HAVE a pair of buckskin cricket boots and wish to know if you can help me on the following points :

Is there any method of removing the green grass stains which so readily disfigure them ? Is there any preparation which, if previously applied, will help in preventing the grass staining the leather ?

Are there any preparations which will prevent the leather of the soles from going hard and brittle and keep the buckskin supple ?

Could you give a formula for a whitening preparation which will not damage the leather, and will not rub off as ordinary whitening does ?—S. Green (Birmingham).

ADD 10 drops of strong ammonia to about a gill of turpentine and, having fitted the boots on the feet, apply the turpentine with a stiff brush. Follow up this application with some fine pumice powder. Rub the boots with a flannel or a sponge dipped in the turpentine. Rub vigorously to remove the pumice powder. Repeat the same process once or twice and then hang the boots in the air to dry. There is no special preparation which will prevent the restaining of the leather by grass, since buckskin, being soft and porous, is very apt to pick up stains from its surroundings.

To keep the buckskin flexible, make up a mixture of equal parts of castor oil and neatsfoot oil, and apply this by means of a sponge sparingly to the leather. This preparation is excellent for maintaining the suppleness of the leather and for preserving it from cracking and deterioration, to say nothing of rendering the leather damp-proof. The treatment, however, is open to the objection that even when applied sparingly it will always tend to darken the leather. In fact, any oil treatment will have a similar disadvantage. A mineral oil, such as medicinal paraffin, can be substituted for the above oil mixture, but it will not have quite the same effect in maintaining the flexibility of the leather.

The reason why your ordinary whitening preparation rubs is because it does not contain an adequate amount of " binding " material. You can make a better quality whiting material by dissolving about 8 to 10 parts of glue in 100 parts of hot water. Knead white chalk into a paste with a minimum of the above glue solution. The paste should be fairly thick, of dough consistency. It should then be packed into moulds, slight pressure being applied to compact the block of paste. The mass is then placed in a gently warm oven and left there until all the moisture has been driven off. This paste is then applied to the leather with a wet rag in the ordinary manner. It will not damage the leather since it does not contain any deleterious ingredients. If you find that it rubs slightly, make a new block, using water having a higher glue content. This preparation has the great advantage that, if desired, it can be completely removed from the leather by means of vigorous rubbing with a wet rag.

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.

Painting Over Tarred Surfaces

COULD you advise me of a type of paint that could be applied to felt roofs that have been coal tarred for many years ? If there is such a paint could it be obtained in, say, slate grey colour ? Where could I obtain it and what is the price per gallon ?—L. MacKinnon (Tiree).

THE only type of paint which you can apply to a tar felting is a good bituminous paint, such as " Mariolene," which is manufactured by British Asphalt & Bitumen, Ltd., The Docks, Preston, Lancs. This is supplied in dark red, brown and black, but not in grey, the price being about 15s. per gallon. You may be able to get a grey bituminous paint from Wailes Dove Bitumastic, Ltd.,

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Meters.—20 amp., 2½in., m/i, 12/6 ; 15 v., 2½in., m/c., 9/6 ; 150 v. 2in., m/c., 10/- ; 3.5 amp., 2in., T.C., 6/- ; 4 amp., 2½in., T.C., in case with switch, 9/6 ; 100 m/A, 2in., m/c., 7/6, all post extra. Meter Movements, Units with 2-500 microamps, 7/-, post 1/-.

Bell Transformers. — These guaranteed transformers work from any A.C. Mains giving 3, 5 or 8 volts output at 1 amp., operate bulb, buzzer or bell. Will supply light in bedroom or larder, etc., 9/-. Similar Transformer but output of 4, 8 or 12 volts, 12/6. Both post 8d. BELLS for use with either the above or batteries, 6/-, post 6d. BUZZERS, 3/9, or Heavy Duty, 4/6, post 5d.

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/-. **Hand Microphones,** with switch in handle and lead, 5/6. Tannoy 7/-. Similar instrument, moving coil, 8/6. All post 9d.

Mike Buttons (carbon). 2/-. **Moving Coil 4/6. Transformers, 5/-.** All post 4d. each. **Sparking Plug Neon Testers,** with vest-pocket clip, 3/3, or with gauge, 3/6, post 3d. **S.B.C. Neon Indicator Lamps,** for use on mains to show "live" side of switches, etc., 3/6, post 4d. **Neon Indicator,** complete with condenser, pencil type, with vest-pocket clip, 7/6, post 5d.

Crystal Sets. Our latest model is a real radio receiver, fitted with a permanent crystal detector. Have a set in your own room, 12/6, post 8d. 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., 2/3/- and super-sensitive, 30/- a pair. **Headphones in Good Order,** 6/-. **Better Quality, 7/6 and 10/-. Balanced Armature Type** (very sensitive), 13/6. All post 1/-. **New Single Ear-pieces,** 3/6. Bal. armature type, 4/6 (two of these will make an Intercom. Set). Ex-R.A.F. ear piece, 2/6, post 4d. **(All Headphones listed are suitable for use with our Crystal Sets.)** Money refunded if not completely satisfied.

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58, NEW WANSTEAD, LONDON, E.11.
New illustrated List sent on request with 1½d. stamp and S.A.E. Letters only.

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1/3rd H.P. MOTORS. New, 230 volt A.C. single phase, 50 cycles, 1,425 r.p.m., ½ shaft, CAPACITOR START, usual price, 179/6. OUR PRICE 119/6. Carr., 8/6.

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HAND GENERATORS. Complete with handle and 72/1 gearbox. Output 28 volts and 300 volts. As described for WASHING MACHINE in P.M., Aug., '53, and WRINGER Mar., '54. Each 25/-. Post 1/9.

EPICYCLIC GEAR MOTORS (aircraft cowl gill motors), operate through four-stage 625/1 gear (5-25-125-625 one or more of these stages easily locked to give any of these ratios) 24 v. D.C. app. 5 amps. 12 v. D.C. app. 4 amps also operate 16/30 v. A.C. app. 5/7 amps. Each 25/-. Post 1/9.

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MOTORS, TELEPHONES, TRANSFORMERS, LAMPS, SWITCHES, CABLE, BOXES, etc., etc.
Hundreds of Bargains.

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Money Back Guarantee.

