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PRACTICAL MECHANICS

EDITOR : F. J. CAMM

AUGUST, 1952

A MODEL *Steam* LAUNCH

SEE PAGE 370.

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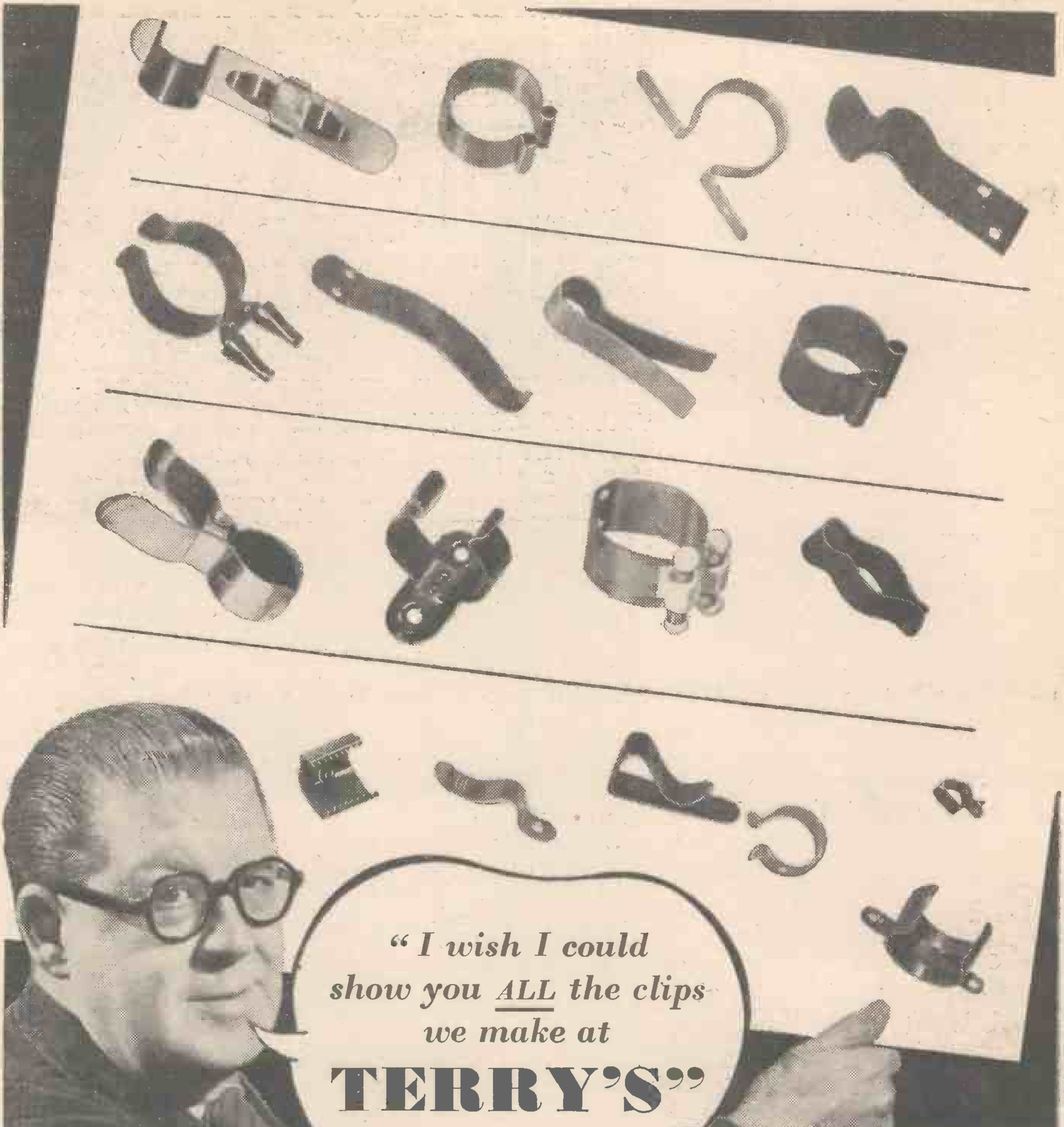

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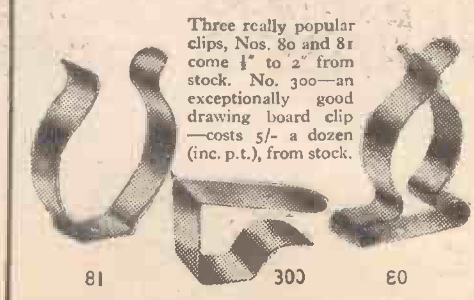

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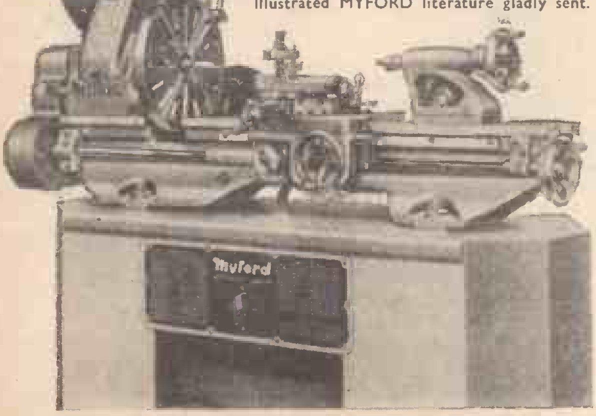

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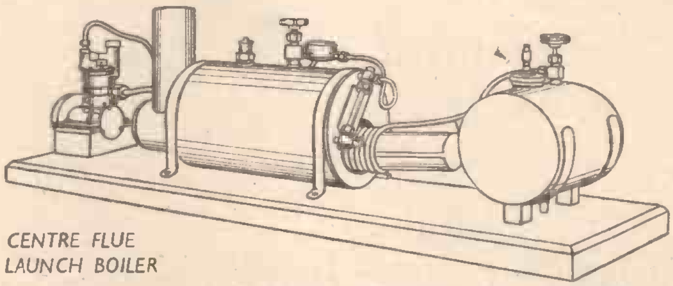

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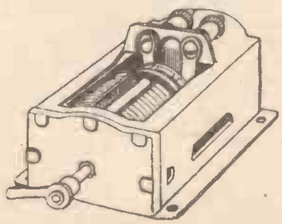

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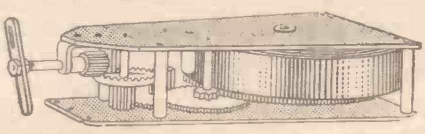

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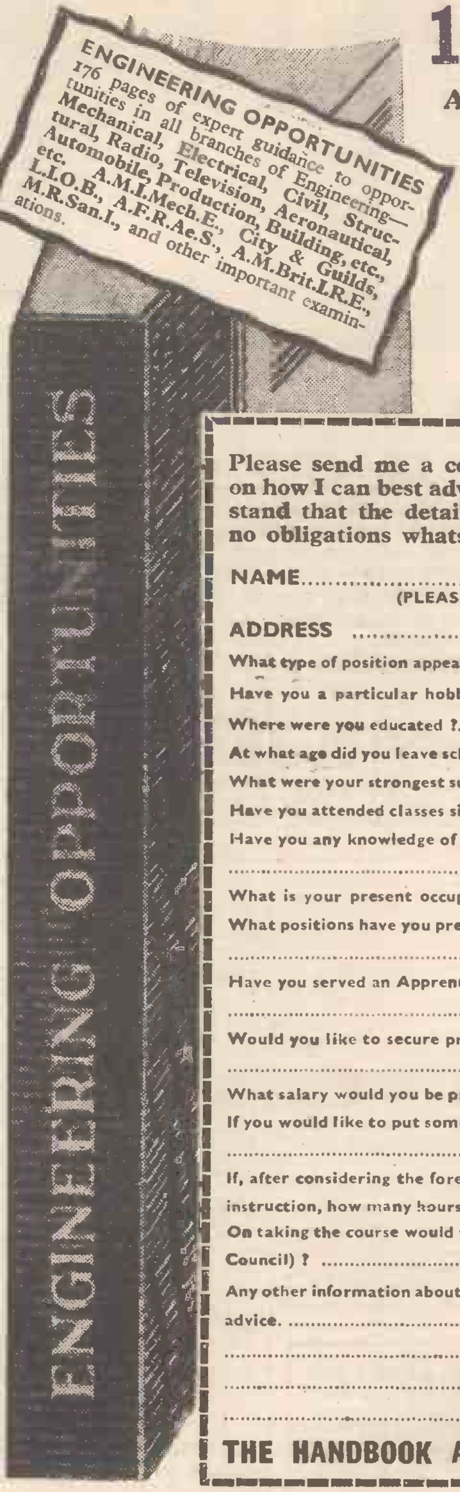

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AUGUST, 1952
VOL. XIX
No. 224

PRACTICAL MECHANICS

EDITOR
F. J. CAMM

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

FAIR COMMENT — By The Editor

£200 Competition Result

A VERY large number of entries was received in the four sections of our £200 National Competition, details of which were announced in our April issue and entries for which had to be submitted by June 1st. The task of judging the individual entries, most of which were of a high order of merit, has been difficult.

Some entries which, on first inspection, appeared to be in the running had finally to be rejected because they were too similar to commercial articles already on the market, whilst others finally had to be rejected because examination showed them to be either unworkable, too costly to produce, or, in the case of electrical devices, contrary to I.E.E. Regulations.

After finalising a short list in each of the four groups it was decided finally to award the prizes to those whose names and addresses appear in the adjacent column.

The entry for Section 2 of the competition was disappointing as to quality, or rather as to disparity of quality.

A large number of the entries submitted are being retained for publication at our usual rates, and the entrants are being advised accordingly.

The competition indicated the great ingenuity of our readers, and although some tended to concentrate on everyday items, such as airers, economy tooth brushes, and similar gadgets which were not in the winning class, they nonetheless displayed skill and thought.

Some entrants had approached the problem from the wrong point of view. They invented a need, and then proceeded to invent something for the invented need. The judges were guided throughout by the practicability of the device and whether it fulfilled a purpose or supplied a need. Every entry was scrupulously and carefully examined.

Some readers submitted working models of their devices and these were, of course, of assistance in the judging. In view of the fact that some of the entries were designed to lighten the work of the housewife it is not surprising that a fair number of entries were submitted by women.

We shall commence publication of the winning entries next month.

'PUBLISHERS BE PRACTICAL'!

THE Eccles Borough Librarian, in a recent article, says that the book trade attempts to exist in self-perpetuating isolation, and that there is little evidence that publishers are aware of the fact that most people to-day are skilled mechanics or craftsmen and that most of them have practical hobbies. This is a surprising statement from a librarian who should be aware of the enormous number of technical periodicals and books published in this country every year.

The publishers of this journal have specialised for over 40 years in the publication of practical books and periodicals. He says that publishers adopt a "take-it-or-leave-it attitude with technical books." We can assure him that they do not, and that intensive efforts are made to bring books to the notice of the entire technically-minded public. The sales of some technical books exceed those of a best-selling novel.

LIST OF PRIZEWINNERS

Section 1.—(1st Prize, £25), A. R. Eades, Esq., 2, Greenwood Drive, Littledale, Sheffield, 9; (2nd Prize, £15), Arthur Pearson, Esq., 21, Fairfield Avenue, Ormesby, Middlesbrough, Yorks; (3rd Prize, £10), H. P. May, Esq., 137, Alexandra Park Road, Wood Green, N.22.

Section 2.—(1st Prize, £25), W. E. Davies, Esq., 5, South Terrace, Ditherington, Shrewsbury; (2nd Prize, £15), 22598638 Spr. Glazer, 24, Field Squadron R.E., Ure Bank Camp, Ripon, Yorks; (3rd Prize, £10), J. Brooks, Esq., 132, Every Street, Nelson, Lancs.

Section 3.—(1st Prize, £25), W. Bodak, Esq., 20, Winthorpe Road, Newark, Notts; (2nd Prize, £15), W. Brook, Esq., 5, Southgrove, Fulwood, Preston, Lancs; (3rd Prize, £10), Mrs. M. Garrick, 6, Victoria Crescent, North Shields.

Section 4.—(1st Prize, £25), L. A. Neale, Esq., 20, Newmarch Street, Tinsley, Sheffield, 9; (2nd Prize, £15), D. S. Noble, Esq., "La Rambla," Bagatelle Road, St. Saviours, Jersey, C.I.; (3rd Prize, £10), J. L. Brown, Esq., 70, Strathmore Road, Horfield, Bristol, 7.

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INDUCTION HEATING

FACED with the necessity of cleaning a large volume of regular shaped bar stock, the International Harvester Co., Chicago, Ill., recently investigated successfully the possibility of cleaning by induction heating.

The theory involved is to raise the temperature of the surface scale rapidly enough to cause expansion to a degree where it will separate from the cooler base metal. Tests were run on heat-treated bar stock of 2¾in. and $^3/_{16}$in. diam., 39in. long. Experiments proved that by passing the bars through an inductor connected to a source of 9,600 cycle current, the scale could be removed satisfactorily. A power input of 15 to 25 kW. per sq. in. gave the best results. Speed of travel was regulated to obtain a surface travel of approximately 350 deg. F. at the inductor.

It was also found that moisture was a factor in removing scale by this method and, in consequence, a water spray quench was introduced following tempering. This operation precedes the descaling process by about 15 min. It has been noted that the descaling is more complete under these conditions, and the scale tends to "pop" off the surface in a much more lively manner than on bars that are thoroughly dry.

Power cost for cleaning stock is relatively small. The low cost plus reduced handling cost make induction descaling an economical means of cleaning.—F. J. C.

A MODEL STEAM LAUNCH

A Modern Stream-lined Design Powered by a Single-cylinder Oscillating Engine

By J. E. J.

IN presenting this article, three points were borne in mind which should prove beneficial to a potential beginner. First, the model is sturdy, small and compact, and thereby easy to handle. Secondly, it is made of materials that involve little expense and thereby will suit the average pocket. Thirdly, the construction is of such simple character that almost anyone who is handy with tools could build it with little or no difficulty. No elaborate equipment is needed, and the work can be carried out partially on the kitchen table—a fact which will, no doubt, find favour with those who do not possess a workshop.

A biscuit-tin provided most of the material for the hull and cabin structure, and nearly all the fittings, including the power unit, were improvised and devised from a various assortment of "odds and ends" which were found to be of suitable character, and each item of which will be dealt with separately in due course.

The design is completely free-lance, and is not intended to represent any existing prototype. It began with a scribbled sketch, which was later transferred to the drawing-board for the adding of some proportionate measurements.

The power is supplied by a small, simply-designed steam unit, the engine of which is single-acting oscillating. Methylated spirit provides the fire, the burner being fed from a container lying externally away from the boiler. The combined weight of the model, plus unit, ready for running, is no more than 6lb., the overall length 21in., beam 5in., and depth of hull amidships, $2\frac{3}{4}$in.

Construction of Hull

The hull was constructed in four main sections—port and starboard side-plates, bottom-plate and stern transom. The remainder of the items, such as bulkheads, cross strakes and ribs were added later as separate embellishments. Using the drawings as a guide, templates of brown paper were made up of each section of the hull and cabin structure, these being used to mark out the metal, which was correspondingly cut with the shears (see Fig. 4). Once this was done, all sections after cleaning up lay ready to solder together. No filing to size was necessary, as careful cutting with the shears ensured perfection along the prescribed lines of the templates.

No formers were used whilst soldering,

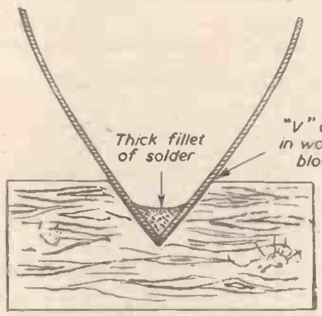


Fig. 2.—The bow joint.

as the shape of each section ensured their taking up the necessary sheer and flair, assisted only by a little easing with the hands.

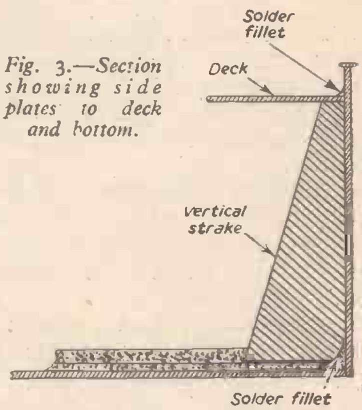
Assembly

Laying the bottom-plate flat on the bench, first one side-plate was laid edge on, and beginning with the stern, "tacked" with solder right the way along. When the other side-plate had been attached likewise, the transom was fitted. To effect the bow joint (Fig. 2), a "V" cut was made in a block of wood, the hull up-ended, and the ends of the plates brought together in the "V," to be "tacked." The final soldering was accomplished by first chopping pieces of solder into the seams, then running the hot iron along to obtain a good fillet (see Fig. 3), the bow needing particular attention, in view of its vulnerability to head-on bumps.

All the soldering was done internally which left little or no cleaning-up to be done on the outside of the hull.

The next phase was the strengthening. There are two bulkheads, situated one fore

Fig. 3.—Section showing side plates to deck and bottom.



and one aft. These were merely cut from pieces of tin and fitted into their assigned locations. (Incidentally, these finally sealed off the two compartments and rendered them watertight). Cross-strakes of $\frac{1}{8}$in. angle brass were next soldered into position on the bottom, and, finally, to these and to the hull sides, consecutively, were soldered triangular pieces of tin to ensure rigidity. (See Fig. 1.)

Turning the hull upside down, the positions for the stern and rudder tube were located and drilled out, the one for the stern protruding through the lower portion of the aft bulkhead in the requisite position to ensure the correct angle, or cant, of the tube when inserted. The rudder tube is vertical. Both these items were soldered in, the stern tube having a fin support where it protrudes through the bottom of the hull. (See Fig. 5.)