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All goods are of a well-known manufacture and carry a money-back guarantee. All cables are manufactured to the latest British Standard Specification. C.O.D. or C.W.O. All carriage paid.

CABLE TRS.—Flat Twin, 1.044, 46/-. 3.029, 58/-. 7.029, 97/6. PVC Sheathed. Flat Twin, 1.044, 40/-. 3.029, 57/6. All per 100 yds. Our PVC cables are suitable for interior or exterior use and may even be buried in concrete. All types and sizes of cables available in 25, 50 or 100 yd. lengths. Heavy cables cut to desired length at no extra charge. Switches, 1/6. 2 Way, 2/-. Ceiling Roses, 10d. Lampholders, 10d. 3-pin Sw. Sockets, 5 A., 4/6. 15 A., 6/6. Send for Price Lists of other accessories.

HUNT & CO.,
West Street, Exeter.
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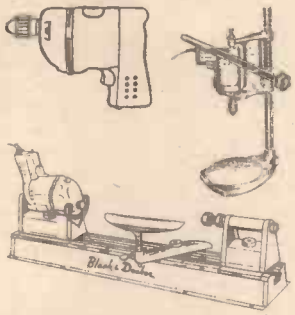

Build up your home workshop stage by stage on easy terms. The ¼in. drill shown drills, polishes, sands and grinds and can be used with the vertical stand and lathe, besides other attachments. Write for free full catalogue and easy terms schedule.

	Cash Price	Dep.	8 Mthly. of
As illustrated.	£5-19-6	30/-	13/3
¼in. Drill ...	£5. 5.0	27/6	11/3
Lathe only ...	£3. 7.6	17/8	7/6
Stand only ...			
Items not illustrated.			
¼in. Drill ...	£12. 7.6	44/6	28/6
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When ordering please send Cash Price or Deposit and state Mains Voltage.

THE "I & G" UNIVERSAL SAW

Fits any electric hand drill. Will Jig saw, Cross cut, Rip Saw, Hack saw etc. Complete with attachments and two extra saw blades. Send for leaflet.

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For spraying Paint, Varnish, Lacquer, Light Oils, Insecticides, etc. As easy to handle as a brush. Just plug in and spray. A.C. mains only. State Voltage.

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No pumping—it's self-pressurising. No working parts to go wrong. Burns methylated spirits. Weighs only 7 ounces and is 5½in. in height. All parts are interchangeable and spares obtainable. Attains temperature of 2,000 deg. F. Ideal for SOFT SOLDERING, SILVER SOLDERING, PAINT STRIPPING, GLASS BENDING and DRAWING. This pocket size blowlamp is a valuable addition to every tool kit. Made of solid brass without soldered joints. SEND FOR ILLUSTRATED LEAFLET.

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No. SW/DX.1. All-dry battery One-Valver. High Sensitivity. Band-spread. Latest Eddystone Coils from 10 metres upwards. Data Sheet, etc. 2/6, plus 2½d. Stamp.

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(Note.—Those who make the 1-Valver can progress to the 2-Valve version without wasting a single component.)

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See Last Month's Issue or
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GOOD NEWS FOR QUALITY ENTHUSIASTS

If you want to hear quality reproduction, send 2½d. Stamp for preliminary details of the NEW Mullard 5-Valve 10 Watt High Quality Amplifier (A.C. only) which I am happy to announce I shall soon be publishing in my usual Data Sheet form. It is exceptional.

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Collingwood Buildings, Newcastle upon Tyne.

These bituminous paints will resist the tendency to soften unduly in hot weather, bitumen having a much smaller temperature susceptibility than tar compounds and mixtures.

Cistern Repair

COULD you tell me with what I could line the inside of a porcelain lavatory tank to stop slight dripping of water on to the bathroom floor ?

The tank appears to have a number of minute cracks in the front wall, causing it to be slightly porous.

Would some form of cement spread over the inside of the tank and left to dry do ?—K. Kirkus (Stockport).

RUN the water out of the lavatory cistern and wipe the sides quite dry. Obtain a small tube of cellulose cement, such as, for example, the "Durofix" brand. Work as much of this cement as possible into the crack. Allow it to dry. Then obtain a small quantity of bituminous paint ("black varnish") from a local ironmonger. Put three separate coats of this on the crack. Then give the area a fourth coating and whilst this is still wet press down on to it a strip of stout, finely woven linen or similar cloth. Give this a coating of the bituminous paint also, so that the paint thoroughly impregnates the fabric. Give it three days to dry out. Then refill the cistern with water and use it in the normal manner.

Done in this way the repair will not look very unsightly, but it will resist water for years and the cost will be very small.

Another method is to work a little fresh putty or white lead oil paste into the crack. Give the putty two weeks to harden. Then paint over the area with bituminous paint, applying several coats.

It is doubtful whether cement would make a satisfactory leak-proof filling for the crack.

Repolishing Glass Paperweights

HAVING some old glass paperweights which have become scratched on the domed surfaces I should be glad if you could give me a technique for removing the blemishes and repolishing, at the same time retaining as far as possible the original contour.

I have several small fractional electric motors which I could use for the power.—O. J. Roots (Rochester).

IF the scratches in the paperweights are deep it will be a heavy job to remove them. Unfortunately, the domed surfaces of paperweights are not spherical, but elliptical, but they will have to be treated to some extent as though they were spherical. We are quite familiar with them and have seen scratched specimens, though we have never attempted to grind them. We do not think you can use your motors ; the grinding will have to be done by hand. Obtain a lump of pitch, soften this in hot water and press it down on the top of the paperweight ; do not let it stick. This is to be the grinding tool. Next obtain some medium coarse carborundum powder, also some fine, some tripoli powder and some fine rouge. Start the grinding with the coarse carborundum powder with water under the tool, working the pitch tool with a circular motion and putting considerable pressure downward. Wash under the tap from time to time and examine. When the scratches have disappeared commence polishing ; using the same tool, apply fine carborundum. Then make a fresh tool with more pitch and work up the surface with tripoli powder, finally, with a small fresh tool, polish the surface of the glass with rouge, using the finest jewellers' grade for the finish.