Main Deck

Normally this would have been fashioned from one continuous section of tinplate, but as available material did not permit such a lavish procedure, the deck was built up from pieces, forming virtually three sections: the first extending from the bow peak to the forward bulkhead; the second, from here to the after bulkhead; and the third, from the after bulkhead to the transom. (See Fig. 1.) No templates were necessary, as each section was cut and fitted into its location. The middle section was cut out, presenting an aperture through which the

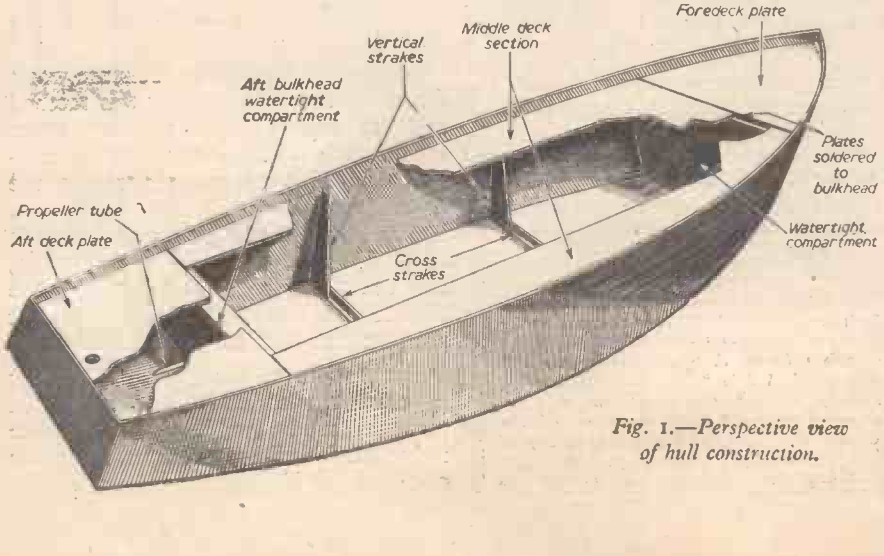


Fig. 1.—Perspective view of hull construction.

power unit can be inserted, and it is, of course, over this that the main cabin structure is fitted. With the main deck in position the final stage was the fitting of a beading around the edge of the hull. This was ⅛in. by 1/32in. brass strip, first shaped to the curve, then soldered on. As this was to be left bright, fine emery paper was applied, followed by a good shine with metal polish. When painted up, the hull appearance is much improved by the beading, which shows up to advantage the curve of the deck.

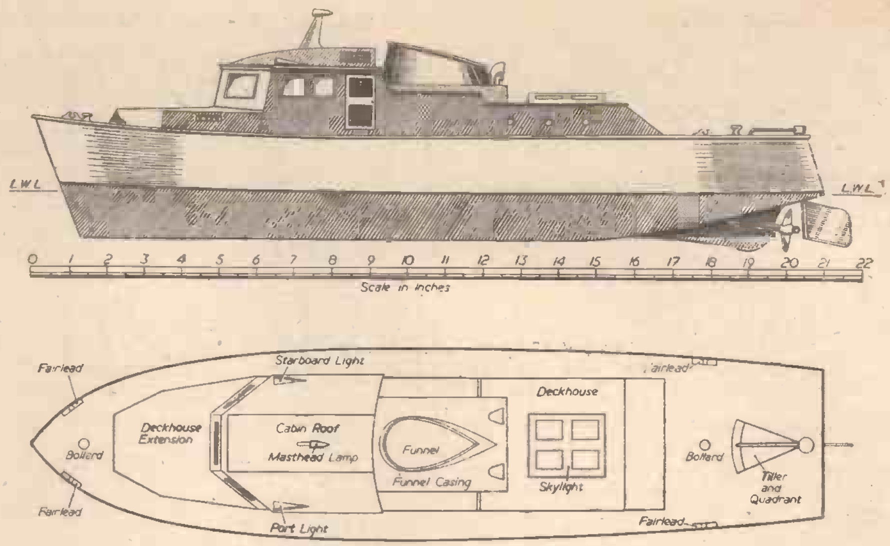


Fig. 5.—Side elevation and plan.

The Cabin

The templates (Fig. 4) were used again and when the various sections were cut out and cleaned only the soldering into position remained. They were actually laid on the main deck, leaving a slight ledge about 1/16in. wide, to provide a good bed for the solder. No routine was laid down for the assembly, as the exact locations were first drawn on the main deck, enabling each section to be put into place directly. To "obtain" the windows, first the positions were marked out, then a succession of small holes were drilled along the inside of the lines. Then, using a fine bevelled chisel, the metal was chopped away, the resultant jagged edges being filed down smooth to register with the outlines. When windows or ports are required in metal sections of cabins or deck houses, etc., drill or cut these out before cutting out the section from the main sheet of metal, and if chiselling is necessary, use a chisel that has a very sharp edge, and a fine bevel. This will ensure a clean cut with little or no "lift" of the edges of the metal. The cabin sections number four: front, two sides, and the transom, or rear piece. The extension at the front on the deck was cut from a separate piece of tinplate. The roof was built up as shown, and slides into position over two narrow projections on the upper edges of the cabin walls. The upper deck was fashioned from an odd piece of tin, and is held in position by two lips soldered to the underside.

The Funnel

The funnel presented something of a minor problem, and several drawings were necessary before a satisfactory template was cut. This type of funnel is never any easy item to fashion, and necessitates an absolutely correct plan and elevation. The easiest way out for the beginner is to experiment with scissors and some paper first, gradually trimming off until the desired shape is obtained. This is the most prudent method as, unless one is something of a mathematician and is familiar with the mechanical drawing of elevations, radii, and curves, etc., the beginner is likely to find himself in deep water.

The metal was cut to the template formed to the right shape with the hands, butt joined and soldered, with the top edges with a beading of 1/16in. dia. brass wire. Then the complete funnel was soldered into the aperture cut for it in the upper deck. There is no chance of the solder melting from the heat of the fire, as it is protected by the inner funnel on the boiler casing.

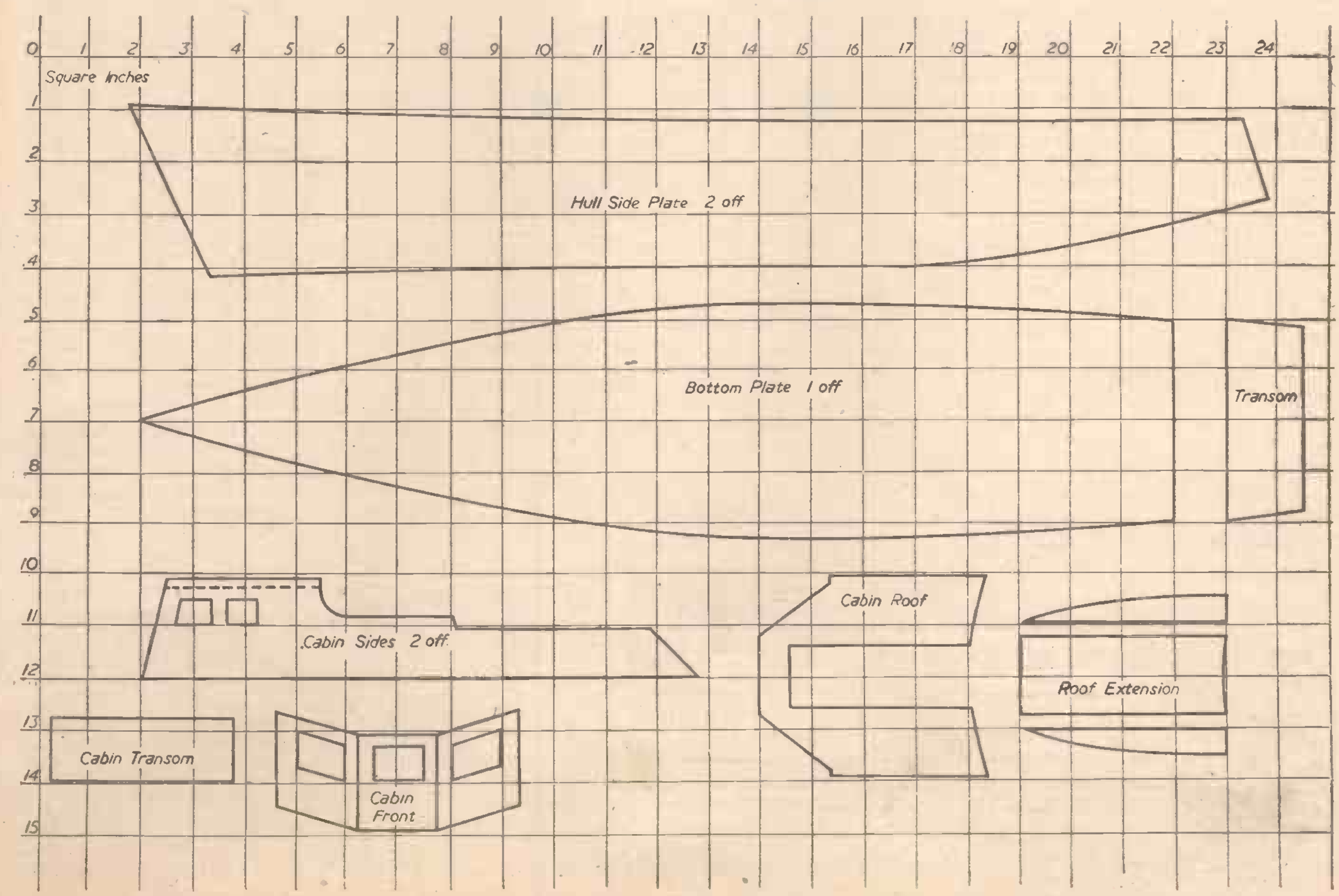
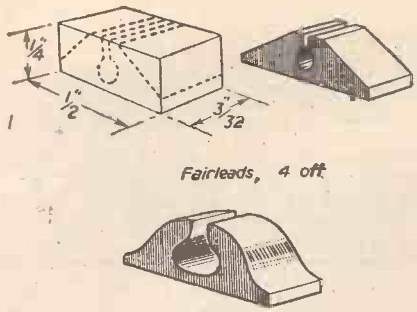


Fig. 4.—Marking out plan for the hull and cabin sections.



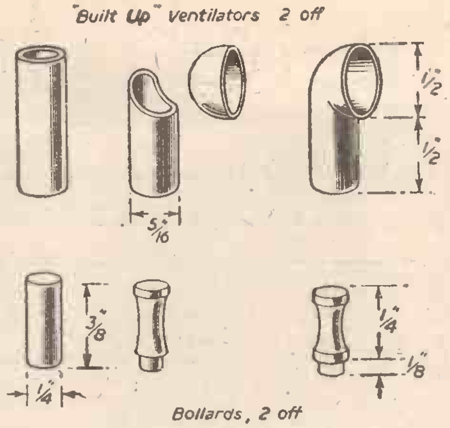


Fig. 6 (*Above*).—*Details of fairleads.*
Fig. 7 (*Right*).—*Ventilators and bollards.*

Windows and Ports

The windows were made of "Perspex," 1/8in. thick, each window having a separate piece fitted in. This was accomplished by first filing a step all round the edges, then inserting them as a tight fit into the window apertures, with a little "Bostik" added to ensure that they did not move.

The ports, of which there are six, three on either side of the engine room casing, consist of small brass washers soldered on. Their positions may be seen in Fig. 5.

General Fittings

The situation of the engine room skylight is easily ascertained from the sketch and likewise the construction; the windows are of the same material, and were fitted in a similar manner to those of the cabin.

The general fittings are just of sufficient a number to apply a reasonably nautical aspect, and consist of: bollards, fairleads, navigation lamps, and cowl ventilators, illustrated in Figs. 6 and 7. Virtually all these details were improvised from odds and ends. A few pieces of rectangular brass strip were used for the fairleads, which were filed to shape, whilst the bollards were the result of some turning carried out on a few short lengths of 1/4in. dia. brass, the hand-brace, clamped in the vice, serving as a lathe, and a file taking the place of a cutter. (Incidentally, a good substitute for small bollards are the kind of studs found in a new shirt at the shop.)

The navigation lamps found their way into existence via a couple of pieces of brass tube soldered to the roof, with the "glass" consisting of bits of "Perspex" stuck in, port red, starboard green. The ventilators required a little extra attention as they had to be built up. The cowls were beaten out on a block of lead, from bits of sheet brass, using a 1/2in. dia. ball-bearing as a "hammer," or former. After the edges were trimmed and filed smooth, they were soldered to short lengths of 3/8in. dia. brass tube, the upper ends of which were filed half-round to form a seating. The units were then pressed and soldered into the requisite hole cut for them in the funnel casing, just aft of the funnel.

Rudder

This was cut from a piece of 20g. brass sheet, and is fitted over and soldered on to a rudder post made of a length of 1/8in. dia. brass rod. The head consists of a brass collar screwed on to the rudder post, and fixed with

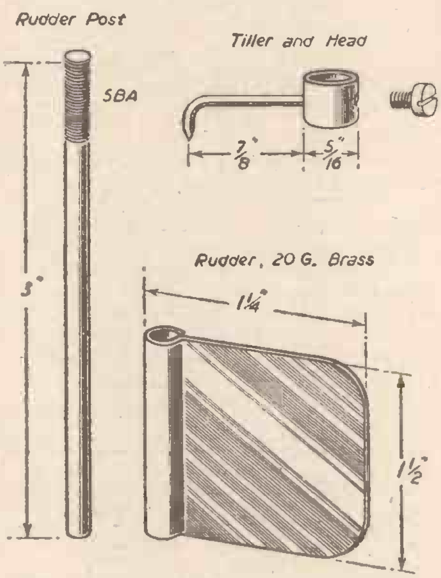


Fig. 8.—*Details of the rudder and tiller head.*

a small set screw inserted at right angles through the collar, to bind on the post. The tiller, which is soldered to the head, is made of 1/16in. dia. brass wire, the forward end of which is sharpened to a point, and laid at right angles to engage in the quadrant on the deck (see Fig. 8).

Propeller

This was pre-fabricated, 1 1/2in. dia., two-bladed, with a medium pitch—blades set at 45 deg. from the horizontal. They are made of 20-gauge brass and are soldered into slots cut into the boss, which was improvised from a brass collar. To obtain uniformity the blades were cut to correspond with a template fashioned to the size required. Once the blades were soldered into the boss, all the edges were filed sharp, and then brought to a high polish with emery paper. This latter process is very necessary as the blades are better able to meet the resistance set up by the water and thereby throwing less strain on the engine. The blades are curved, i.e., although the set angle is 45 deg. the tips of the blades are twisted until the cutting edges are nearly at right angles. "Spooning" is the correct term (see Fig. 9).

The shaft is a length of 1/8in. dia. silver steel tapped 5 B.A. at one end to enable the propeller to be screwed on and secured with a lock-nut.

The Stern Tube

This is a length of 1/4in. dia. brass tube fitted with 1/8in. brass bushes soldered into either end (Fig. 10). There is no gland. Grease pumped into the tube ensures that no water penetrates into the hull. This also serves as a lubricant for the shaft. For a small model of this nature a gland would not be necessary, as the action of it bearing on the shaft would seriously retard the speed of the small engine. Even thick oil will stop the water

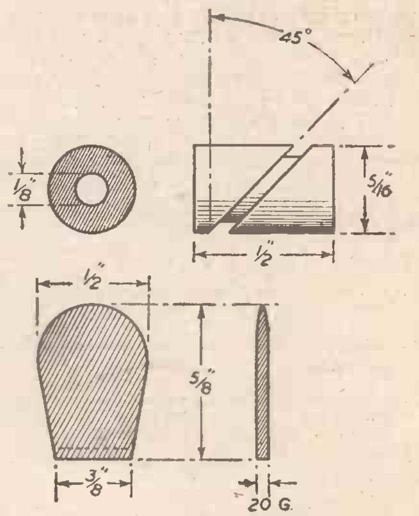


Fig. 9.—*Shape of propeller blades and boss.*

coming through, and provided the shaft is well fitted it will not leak. The writer has a model cross-Channel steamer built over five years ago. The oil pumped into the stern tube at that time is still there, despite the fact that the model has had countless "voyages" during that time.

(*To be continued*)

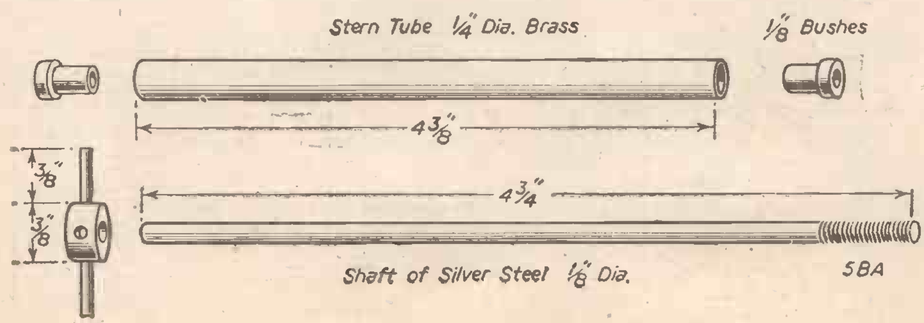
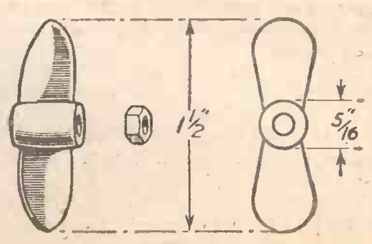


Fig. 10.—*Stern tube and propeller shaft details.*



Propeller

A Lumimeter for Photomicrography

Constructional Details of a Useful Accessory for the Amateur Microscopist

By BRIAN THRUSH, B.A.(Cantab.), and EDWARD ELKAN, M.D., L.R.C.P. & S.

PHOTOMICROGRAPHY is the art of photographing the image seen in the microscope. This can be done with any microscope and with any camera, but a modern microscope and a camera built for the purpose considerably simplify the process. Even so, the photographer using a microscope has to contend with a more than usually

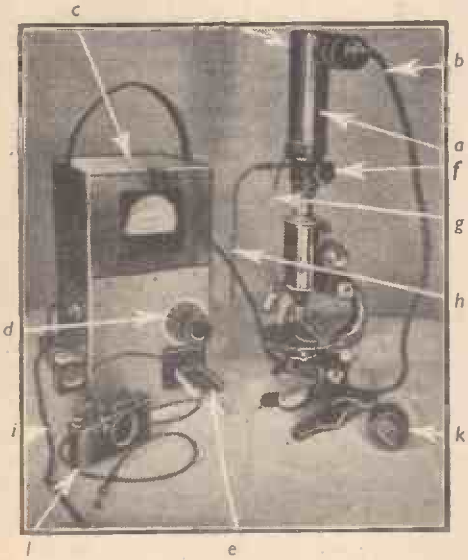


Fig. 1.—Microscope fitted with photomicrographic extension tube and photomultiplier cell.

(a) Housing containing photo-cell; (b) three-core cable carrying high-tension and anode current; (c) microammeter 0-500 microampere; (d) variable resistance R_1; (e) switch; (f) photomicrographic extension tube; (g) shutter release; (h) prism release; (i) mains supply; (k) ground glass focusing screen; (l) Leica body with cable release.

wide range of light intensity. Between the extremes of dark field illumination or the photography of opaque specimens by reflected light on the one hand and thin, badly stained sections viewed under low power on the other, this range is far greater than that encountered by the ordinary photographer. Even so, the total quantity of light which eventually impinges on the emulsion is small, and exposure times are fairly critical, particularly when colour film is used. It is important, therefore, not only to have a reliable exposure meter, but to be able to measure, in each instance, the light intensity used for the making of any particular picture. Once such readings have been taken with some of the frequently recurring specimen, losses through spoiled negatives diminish more and more.