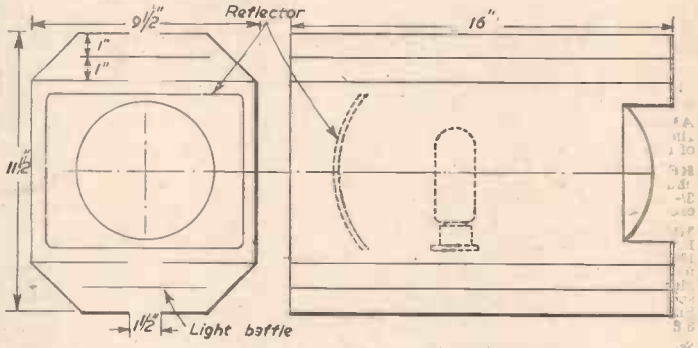
Spotlight Queries

THE drawing below is of a spotlight which I intend to construct for use as acting area flood and for general front lighting at distances of 24ft. and less from front of stage and also a spotlight proper at 50ft. The construction would be of tinplate, finished matt black inside and out. Is the design sound and what paint would stand the heat ?

Cooling would be by two 1½in. slots with baffle between running whole length of body, top and bottom. Would this be adequate ?

How can a soft edged beam be obtained and will there be any filament image ? The lens is a single moulded condenser 6in. dia. and 7½in. focus, and the reflector is a Government surplus 8½in. by 6½in. 5½in. radius of curvature reflector of honeycomb glass with 2in. dia. hole in centre. Are these suitable ? What type of lamp would be required ?—G. B. Dodd (Spalding).

ORDINARY heat resisting paint should be suitable for the fitting, as this appears to be adequately cooled. Filament image is liable to be seen if the lamp is drawn too far back in the lamphouse, but this may be dissipated by the use of a light frosted gelatine, which can also be used to give a soft edged beam. The lens will probably be suitable, but we would advise you to use a spherical reflector without a hole through the centre. A 100 to 200 watt lamp with a concentrated filament would probably be large enough for your purpose.



Spotlight queries.—G. B. Dodd (Spalding).

Information Sought

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

Mr. G. W. Ottaway asks : "Could you please provide me with suitable sketches to show the construction of a septic tank capable of handling the waste from a small country house in which not more than six people would normally be living ? What should be the fall of the pipe leading from the house to the tank ? Should rainwater be piped into the tank or kept clear of it ?"

Mr. N. G. Suffield, of Oldbury, Worcs, writes : "I wish to construct a small furnace for the hardening or annealing of tools.

I require it to have a cubic foot of heating space or, at the least, half a cubic foot. Gas and air are available, also electric power, although the former is preferred. I would be grateful for any information concerning sizes and materials required for this project."

The following is an extract from a letter from P. James, of Enfield : "I have a query on carbon arc welding/brazing and hope you can help me.

I have been trying the contact method of joining metals with a carbon rod, using 4 to 12 volts from a transformer, and although the metals can be made to run, their joining is prevented by the formation of soot. I understand a cleaning fluid should be used and also certain fluxes. Could you give me the composition of these fluxes and cleaner, or suggest any materials I might try ? I have tried borax as a flux on both copper and steel but when this liquifies it forms an insulating barrier, and all work ceases until the borax glass is scraped off to get contact with bare metal."

E. West writes : "My job is with the making of rubber footwear. Have you, please, any information on how the printing, in various colours and patterns, is obtained on thin rubber facing as used for shoe uppers ?

The points I think are my biggest problems are :—

(1) Should the marking roller be metal or otherwise ?

(2) How is the feeding of that roller with the dye or paint accomplished ?

(3) Should it be patterned before vulcanising or after ?

(4) Could the pattern be applied as the rubber is being processed from the callender (which is, by the way, about 15in. wide) ?

I am able to have various equipment made so the only drawback at this moment is knowledge of working methods."

A letter from W. Ditchburn says : "Can you supply me with details of refrigeration by means of an electric thermo-couple which uses a junction of bismuth and bismuth Tethuride ; also details of current and voltage and where I can obtain the materials for the construction of a small unit ?"

Mr. A. E. Jones, of Enfield, writes : "Please inform me how to construct a medium weight frame tent, approximately 8ft. square, walls 5 to 6ft. high, total height 7 to 7ft. 6in."

Mr. P. Edgeley, of Ashford, says : "I have seen in several American magazines, advertisements for refrigerators with press button ice cube dispensers.

The business of removing ice cubes from the trays is always a nuisance and the prospects of having the press button dispenser I find most fascinating. Could you explain the principle by which these dispensers operate and the possibility of building such a dispenser, using the refrigerator components advertised in your columns."

Mr. T. S. Gooch, of Farnham, states : "I am shortly opening up a Bendix Self-Service Launderette and am using two De La Rue Rex D6 Heaters, which are gas fired. Even with a heat reclaim unit the gas consumption is considerable and I am toying with the idea of a possible conversion to oil firing. Have you any experience of such a conversion and/or could you put me in touch with any firm who could undertake the job ? Also can you give me any comparative figures of gas versus oil firing costs ?"

Mr. B. Frank, of Middlesbrough, desires information regarding a pipe cleaner which has recently come on to the market, known as the "Walton Mole."

U.S.A. THROAT MICROPHONES.—1/9 each, post 5d. ; 12/- dozen, post free.

TOGGLE SWITCHES.—S.P.C.O. New. 7/6 doz., post 9d. ; 72/- gross, post 2/6. Type 5d/531.

BATTERY CHARGING KITS.—New. G.E.C. 1.25 amp. 12 volt rectifier, matched transformer, to give output of 5-11-17 volts for charging 2-6 or 12 volt batteries, 27/6 each, post 1/9.

TEST PRODS.—Has 2ft. flex, ebonite rods, brass prods, ideal testing, 2/6 each, post 4d. ; 24/- doz.

SMALL SEMI-CIRCULAR RHEOSTATS.—0-5 ohm variable, suitable meter shunts, W/W 2½in. long, new, 9d., post 3d. ; 7/6 dozen.

MOTOR CYCLE SILENCERS. Chromed, new, suit Bantams, fishtail, fit 1 7/16in. 10/- each, post 1/-. Also M/C Tyre pump connectors, 1/- each, post 3d. ; 10/- doz.