The ordinary photographic exposure meter, as described in the February, 1952, issue of this Journal, is unsuitable for this purpose. The current generated by a barrier layer cell, activated by light passing through a microscope, is too small to be registered by the meter movements that can be used, and amplification is difficult in this instance since we are dealing with direct current. The simplest way out, suggested by beautiful instruments offered by several firms, lies in the use of large galvanometers which register such currents without any amplification. But such an instrument will cost about £40.

Construction

The lumimeter described was built from Government surplus stock at a cost of about £5, the most important item being the type 931 A photomultiplier cell which is at present offered at £1 10s. The construction of this cell is that of an ordinary photo-vacuum cell, but instead of one anode and one cathode it has, in addition, nine intermediate electrodes. Light which falls on the cathode releases electrons which are then attracted to the first multiplier electrode. This is maintained at about 100 volts positive to the cathode. The electrons, on hitting this electrode, knock off a further number of electrons which are attracted to the second multiplier electrode, which is maintained 100 volts positive to the first. This multiplying process is repeated nine times in all and the number of electrons which finally reach the anode (50 volts positive to the ninth multiplier electrode) may be up to a million times that of the electrons which originally left the cathode; hence the great sensitivity of the device. The current allowed to flow through the anode should not exceed 1mA. It is proportional to the intensity of the light striking the cathode and is measured by a 0-500 moving coil microammeter. Suitable meters with internal resistances of about 500 ohm and scale diameters of 2-3in. can be found in the shops. If a larger instrument can be purchased so much the better, since larger scales are easier to read.

The 950-volt supply required for the photocell is obtained from the mains by using a step-up transformer and a half-wave rectifier. It is smoothed by two 4mf. condensers and the variable resistance R_1 of 500,000 ohm (see Fig. 3). If a suitable transformer cannot be obtained, the output from the H.T. windings of a standard 350-0-350-volt radio mains transformer may be sufficient, particularly if some turns are added to the secondary winding.

Fig. 2.—Microscope fitted with photomicrographic extension tube and Leica camera. Photomultiplier cell removed from housing.

(a) Housing for photo-cell; (b) photo-cell and base containing resistances R_4-R_{12}; (c) microammeter; (d) variable resistance R_1; (e) switch; (f) photomicrographic extension tube; (g) shutter release; (h) prism release; (i) mains supply; (k) ground glass focusing screen; (l) Leica camera with cable release.

When the switch is in position "3" the meter measures the anode current, which is proportional to the light intensity. Since the sensitivity of the photo-cell increases very rapidly with the applied voltage some means for controlling this voltage is necessary, and for this purpose the meter switch is set to position "2." The meter then measures the current flowing through the voltage dividing

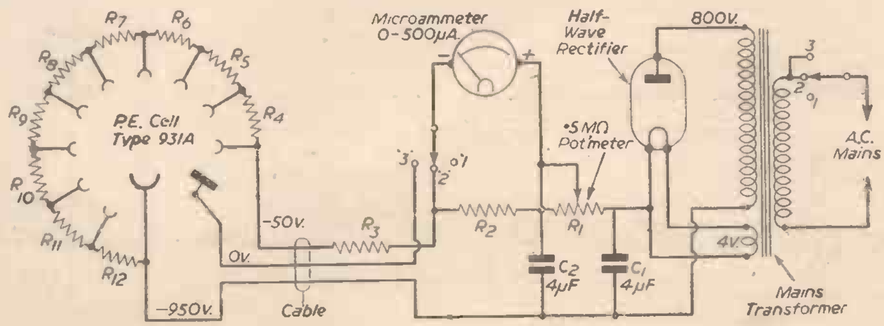


Fig. 3.—Theoretical circuit diagram.

resistances, R_3 to R_{12} inclusive, which is proportional to the applied voltage. The current can be adjusted as required by altering the variable resistance R_1 until the meter points to the mark corresponding to the sensitivity range required.

The housing for the photo-multiplier cell must be so arranged that the cathode side (recognised by the grid in front of the cathode) can easily be put into the plane of the plate or film used without disturbing the set-up and without letting any extraneous light reach the cell. In the present instance, where a Leica outfit similar to the Leitz "Mikas" (or "Micro-Ibso") attachment is used, the cell is housed in a metal hood fitting snugly over the extension tube of the photomicrographic attachment when the camera is not in place (Fig. 1).

The resistances R_4-R_{12} are wired to the base of the photo-cell and the latter is connected to the box containing the meter, the transformer, the condensers and the rectifying valve by a three-core cable which must be capable of withstanding 1,000 volts. The actual conductors need only be very thin (Fig. 2).

If it is intended to take readings in the dark, as when the meter is used for enlarging or other purposes it is an advantage to have a small light bulb fitted close to the meter. This can be run from the 4-volt filament winding of the mains transformer.

Several Sensitivity Ranges

This instrument is accurately linear, i.e., the deflection of the meter in switch position "3" is proportional to the intensity of the light falling on the cathode. Since the degree of sensitivity obtained depends on the supply voltage, given by the meter deflection in position "2," it is quite simple to devise a method of obtaining several sensitivity ranges for the meter. This is possible because a light intensity which gives full-scale deflection on one range setting will give 1/10 full scale deflection on a range of 1/10 the sensitivity. Each range will correspond to a certain meter reading when the switch is in position "2"; these readings can be marked on the scale and the meter set to this position by altering R_1. For this purpose, the weakest light it is required to measure is allowed to fall on the cell. R_1 is set to its maximum value and the switch is set to position "3." R_1 is now so adjusted that the meter reads full scale deflection and the switch turned to position "2." The meter reading should then be marked as "A." Should the meter tend to deflect above the end of the scale in position "2," R_3 may be too high or the cell may be defective. To obtain range "B," turn the switch to position "3" and increase R_1 until the meter reads 1/10 full scale deflection. Then increase the light intensity until the meter reads full scale deflection, turn the switch to position "2" and mark the meter reading "B." Repeat the process to obtain range "C." This gives three sensitivity ranges of a ratio of 100:10:1, adequate for most purposes.

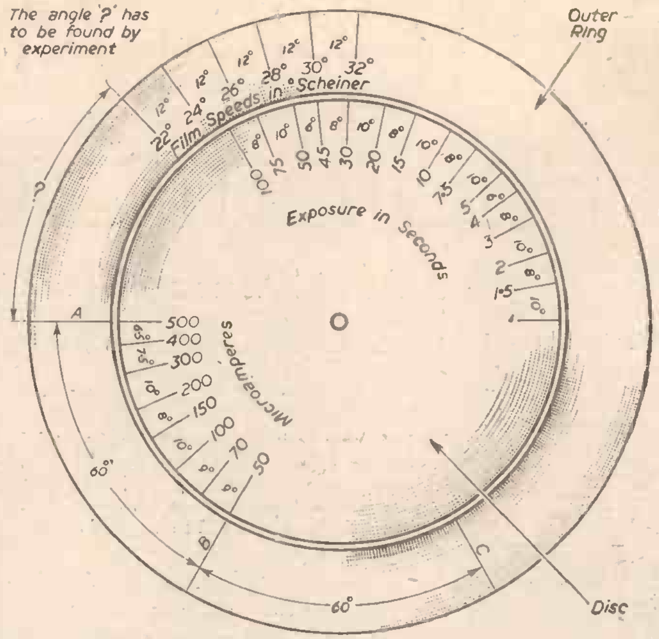


Fig. 4.—The disc calculator. (Note. The angle marked ? has to be found by experiment.)

An unknown light intensity is measured by turning the switch to position "2" and adjusting R_1 until the meter points to position "C." The switch is then turned to position "3" and the reading taken. If the reading is too low, positions "B" and "A" are tried in turn. Since the exposure time is roughly inversely proportional to the light intensity, the meter need only be calibrated for one standard intensity for one type of film by means of test exposures. In practice this is not nearly as complicated as it looks on paper.

LIST OF COMPONENTS

Mains transformer: 230 v. primary; 800 v. 2 mA. and 4 v. 1.5 A. secondary.
Microammeter: 0-500 Microampere.
Rectifier valve: VU111 or VU133 or U 17.
Photomultiplier cell: 931 A.
Switch: 2-pole three-way.
Condensers: C1 and C2: 4 microfarad, 1,000 v. working.
Resistances:
R1 = 500,000 ohm (carbon) potentiometer 1 W.
R2 = 1/3 of meter resistance ± 5%; ½ W.
R3 = 22,000 ohm ± 10%; ½ W.
R4-12 = 47,000 ohm ± 10%; ½ W.
Cable: High tension, to carry 1,000 v.
Suppliers:
Photomultiplier cells were obtained from Henry's, 5, Harrow Road, London, W.2.
Rectifier: Premier Radio Co., 207, Edgware Road, London, W.2.
Meters: British Physical Laboratories, Houseboat Works, Radlett, Herts.
Other parts from Radio Clearance, Ltd., 27, Tottenham Court Road, London, W.2.

Disc Calculator

Once the meter readings for one type of film are known, a disc calculator may then be constructed (Fig. 4) on which the positions of other films may be marked according to their sensitivity. These positions have to be re-checked if another photo-cell has been installed. In photographing objects with an unusual proportion of bright or of dark areas the exposure indicated may have to be varied by a factor of two either way. This meter is more complicated than those obtainable commercially, but its advantage lies in its cheapness and in the enormous range of its sensitivity which allows it, for example, to measure accurately light transmitted by the most powerful combination of lenses likely to be used with ordinary microscopes, e.g., a 1/12in. objective + 15x compensating eyepiece.

Items of Interest

New Cargo Liner

OSWESTRY GRANGE, a new cargo liner, has been built by R. and W. Hawthorn, Leslie and Company, Ltd., for the Houlder Line. Having a length of 450ft., breadth 61ft. 6in., and a depth of 40ft. to the upper deck, the service speed is 12¾ knots. There are five cargo holds, two deep tanks for vegetable oil, and the derricks include one of 25 tons. The liner is powered by a four-cylinder Hawthorn-Doxford oil engine, which develops 3,780 b.h.p. at 100 r.p.m., and is fitted for burning heavy fuel.

Model Ship for the Duke

NINE of Britain's famous model engineers are working on a detailed waterline model of H.M.S. *Magpie*—a gift from the model engineers of Great Britain—to be presented to H.R.H. the Duke of Edinburgh when he opens The Model Engineer Exhibition next October.

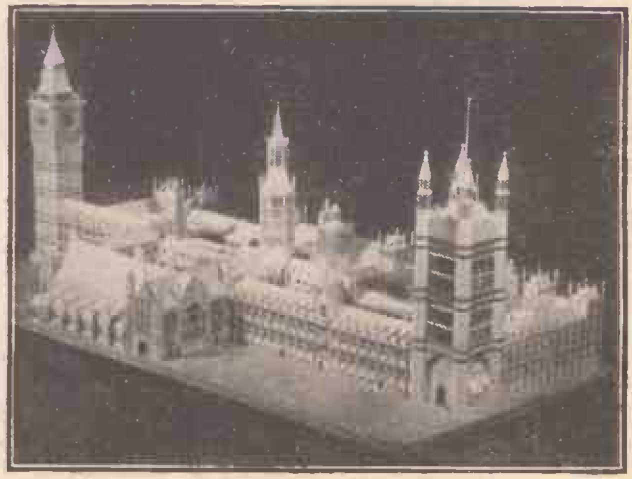
Each of these model engineers is noted for the craftsmanship of his ship models and is working against time to complete his part of the work on a scale of ⅛in. to 1ft.

The work has been divided into the following sections: the hull, superstructure, deck details, guns and other armament, masts and radar array, rigging and W/T aerials, boats, paintwork, scenic setting.

The Admiralty is co-operating with the model engineers to ensure that the model will represent H.M.S. *Magpie* as she was under the Duke's command.

A Remarkable Model

THE accompanying illustration shows a model of the Houses of Parliament, which was built by Terry Summers (aged 16) from a plan and photographs provided by the Ministry of Works. The model contains 10,000 pieces of balsa wood, and took nine months of spare time to build. The only tools used were razor blades and tweezers.



WALL FIXING METHODS

Modern Ways of Fixing to Walls, Floors and Ceilings

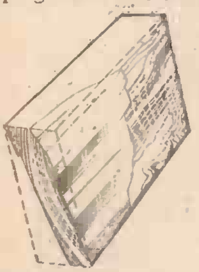
By W. P. MATTHEW

The expert on household repairs who regularly appears in the "About the Home" programme on Television

THE history of modern fixings to walls, floors and ceilings does not go back more than about thirty years, and just after the first world war the methods in general use were those which had been established by the traditions of generations of building craftsmen.

The Old Methods

Fixing to walls where the bricks were still exposed was by means of the winding plug which was driven into the joint between



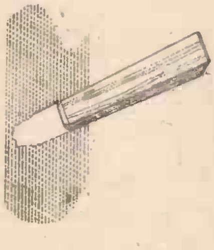


Fig. 1 (left).—A winding plug. Fig. 2 (right).—Old-time plug for plaster-covered walls.

the bricks and afterwards sawn off flush to the wall. Fig. 1 shows such a plug. It was made of well-seasoned timber, usually a piece of second-hand stuff to obviate loosening by shrinkage, and shaped by chisel or axe as shown, so that, as it was driven, it turned slightly and was thus under considerable tension as well as pressure.

If the bricks were covered with plaster a plug such as that in Fig. 2 was used and was driven into a hole made by a small cold chisel. The hole was made to slope downwards to withstand the pull of shelving or other fittings fixed clear of the floor.

Ceiling fixings were made to the joists

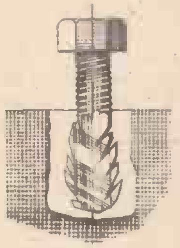


Fig. 3 (left).—Method of fixing to stone or concrete walls. Fig. 4 (right)—Rag bolt, used for fixing to floors.

which carried the ceiling, or where this was not convenient, to struts wedged and nailed between the joists.

Fixing to stone or concrete, whether of walls or floors, was a job for the bricklayer. Fig. 3 shows the usual method for walls. A bolt with a "T" or hook shaped head was set into a hole and grouted in with cement. In floors a rag bolt was employed. Fig. 4 shows a rag bolt in position before the hole is filled. The filling in this case was often molten lead which was caulked firmly with a blunt chisel as it cooled.

Fixing to hollow partitions of such materials as lath and plaster was impossible except at the supporting studs. One method of locating these studs is still very useful at the present day when a fixing has to be made to a partition sheeted with hardboard, asbestos cement boards, etc. In Fig. 5 such a partition is shown with the usual skirting. The skirting is, of course, fixed to the bases of the studs, and even under paint it is usually possible to locate the fixing nails. A plumb line from these gives the position of the studs at any height on the partition. In the same way it is possible to trace the position of ceiling joists by locating the fixing nails in the floor of the room above.

Modern Methods

Plastic plugging is perhaps the simplest and most convenient method of securing light fixtures and fittings to solid walls. The asbestos plugging compound is immersed in water and squeezed in the hand to a putty. When rammed firmly into a hole in the wall it gives an immediate solid fixing to a screw. The plugging outfit is sold at 3/- and contains compound, wall drill, a combined ramming and piercing tool, and a small selection of screws. The components of the set are also sold separately.

The plastic method has an advantage over all others in that, within limits, the size and regularity of the hole in the wall is not important as the compound can be rammed tightly to fill it. It follows, therefore, that an inefficiently secured fitting which pulls away from the wall leaving a jagged hole can quite easily be re-fixed. Fig. 6 shows the whole process of plastic plugging.

Fibre and Metal Plug Fixings

The fibre plug for screw fixing is nowadays too well known to need description, and if two or three essential conditions are observed, there is no better fixing medium. A medium-sized fibre plug, fitted with the appropriate screw, will hold a weight of half a ton. The largest-sized plug in conjunction with a coach screw will hold four tons.

What, then, are these essential conditions? First, the hole for the plug must be bored accurately and with the proper sized wall drill as supplied by the makers. The most common faults in drilling the holes are:—(1) allowing the drill to wobble in the hand as it is driven so that the hole tends to be irregular and enlarged, and (2) the tool is driven in by too heavy blows of the hammer so that it jams and has to be worked from side to side to free it, with the same result. The tool should be tapped with light blows and should be slowly rotated as it penetrates.

It is essential, too, that the right size of plug should be used with each screw, and there is a plug to fit every size. As the whole technique of plug fixing depends on the degree of expansion of the plug as the screw is driven home, this is obvious, and like so many things is often ignored.

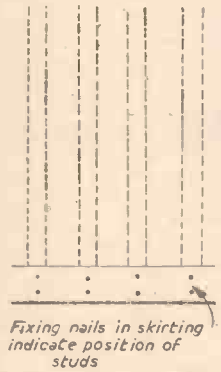
As the screw is driven, it cuts a thread on the inside of the plug so that, if properly fitted, the screw can be withdrawn and re-screwed as often as required.

Hints on Fixing Plugs

Sometimes when holes are bored in soft bricks the surface breaks away, resulting in a bell-mouthed hole. The hole, however, soon becomes parallel, but it is a good idea in these cases to make the hole a little deeper than normal and insert the plug a little below the surface, as shown in Fig. 7.

Plaster, too, will often crumble on the surface as it is drilled, but this can generally be avoided if a small square of sticking plaster, or even gummed paper, is stuck over the place before commencing to drill, (Fig. 8.) Afterwards soak it off. Where crumbling does occur, sink the plug to the depth of the plaster as in the case with the soft brick. In both these cases it is better, when inserting the plug, to enter the screw into it first by about half a turn and then to enter plug and screw together, otherwise there may be difficulty in accurately centring the plug.

When fixing to tiles the best tool to use initially is a durium tipped drill These drills will bore holes accurately in all forms of masonry and are sold in all sizes from



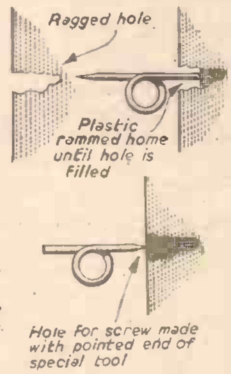


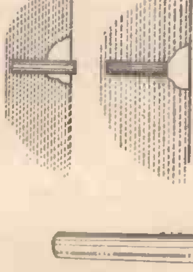
Fig. 5 (left).—Locating supporting studs in partitions of lath and plaster. Fig. 6 (right).—The process of plastic plugging.

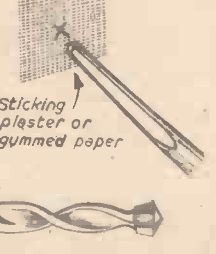
5/32in. to 15/16in. This is the cutting size of the head, the shank being somewhat smaller in all cases, as shown in Fig. 9. The drill used should be slightly larger than the hole for the plug, and when the tile is fully penetrated the remainder of the hole is drilled in the usual way. When the plug is inserted it should not protrude more than 1/16in. from the back of the tile, as shown in Fig. 10, so that there is no danger of the tile splitting as the plug expands.