PROJECTION LENS UNITS.—Contains 24 v. bulb, cover, mirror reflector, high grade lens, 40 mm. Achromatic, also Dalmeyer concave dark lens, 10/-, post 1/-.

SELENIUM RECTIFIERS.—12 volt, 3 to 4 amps., new, 15/- each, post 1/2.

AUGER TWIST DRILLS.—Sizes ½in. to ¼in., various sizes between, set of four mixed, 10/-, post 9d.

RELAYS.—Type P.O. 3,000 coil, 2,000 ohms, 3/6 each, post 8d. Coil, 200 ohms, 3/- each. Type 600 coil, 1,000 ohms, 3/6 each, post 7d.

METAL SPANNER BOXES BY FAMOUS MAKER.—3 sizes. Large 18in. by 10in. by 1½in. deep. Sections for sockets and other tools, 7/6, post 1/6. Medium size. 10in. by 7in. by 1½in. deep, socket sections, etc., price 5/-, post 1/-. Small size 7in. by 2in. by 2in., price 3/6, post 7d. All new and half list price.

Send 6d. for our bargain list of surplus equipment.

We always have large stock of Single Phase 230 v. electric motors. Sample : 1/6 h.p. NEW CROMPTON 230, £4/10/- each, carriage 5/6.

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All items carriage paid and Money back guarantee.

TWIST DRILL SET

9 drills 1/16in. to ¼in. complete with plastic case and stand. Brand new. **4/6**

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Solid brass, built-in slide to protect glass **3/11**

ALL STEEL TOOL BOX

With removable inner tray. Strong hasp, staple and carrying handles
Size 1. 14 x 8 x 8in., 25/-
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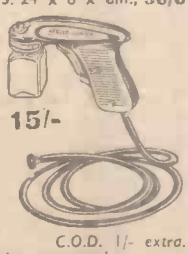
Size 3. 24 x 8 x 8in., 36/6

APOLLO SPRAY GUN



Ideal for model maker & handyman. Sprays paints, insecticides, etc. Will work from foot pump, spare car tyre, compressor, etc. New and boxed. **15/-**

Cash with Order. *C.O.D. 1/- extra.*
'Phone orders accepted.

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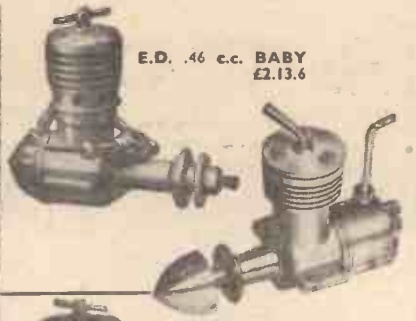
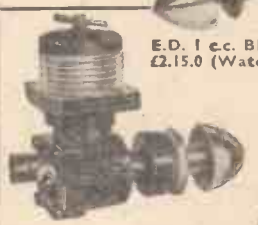


E.D. .46 c.c. BABY £2.13.6



E.D. 1 c.c. BEE £2.15.0 (Water cooled £3.16.0)

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Designed and manufactured by a team of skilled aircraft engineers, each engine is individually checked for accuracy and reliability up to a standard that ensures the greatest possible speed and performance for your models.

OTHER MODELS NOT ILLUSTRATED

E.D. 1.46 c.c. HORNET £2.17.0 (water cooled, £3.18.11)
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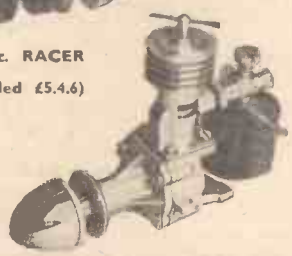
All prices include Purchase Tax.

Order through your model shop.

Ask for a copy of our 1954 illustrated folder which gives particulars of all E.D. Engines, Kit Sets, Radio Control Units, Spare Parts etc.



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KINGSTON 4411-2 DEVELOPMENT ENGINEERS
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IT'S A GALLAHER TOBACCO

. . . it smells as good as it smokes!

ELECTRIC DRILL

Quarter-inch made by **Black & Decker**, 220/250 v. A.C./D.C. Domestic or power. **Cash Price** £5/19/6.

YOURS FOR DEPOSIT. 27/6

ALSO SURFACE GRINDER
(As Illustrated)

Ideal for removing rust, preparing woodwork, **Buffing, Burnishing, Polishing** 220/250 v. A.C./D.C. Domestic or power. **Cash Price** £8/7/6. Balance over 6 months. *Post/Pkg. 2/6 each* (With Cash or Deposit). **YOURS for DEPOSIT. 37/6**

Another Bargain!

NEW ELECTRIC MOTOR

12/24 v. D.C. 33 amp. .33 H.P. 3,800 r.p.m. Size : 7in. x 4in. (approx.) **ONLY 8/6**
Post/Packing 3/-.

NEW EX-W.D. 12 VOLT STORAGE BATTERIES

New ex-W.D. Portable in strong wood case (similar to illus., but 12 v.). Heavy duty, 75 amp. 13 plates per cell. 15½in. x 8in. x 11in. Worth double. **ONLY 79/6**
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1 AMP. BATTERY CHARGERS

Also useful as Eliminator. New and fully guaranteed in leading maker's original carton. 200-250 v. A.C. **With Warning Indicator Light. Charges** 6 v. and 12 v. batteries & maintains 1 amp. output at all voltages. (List price 95/-.) *Post / Pkg. 1/11.* **52/6**

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ASTRO COMPASS. Precision observation instruments. Optical sight, four scales, two spirit levels. In case, 8/6, post 2/-.

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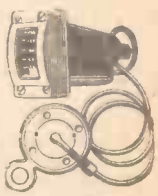

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THE Cyclist
Editor : F. J. CAMM

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COMMENTS OF THE MONTH

By F. J. C.

The New Brake Regulations

As from September 1st, every adult's bicycle and tricycle used on the roads must have two efficient independent brakes if it is a free-wheel cycle and one brake if it is a fixed wheel. On the smaller cycles for children, that is to say those with a wheel diameter of 18in. or less, a single brake will be sufficient. The obligation to fit and maintain efficient brakes rests not only on the actual user, but on those who cause or permit cycles to be used, such as the parents of a child cyclist or the employer of a trade cycle. The police are given power to test and inspect cycle brakes.

Autocycles and cycles fitted with auxiliary motors are classified as motor cycles under the Road Traffic Acts, and the law already requires that they should have two braking systems. All free-wheel bicycles and tricycles which have any wheels of an outside diameter exceeding 18in. must, therefore, have two independent brakes, and a brake operating on the tyre does not satisfy the regulations. Where the pedals are in one piece with the wheels, that is to say where there is no gearing, chain or other device, brakes are not compulsory. In the case of three-wheeled tricycles which have any wheel of an outside diameter, including the tyre fully inflated, exceeding 18in., the two independent brakes must be fitted in such a way that if it has two front wheels one brake acts on both front wheels and one on the rear wheel, or if it has two rear wheels one brake acts on the front wheel and the other on one of the rear wheels. Alternatively, both brakes may act independently on the single wheel whether that be in the front or the rear, with the exception that if a tricycle is constructed or adapted for the carriage of goods, as in the case of a box tricycle, the latter arrangement is not permitted.

This new law merely regularises a position already in existence. But it does give the police power now to act; for hitherto it was not an offence to ride a bicycle not equipped with brakes. We have never seen a bicycle, however, without brakes, and it would seem that the new regulations are designed to give the police power to inspect and test bicycles with inefficient brakes. We do not think that cyclists will object to the new regulations, which are based on common sense.

International Cycling

ARISING from a suggestion from the Manufacturers' Union, the B.L.R.C. met in London recently. Invitations had been sent to the N.C.U. and R.T.T.C., but when the N.C.U. delegates arrived they would not meet the delegates from the B.L.R.C.

In order, however, to try and reach a solution to the present unsatisfactory position it was agreed that each side should state a case independently to the representatives of the Manufacturers' Union.

The N.C.U. stated their case first, and when the B.L.R.C. delegates went into the conference room they were informed that the N.C.U. were not prepared to resume discussions in the Joint Committee until the B.L.R.C. gave an unqualified withdrawal of the possibility of legal action in connection with Clauses 6 and 8 of the Joint Agreement.

The B.L.R.C. solicitor had previously written agreeing to suspend the possibility of legal action pending further discussions. In order to prove their sincerity, the B.L.R.C. agreed that if the N.C.U. delegates would agree to the formation of the Overall Body (allowed for in the Joint Agreement) by September 30th, 1954, then the B.L.R.C. would unreservedly withdraw from taking any legal steps whatsoever in connection with the Joint Agreement and would, in the meantime, raise no objection to the B.L.R.C. members taking out N.C.U. International Licences for the purposes of racing abroad. Furthermore, the B.L.R.C. would return the licences to riders already penalised for so doing.

The B.L.R.C., to ensure equity in creation of the new body, made certain suggestions in conformity with the Tripartite Agreement. Notably they are that the overall body shall be formed on or before September 30th, 1954; each party to the existing agreement shall draw instructions in writing for submission to counsel to settle the constitution and setting out the history of the dispute and the views and wishes of each party on the formation of the new body; each party to accept the constitution as settled by counsel; at the date upon which the overall body comes into being all other forms of International Licences shall cease to be valid and only those issued by the overall body shall henceforth be recognised, and the Union Cycliste Internationale recognisation shall pass to the overall body at the date upon which it comes into being. This presupposes that the arrangements meet with the approval of the U.C.I.

These provisions were conveyed by the representatives of the Manufacturers' Union to two representatives of the N.C.U., who agreed to sign letters containing the provisions which were to be submitted by an independent party to the B.L.R.C., R.T.T.C., and N.C.U. The following day, however, a representative of the Manufacturers' Union advised the B.L.R.C. National Secretary that the N.C.U. were not now prepared to sign the letter in question.

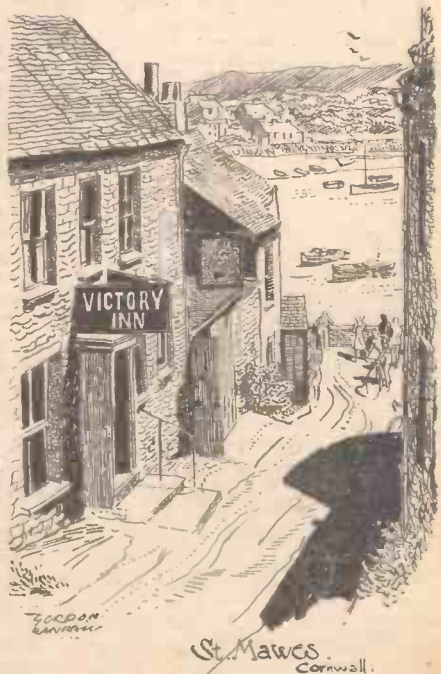
The B.L.R.C. naturally feels in the circumstances that it has done everything in its power to reach some reasonably satisfactory solution and it is still willing to discuss the matter. It is our view that the B.L.R.C. should not waste further time with the N.C.U., which is an unbending and uncompromising body, but should take the steps which are now open to it.

The dispute has been going on long enough and discussions merely regurgitate the old arguments. Boiled down to quintessence, the position is that the N.C.U. is not prepared to submerge its identity but wishes, in spite of its history in connection with sport, still to remain King Pin. The B.L.R.C. has a perfectly sound case to ask the N.C.U. to bend the knee on this issue in view of its attitude over a long period of years. It is our view that unless there is a radical change in its policy it will eventually do great harm to cycling. It seems unable to discern which way the wind is blowing in spite of the omens provided by its own balance sheet. It has, unfortunately, accepted wrong advice from certain sections of the Press with axes to grind, and from others who saw that their power would wane if the fortunes of the B.L.R.C. were in the ascendant. The fact that in spite of all opposition it has reached the position where it is a power to be feared—and *is* feared by the older bodies, should show the N.C.U. that once again they have been the apostle of a lost cause. B.L.R.C. opponents have formed themselves into cliques, and it can be said for them that they presented a united front. Their ranks, however, to-day show some severe gaps as a result of the bombardment they have suffered.

H.P. Restrictions Abolished

THE abolition of all hire purchase restrictions has given a fillip to cycle sales, and dealers report that the effect was immediate. When these restrictions were first introduced the sales of bicycles fell very considerably almost overnight and caused depression in the trade and some unemployment.