Finally it is good practice to arrange that as little as possible of the unthreaded part of a wood screw enters the plug, and this often means sinking the plug below the surface as in Fig. 7.

Two other types of plug should be mentioned. These are the white bronze plug (Fig. 11) and the screw anchor (Fig. 12).

The bronze plug is used where fixings are subjected to high temperatures, and the screw anchor where chemical fumes may be





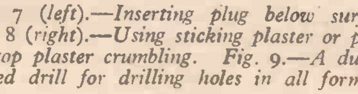


Fig. 7 (left).—Inserting plug below surface. Fig. 8 (right).—Using sticking plaster or paper to stop plaster crumbling. Fig. 9.—A durium tipped drill for drilling holes in all forms of masonry.

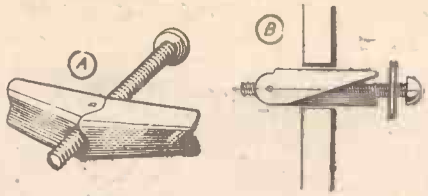
present, and because of the flanged head it can be used in bottomless holes.

Fixing to Hollow Partitions

This problem has already been discussed in its relations to the older fixing practices. In many modern constructions, however, the fixing to intermediate studs is not practicable as these are often far apart. Then, too, there is the problem of the hollow brick and hollow tile construction which has become increasingly popular. Considerable research has been devoted to these and similar problems, and three solutions will be discussed.

The Spring Toggle

Fig. 13 shows this ingenious device. The wings are spring-actuated, and they automatically open when inserted through a ½in. hole bored in the material. The minimum length of screw required is 1¾in. plus the thickness of the material and the thickness of the fitting to be attached. They are normally supplied with 3/16in. Whitworth screws, 2in. long, but longer screws can, of course, be supplied. At B (Fig. 13) the wings, collapsed, are being pushed through a ½in. hole, and in C they have sprung open and the fitting has been secured. Spring toggles are particularly suitable for use on ceilings as the expanded wings distribute the weight of fittings.



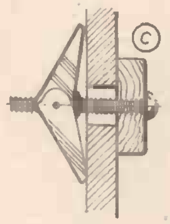


Fig. 13.—A shows the spring toggle, B shows how it can be closed to be inserted through a ½in. hole, and at C the wings have sprung open, securing the fitting.

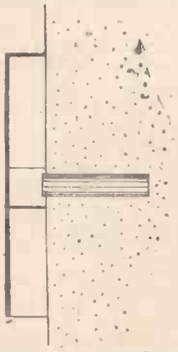


Fig. 10.—Positioning the plug when drilling in tiles.

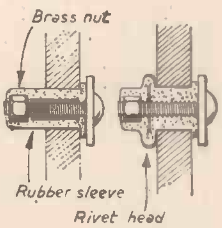


Fig. 15 (above).—Fixing the rawl nut, the effect of tightening the screw.

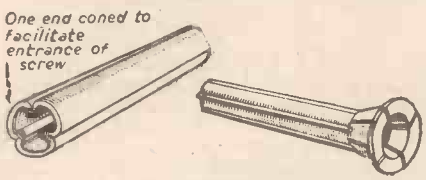


Fig. 11 (left).—The white bronze plug. Fig. 12 (right).—The screw anchor.

The Gravity Toggle

This is intended for thin or hollow partitions. It is inserted into a ⅜in. hole, and when clear of the hole the toggle drops to a perpendicular position and the screw can be tightened, giving a perfect fixing. Fig. 14 makes the method clear.

The Rawl Nut

This is a shake-proof fixing, consisting of a tough rubber sleeve in one end of which is bonded a brass nut, the opposite end having a flange. The action of tightening the screw draws the brass nut back towards the inside face, forming a rivet head. The whole process is shown in Fig. 15. The rawl nut may be used with equal success, whether introduced into a hole or a cavity, and this makes it particularly suitable for use on any type of hollow brick where it is impossible to forecast whether the site of a fixing screw will coincide with solid material or cavity. The rubber sleeve, of course, renders the fixing proof against vibration.

Rawlbolts

These are used for heavy fixing jobs in place of the methods shown in Figs. 3 and 4. There are two types shown in Fig. 16. At "A" is the loose bolt type, and at "B" is the projecting type. The latter type is normally used on walls where the projecting bolt is convenient to hang, say, a bracket on while the nut us being tightened.

The loose-bolt type is more useful for fixing machinery to concrete floors, as with the bolt removed a machine may be slid into position instead of lifted over a projecting bolt.

The exterior of the Rawlbolt consists of a metal shell divided lengthwise into four segments. Housed in the base of the shell is a nut which, as the bolt is tightened, expands the shell hard against the sides of the hole. The effect of this is illustrated in Fig. 16, which shows both types of Rawlbolt in position.

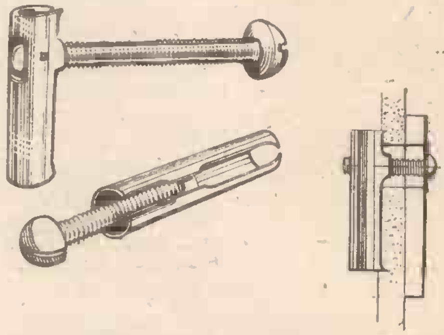


Fig. 14.—The gravity toggle in its open and closed state and also holding a fixture to the wall.

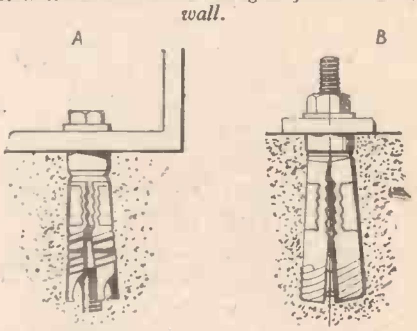


Fig. 16.—On the left is the loose-bolt type and the right is the projecting type of Rawlbolt

BOOKS RECEIVED

The Story of Watches. By T. P. Camerer Cuss. Published by MacGibbon and Kee, Ltd. 172 pages. Price 25s. net.

THIS book has been written with the idea of capturing the interest of three different types of reader: the ordinary man who owns a watch, the man with technical knowledge and the collector of watches. The book is a convenient reference book for the expert, and the clear descriptions of complicated mechanical operations and the friendly way in which it is written will make this volume a welcome addition to the library of the interested layman. The development of the watch is traced in several aspects, including the historical, the technical and the aesthetic, and it includes chapters on earliest methods of recording time and the birth of the watch, one entitled "The Escapement" and another "Friction," and others on decorating the watch and the fashion in cases. The book is profusely illustrated with both photographs and drawings depicting the beauty of design of some of the old-time craftsmen's work, some of the earliest of timing devices and the technicalities of watch mechanisms. This is the first general book on the watch since G. H. Baillie's classic, and the author acknowledges his indebtedness to him and to many others for their permission to illustrate pieces from their collections.

Photo-electric Cells. By P. T. Smith. Published by Percival Marshall and Co., Ltd. 78 pages. Price 5s. net.

AS its title indicates this little book is packed with facts about the various types of photo-electric cell and their uses and applications in everyday life and industry. The vast range of uses for the cell which the book reveals is unexpectedly wide and one reads how they are associated with many everyday things such as lifts, television and the control of advertising signs. There is, in addition, a chapter on experiments with photocells and many others, all of which are illustrated by drawings and theoretical circuits. There are also some photographic plates.

Kuklos Annual, 1952. Edited by B. W. Best. Published by Ed. J. Burrow and Co., Ltd. 165 pages. Price 2s. 6d.

THE 1952 special "Touring" edition includes all the well known features for which this handy annual has become recognised in the past. Included in its pages is a section on cycles, cycling and some general information. There is a section of "Potted Tours" giving routes, distances and points of interest for the cyclist, together with a section on touring abroad. The latter end of the book is devoted to the usual "Resthouse Directory."

Testing Earthing Circuits

The Methods Used to Ensure that Earth Fault Protective Systems are Efficient

By J. L. WATTS

ALL regulations which are concerned with the application of electricity require the metallic framework of the plant, and the metallic sheathing of the conductors, to be connected to earth, at any rate under certain conditions. The connection to earth may be made through a suitable main cold water pipe from an urban water supply which is carried in underground metallic water pipes, having metal-to-metal joints. In this connection it must be noted that certain water supplies are carried in parts through pipes of asbestos cement, such a system is unsuitable for earthing. Wherever possible the connection to a water pipe should be made at the point of entry of the underground pipe into the premises. If made at some other point of the piping the resistance Rp, between the point of connection and the point of entry of the underground pipe to the premises, should not be more than that given by the formula $Rp = \frac{40}{C}$ ohms, where C is the operating-current of the fuse or excess-current trip protecting the circuit. The object of this is to limit the possible volt drop on the water piping to 40 volts under earth fault conditions.

In other cases it may be possible to connect the metallic sheathing to the earthed neutral point of the supply system, either directly, by means of a substantial conductor, or through the metallic sheathing of the underground medium voltage cable from the supply plant. There may, however, be objections to this course if the transformer supplies more than one consumer, as there is a possibility that a fault on the plant of one consumer may raise the voltage of the neutral point and thus raise the voltage between the whole of the metallic sheathing and earth.