Much better h.p. terms now take their place. Most manufacturers are asking for £1 deposit on all models and the balance over a minimum period of two years or more.



The steep little street leading to the sea. . .

In the heart of lovely Dovedale. Ilam Rock (right) towers above the little river that gives its name to this beautiful dale.

Wayside Thoughts

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

Pleasant Retirement

IT is pleasant to sit back and contemplate the position occupied by the sport and pastime of cycling without worrying over the trials and its troubles. That may seem selfish, but when one has given half a century to official life in one form or another, it is comfortable to leave the worries to other people and just go on your way rejoicing. I am one of the lucky fellows who have kept on riding for the sheer pleasure of the game and I find that habit is now a jolly compensation for all the arguments that appear to be disturbing the modern politics of cycling, especially as regards its sporting side. If I talk these matters over with my friends, I end by making the best of my activity and enjoying the pastime in my own simple way. I let the younger generation settle their difficulties, without unduly worrying about the results or even feeling envy that, being out of the hunt, I'm even a back number; for I ride and love it, and any part of this glorious country is mine for just as long as I can escape from town.

Talking about the pastime proper, while the touring emphasis is all on Continental adventure, I think the home country is being neglected, and I cannot avoid thinking that the rider who does not know his own land fairly intimately is missing the build-up of a native pride that leads to contentment and a higher regard for the pastime and all it connotes. I have young friends who know Continental countries fairly well and to hear them talk one would imagine we had no Scotland, no Lake District, Pembrokeshire coastline, or the miniature intimacy of Wales, to say nothing of the moors of Somerset, Devon, Cornwall and the sterner lands of the Yorkshire Dales.

The Outdoor Garage

I WENT out lonesomely the other Sunday morning and feeling idle an hour's easy ride put me into the deep Warwick lanes by a ford of the Blythe. And there a green bank with a back rest invited me to smoke, watch the wind-swayed trees, and the great cumulus piled white against the blue go sailing eastwards trailing their shadows over a drowsy land.

I had scarcely time to fill and light a pipe when a car came quietly down the lane, stopped at the ford's edge and out got a man I know by sight and his young son rising ten. They unshipped a stirrup-pump, the lad waded into the stream, and the pair of them thoroughly bathed that car, much to the enjoyment of the younger generation, who was given his turn in directing the pumped stream while father did the handle exercise. It struck me as quite a good way of practising cleanliness, even if it was only a car; rather than make a mess at home and possibly get into trouble.

Soon the man joined me to enjoy a smoke and pass the time of day in expressing his wonder that he saw me so regularly riding a bicycle to town and home, saying in compliment, I suppose, how well I looked and if cycling was the cause of it then cycling must be good. "I rode a bicycle for many years," said he, "but——" It was the old story; married life, the need for a car for business purposes, the line of least resistance and cycling was over. Yet how unnecessary it is to totally drop the cycling habit, to imagine all wisdom is invested in a car, and travel, pleasure confined to a built-in vault, flying over the roads. To say he agreed with me would be an exaggeration, but at least he said there must be something in it to keep an old man reasonably fit and on the sunny side.

How to Solve the Problem

I OBSERVE that Authority is beginning to think of the road problem in terms I named in these columns long ago. It is the city and town road congestion that is the main trouble to-day; I see it every morning, and have been watching it grow, and sometimes almost congeal, for years. In the country you need not use the main roads to make your excursions by bicycle or car, but at the verge of the cities and towns, sooner or later, whatever route you choose, the way leads to the great congestion, and it is then that tempers are frayed. This traffic gathering has grown to such an extent that the idea I mentioned years ago is being discussed by responsible people. This is to leave the centre of the towns free of cars except public vehicles and delivery vans, and park the private cars at selected spots beyond the city centres. When I had the temerity to mention this question just after the end of the war, the criticism of such an arrangement was very severe, and, of course, I was charged as a fanatical anti-motorist, when really I was only a pro-cyclist with a good daily view of the traffic trouble then, and which has since enormously increased.

There is still severe criticism for any such scheme, but the critics do not appear to be of the constructive kind, for the only alternative they offer to some such control is to widen the streets, and that in the best of circumstances can only be a long distant hope. In the meantime, the traffic congestion is piling up in a way that suggests an almost complete "freeze" in the near future. The one-way street has become common and is accepted with a little grousing, and it may be that conditions will impose on all of us some further restrictions in connection with town traffic, not desirable, but imperative if we are to move round on our lawful occasions.

The Old Days

I SUPPOSE men of my age have lived through one of the most interesting periods of history, political and mechanical, and that last paragraph reminds me of the fact. When I was a youth, home from school, we frequently drove a pony and trap to town for the purpose of shopping, and it is difficult now to remember how quiet the streets were when they were free of the noisy trams. To go touring in those days along the quiet main roads with their wide grass verges (since gathered to the tarmac) was, indeed, to roam in another age, with a country welcome everywhere awaiting. The old houses of call then were in the doldrums of trade, lingering between the stage coach and the motor-car, and only the touring cyclist was the likely customer for accommodation. Of course, we fellows (youth in its early teens and young men who thought they knew everything) certainly did not know what was coming to us, and had the present picture been shown us on the screen of the future, we should never have believed it.

Sometimes people say to me when this subject crops up, "What a splendid time you cyclists must have enjoyed." We did; yet having lived through the great changes, I do not think the modern rider should be less happy—I certainly am not. He shares the highway with the million compared to our hundred of the mid-nineties, but it is a better highway and his mount a better bicycle. And—praise be—he still has his lanes, the real saviours of the British countryside and, from a wheeling point of view, our richest heritage. Often enough I wonder why he doesn't use them more generally, for they are good roads to-day serving many of the places the highways serve, but collecting on their routes a dozen little hamlets which the big roads have had no time to gather.

Make Your Own Selection

THE people who say the roads are too crowded for the enjoyment of touring do not know the roads—only the highways. Too frequently they ask for routes supplied by their organisations, which nine times out of ten follow the great arteries, instead of learning to map read, choosing their own ways and really becoming acquainted with the land. Sometimes you will make a mistake and include a slice of undesirable country, but that kind of error never lasts long and, in any case, gives you a personal knowledge of places you have heard of and wondered what they were like.

Years ago a friend of mine who came to live in Birmingham from the Cotswolds looked at his map one Sunday morning, saw the delectable nomenclature "Swan Village" and travelled the route. Swan Village is in the middle of the Black Country, a region of desolation now, and it was worse thirty years ago; but, believe it or not, that fellow said he quite enjoyed the trip among the iron works and abandoned mines, for it gave him the values of contrast, something he had never wholly realised because of his country up-bringing. I do not suggest that you and I should make such experiments, but I do seriously say that the map-reader cyclist has far more interest in planning his route and using the lanes and rough paths than following a prescribed programme sent to thousands of enquirers. Actually it is only since motor travel has become common that the fashion of routing the land has grown, and made people lazy. The old rider took his map and his bicycle and trusted to luck where he stayed for the night.

AROUND THE WHEELWORLD

By ICARUS

Silicone Polish

IN my notes on cleaning a bicycle, which appeared in the August issue, I mentioned a silicone polish which I had found to be most effective, and I referred to it as "Two-In-One." The manufacturers, E. R. Howard, Ltd., of Ipswich, Suffolk, point out my error, for I should have referred to it under its correct trade name of "3-in-ONE." It is obtainable, as I have said, from most cycle and hardware stores at 2s. 6d. per small bottle.

MacMillan's Bicycle

I WAS glad to notice at the recent Model Engineer Exhibition a large scale model of MacMillan's bicycle. The very first model of this machine was made by the editor of this journal and photographs, as well as scale drawings, appeared in these pages. I hope the maker of the model exhibited at the exhibition found these drawings of interest! Incidentally, the editor's model is to be exhibited at the forthcoming Cycle and Motor Cycle Show at Earls Court.

Public Relations Officer

FOLLOWING the resignation of Mr. R. Williamson, the British Cycle and Motor Cycle Manufacturers' Union has established a Public Relations Department for the two industries under the direction of Mr. H. Watts. Its headquarters will be in London. In view of the constant misrepresentation of the cyclist's point of view in the daily papers such an office is very necessary to-day. I feel, however, that all notices affecting cycling should come through the Manufacturers' Union and not from either the N.C.U. or the C.T.C. Their views have been so consistently biased that they have done the cause great harm. The Manufacturers' Union would, in my view, be a more impartial body. The C.T.C. some years ago headed their handouts with the phrase "What do Cyclists Say? Ask the C.T.C." If you did, it is practically certain that all that you would obtain is the biased C.T.C. viewpoint. It is noted that where they have been at variance with Government policy they have nearly always lost. It is nice to know, however, that they still retain the right to erect "Dangerous Hill" notices at the top of hills which are no longer dangerous.

Newport, Isle of Wight.
Early morning down by the old town quay.

The Amateur Circuit of Britain

THE first Amateur Circuit of Britain sponsored by the Quaker Oats Food Co. shows that the B.L.R.C. are not daunted by the turn of events in connection with the Tour of Britain, the fourth of which was held this year under the aegis of the *Daily Express*. The full story of this event is now told in an illustrated 48-page booklet which may be obtained from them for 2s. It is a stage-by-stage report of the race and I suggest that in future editions they adopt the correct publishing practice of numbering their pages!

The Amateur Circuit of Britain shows, as I have repeatedly said, that there is no lack of sponsors for National events of this calibre. In one of the League handbooks, I pointed to the risk the League was taking in tying themselves up to one newspaper, stating that when the race had served its purpose it *could* be dropped. Now that the League has acted as a really independent body, I hope that its Amateur Circuit of Britain continues year by year.

World Championships

THE B.L.R.C. in a press statement states that the team nominated for the World's Championships by the N.C.U. did not, in their view as a controlling body for professional and independent road racing in Great Britain, represent the best team which could be selected from the riders available to represent Great Britain in the World's Championships. If agreement had been reached on the subject of International licences, the B.L.R.C. could have nominated the following riders as a team: Krebs; Maitland; Cristisson; Mitchell; Bedwell; Parker; Ilseley; Robinson; with reserves, Steel and Greenfield.

Tricycles

THERE are still those who like to trundle that clumsy, antiquated and absurd vehicle the tricycle, preferring the disadvantages and discomforts of three wheel tracks instead of one. For myself, I have only ridden a tricycle on odd occasions, but never found any advantage over the two-wheeler except at a traffic stop when one could remain sedately seated. Of course, this *is* an advantage when old age creeps on and the rider cannot nimbly swing his leg over the saddle. The fact that it has practically disappeared from most manufacturers' catalogues is an indication of the declining demand.

The tricycle was originally introduced for those who found it too difficult to learn to balance on two wheels. If you have never ridden a bicycle, you will learn to ride a tricycle quite quickly, but otherwise you will find it a most tricky instrument to master.

Protagonists of the tricycle, in my view, write their eulogies as a result of nostalgia rather than logical reasoning. It is undoubtedly an old man's instrument, but it is lumbering, requires more effort to propel unless the gear is made ridiculously low, which means fast pedalling even for an average speed of 10 miles per hour, and it is certainly uncomfortable.

Liverpool to London in Under 8 Hours

KEN JOY recently broke the Liverpool to London record in 7 hours 55 minutes 37 seconds, which counts as 7 hours 56 minutes for record purposes. This is 23 minutes under the tandem-trike time of Arnold-Crimes and 1 hour 2 minutes better than the ride of Richard Kemps pre-war record for the same journey. His average speed for the 211 tour mile record was over 25 m.p.h., and he nearly approached beating the 100 mile record.

The End-to-end

EILEEN SHERIDAN recently broke the W.R.R.A. Land's End to John O' Groats record with a phenomenal ride of 2 days 11 hours 7 minutes, which is only 4¼ hours outside the record for this journey made by F. H. Ferris in 1937, and it beats the ride by Edith Atkins, riding as an amateur last year, by 6 hours 57 minutes. It breaks Margaret Wilson's 1939 record by 11¾ hours. When Margaret Wilson was wiping up the records almost weekly we thought it would be many years before this blonde bombshell would be matched. Allowing for the intervening war years, when record breaking was at a standstill, I have no doubt that her records, or at least some of them, would have been beaten, since some of them were records *made* not broken. Eileen Sheridan's riding shows that each generation can produce riders to equal the stars of the past.

Then there is the record of Arnold-Crimes over the same roads to record. They made the fastest ride to John O' Groats from Land's End in 2 days 4 hours 26 minutes, continuing to make the fastest 1,000 miles in 2 days 14 hours 1 minute.

It must appear that this record is approaching the point where they must unhappily be put on the shelf for all time. I say unhappily because I think it is one of the most romantic, if not the most romantic, of all the R.R.A. records. The thought of a lone rider pedalling away day and night on a very tortuous journey is in itself thrilling. The R.R.A. will shortly have to think of some other record to replace it. The original end-to-end record was over the short course in which the riders were assisted by three ferries. Over the course trundled, in the early part of this century, such giants as Peck and Olley, and the redoubtable Harry Green, many of whose records stood for over 20 years. The late G. P. Mills held the record for a time.

The great medieval Castle at Warwick.

CYCLORAMA

By H. W. ELEY

Mellow Fruitfulness

SEPTEMBER again, and as always Keats's lines about the "season of mellow fruitfulness" come to my mind as I ride out into the countryside. Apples are ripening in the orchards; and one feels a sense of fulfilment and completeness as one gazes out over the stubble fields. In some districts the corn is already garnered; in others it still awaits cutting, waving in the soft September breeze like a sea of gold. Over the stubble the little brown partridge is foraging for food—and over by the old warren there are rabbits a-plenty, and at their best. A goodly time this month of September, and the rider is wise who makes the most of the golden days. All too soon winter will follow mellow autumn, and the hollyhocks and sunflowers and Michaelmas daisies will be gone.

The 14th Cent. SWAN HOTEL, Thames Ditton. A delightful Thameside inn near Hampton Court.

In Superstition Land

I HAVE referred before to the number of quaint and curious superstitions which still linger in the heart of the countryside, and the other day, while talking to an old woman who lives on the fringe of the ragged common at Tideswell, I heard of more strange beliefs. The old dame is quite a friend of mine, for I often call at her tumbledown cottage for a chat. She likes a pipe of tobacco, and brews a very strong cup of tea. We fell to talking of the many superstitions connected with flowers, and she told me that the Canterbury bell is a sacred flower and should never be grown in the ordinary garden. "If anyone picks one, it means the tolling of the death bell in the village within a fortnight." I had never previously heard of this strange belief, but I had always known that the Canterbury bell was supposed to bring good luck to all the gardens in the fair city of Canterbury, and that the flower got its name from the fact that the small bells worn by the horses of the pilgrims to à Becket's tomb resembled the bloom. We fell to talking of superstitions about gardens and gardening, and my old friend assured me that to transplant parsley was a sin, and that it played into the hands of the Evil One! Before I left the cottage, after my cup of tea and smoke, I had learned that to stamp on a holly berry and crush it was sure to bring bad luck, because the robin is a holy bird, and in winter time feeds upon holly berries!

The Fen Country

A FEW weeks ago I received a charming letter from a reader of "Cyclorama"—and he told of the delights and beauties of the Fen country round about the ancient town of St. Ives, in Huntingdonshire. Two villages mentioned particularly were Hemingford Grey and Hemingford Abbotts, and my correspondent writes "they have a quiet charm, compounded of old cottages, quiet river, lush meadows, and delectable little old pubs." Well, that sounds an entrancing description, and already I have made up my mind to make a tour of the district, to discover these charms which my good correspondent has known for many years. He also mentions an ancient inn at Over, near St. Ives—The Ferry Inn—with thatched roof, stone floor, walls of old hair plaster, and a beamed ceiling. According to my correspondent this good inn stood in King Alfred's day, and legend has it that it was while that defeated monarch was fleeing from the Danes he found an osier-cutter in the reeds and told him that if he would ferry him across the river he could have the inn!

A legend maybe, but a picturesque one, and we will leave it at that. I am indebted to my "pen-friend" for some charming notes, and I shall explore the district he describes as soon as ever I can.

Bunyan and Bedfordshire

MUSING among some old touring notes the other day I came across some references to a tour made, many years ago, of some parts of Bedfordshire, and among the notes was a sketch I had made of the statue to John Bunyan, which is in the county town, although the famous tinker's birthplace was at little Elstow, a mile or so away. The statue is in front of St. Peter's Church, and recalls the words of Browning: "Bunyan's statue stands where stood his gaol."

Bedfordshire is a homely shire; here no rugged peaks rise in stately grandeur; here no wild moors call us to views of purple heather and the call of the curlew; but there is homely English loveliness nevertheless. I love to wander by the Ouse, and muse upon the activities of this shire which is less known by tourists than it should be. But to get back to little Elstow: Bunyan was born there in 1628, and surely no humbly born man has ever left a greater legacy of fame, or so marked the generations which followed his day!

The Mushroom Mystery

YEARS ago I always used to "bank on" September as the month when, walking over grass-land, I should find plenty of succulent mushrooms. But these days I see them but seldom, and have walked for hours over the kind of pastures which once yielded generous crops and gone home empty-handed. Some of my country friends say that the disappearance of the mushroom is due to the continuing use of chemical fertilisers on the land. This may well be so, although quite near to the fields, without a single mushroom, one may sometimes come across a patch of ground covered with them. "They be chancy things," said one of my farm friends in the inn the other day, and I am inclined to agree with him. What I do know, and grieve over, is the fact that my early morning walk over likely fields secures me no tasty "button" mushrooms to go with my rasher of breakfast bacon!

The Bicycle Carries the Banner

TALKING the other day with a man engaged in the cycle manufacturing industry, and who had just returned from a world-tour on behalf of his firm, he told me how splendidly the British bicycle "carries the trade banner" and acts as an ambassador for our commerce. None of our exports has a greater reputation for high quality and dependability. Everywhere the British cycle goes it gains new friends.

GLEN COE, Argyll. The scene of the great massacre of the Macdonalds on Feb. 13, 1692.

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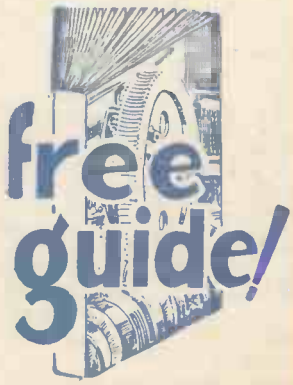

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