In many cases the metallic sheathing must be connected to an earth electrode which has been specially constructed. The following types of earth electrode have proved satisfactory in places. Copper, cast iron, or galvanised iron plates, preferably having a cross sectional area of 4 to 15 sq. ft. buried vertically about 3 to 4ft. deep and surrounded by a bed of hard packed broken coke about 1ft. thick; long lengths of copper strip laid in a shallow trench; pipes or rods driven well into the ground. In general several earth plates each about 5 sq. ft. in area, spaced some distance apart and connected together, give better results than a single, large plate.

Where the top soil is of low resistivity, the copper strip type of electrode is often satisfactory. Where low resistivity soil is obtained at a fair depth, due to greater moisture content or otherwise, pipes or rods driven well into the ground about 10ft. apart may be preferable. In any case the resistance of the earth electrode is unlikely to be constant and may vary with weather conditions.

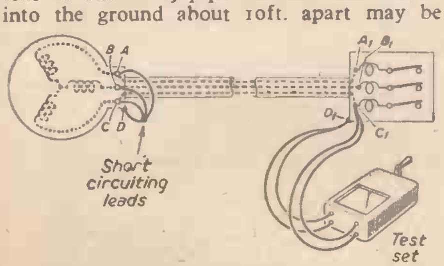


Fig. 2.—Method of testing long earth continuity conductor.

Earth Continuity Conductors

Various conductors are used as earth continuity conductors to connect the metallic sheathing and framework to the earthing point or electrode. These conductors may consist of conduit and armouring of cables, cores of flexible cables, and separate earthing wires or strips. Flexible conduit, which may be used to carry the cables to a motor which has to be moved slightly from time to time to allow for adjustment of belt tension, should be supplemented by a separate bonding conductor. The resistance of the conductor is proportional to the specific resistance of the conductor material, to the length of the conductor, and inversely proportional to the cross sectional area of the conductor. Hence earth wires are usually of copper of low specific resistance and of adequate area to carry the possible fault current without overheating, and are run in the shortest convenient way from the metallic sheathing to the earthing point or electrode. Regulations dealing with earthing specify satisfactory sizes of earthing conductors, and also satisfactory values of earth continuity resistance in most cases. The Quarry General Regulations (Electricity) 1938 and the Coal Mines Act, for example, specify that an earthing conductor consisting of a cable sheathing shall have a conductivity of not less than half that of the same length of the largest conductor in the sheathing; with a minimum size of earthing conductor (other than one contained in a flexible cable) of 0.022 sq. in. cross sectional area. The Regulations of the Institution of Electrical Engineers are generally similar except that the minimum size of earthing conductor is 0.0045 sq. in. and the maximum 0.1 sq. in.

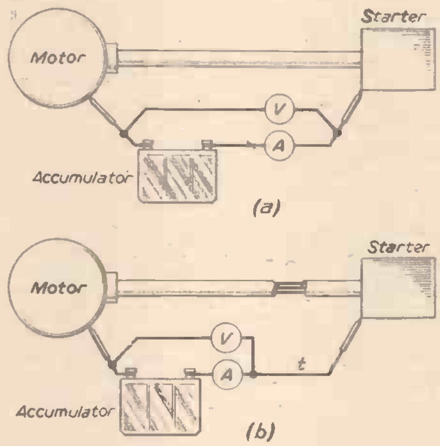


Fig. 1.—Methods of testing earth continuity conductors.

Periodical tests of the resistance of the earth continuity conductors and of the earth electrodes are advisable because these are liable to alter from time to time. The Quarry Regulations and Coal Mines Act require such tests to be made at intervals of not more than six months, whilst the I.E.E. Regulations advise such tests at intervals of less than five years.

Methods of Testing

Earth continuity conductors may be tested by passing through them an appreciable current, say 5 to 10 amps, from an accumulator or the secondary winding of a double wound transformer supplied from the A.C. mains (see Fig. 1). If an accumulator is used as the source of current, it is advisable that the nickel-alkaline type be used; if a lead-acid accumulator is employed, a resistance should be connected in circuit to avoid short circuiting the accumulator through a low resistance continuity conductor. Alternatively, a continuity resistance test set, employing a hand-driven generator and reading the resistance directly, may be used. The resistance of a short continuity conductor may be measured as indicated in Fig. 1(a), the resistance being equal to the reading of the voltmeter divided by the reading of the ammeter. The connections shown in Fig. 1(b) may be used for longer conductors, using a trailing cable (t). In this case the resistance of the trailing cable must be subtracted from the calculated value.

For longer runs of cables or conduit, and where it is necessary to compare the resistance of the cable core with that of the cable sheathing, a different method must be employed, and the test must be made when the circuit is out of action and isolated from the supply. Fig. 2 indicates a suitable method. A robust flexible connection of large cross sectional area is obtained and is connected to four strong bulldog clips. These are used to short circuit together the three ends A, B and C of the cable and to a clean point D on the case of the apparatus to which the cable or conduit is bonded. Test prods are used to pass the test current between pairs of opposite cable ends, A1 and B1, A1 and C1, or B1 and C1. This result R1 ohms divided by 2 gives the resistance of one of the cable cores. It is useful to repeat the tests between all three pairs of ends. If the results differ appreciably a faulty cable connection should be looked for; if the tests include several lengths of cable in series there may be a faulty switch contact or fuse wire connection, which is liable to overheat under working conditions, or possibly to cause burn out of the motor due to "single phasing" or unbalanced voltages. The test prods are then applied between one end A1, B1 or C1 and a clean point on the casing D1. This result R2 is the sum of the continuity resistance D to D1 plus the resistance of one cable core. Subtracting half of R1 from R2 gives the resistance R of the

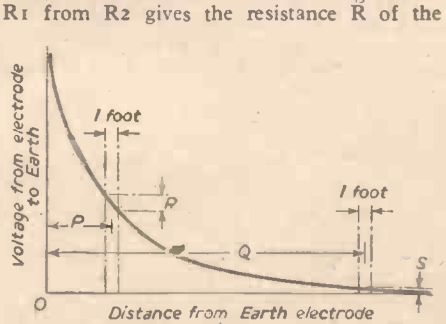


Fig. 3.—Potential gradient round earth electrode under fault conditions.

earth continuity conductor from D to D_1, which should not be more than R_1.

When using this method to test the continuity between a motor and its starter the short circuiting clips should be placed on the motor terminals and the test applied at the starter. If the starter end is short circuited and the test set applied at the motor the first reading will be that of two cable cores in series paralleled by the motor windings. When testing a complete cable run, with the starter close to the motor, it is usually sufficient to make the second test between one cable at the starter and the motor case. If the continuity resistance from the supply point to the motor case is less than twice that of one cable core from the supply point to the starter, it will obviously be less than twice the cable resistance from

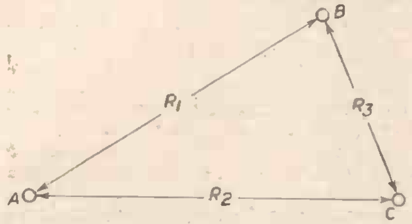


Fig. 4.—Three-point method of testing earth electrode.

the supply point to the motor. Incidentally, if a test is made from the supply point to the motor it is possible that a satisfactory test may be obtained, and that a high resistance connection at some point of the earth continuity conductor near the supply point may be overlooked, due to this being compensated for by a particularly low continuity resistance near the motor. It is advisable that supplementary tests be made at intermediate switches and distribution boxes as such a high resistance might be a point of heating and high volt drop under earth fault conditions.

High resistance of earth continuity conductors may result from the conductors being too small, but is more often due to a local defect such as a loose or dirty connection, loose joint in conduit, enamel not cleaned from conduit where this is secured to apparatus, or to there being several iron-to-iron joints in series between the conduit or cable sheathing and the case of the switch or other apparatus to which the sheathing is connected. Conduit connections to the metal cases of motors, starters, switches, distribution boxes, etc., should preferably be made by screwing the conduit tightly into a tapped hole in the case. Where the conduit passes through a clearance hole in the casing and is secured by a brass bush and lock nut, the connection should be supplemented by an additional copper earth connection, of adequate cross sectional area firmly clipped to the conduit at one end and fixed to the case at the other. Where cable armouring or sheathing has several iron-to-iron joints in series at apparatus, a similar bonding wire is advisable to by-pass these iron-to-iron joints which usually have a comparatively high resistance.

Potential Gradient

When current flows from an earthing conductor to earth through an earth electrode consisting of a buried pipe, etc., a voltage will be created between the electrode and the general mass of earth. This is indicated in Fig. 3. The voltage per foot difference of radius on the surface of the earth around the electrode is termed the potential gradient and is likely to be much greater near the electrode than farther away. This is because the cross sectional area of the earth shell through which the fault current flows is smaller near the electrode than at a greater distance. Fig. 3 shows the potential gradient R at P feet from the electrode is much greater than the gradient S at Q feet. If the soil does not have the same consistency in all directions, however, the gradient may differ at the same distance from the electrode in different directions. The resistance area of an electrode is assumed to be bounded by a point, such as Q, where the potential gradient is so low that it cannot be measured by ordinary instruments. At the boundary of the resistance area the potential or voltage of the resistance area is the same as that of the surrounding general mass of earth. In order to avoid risk of electric shock to persons whose feet may be at points of different voltage on the earth around the electrode under fault conditions, it is necessary to keep the voltage gradient within limits as well as to obtain a low total resistance to earth.

The resistance to earth of the electrode depends on two factors, the size of the electrode, and the resistivity of the soil around the electrode. Thus the earth electrode should be of adequate size and placed where the soil has a low resistivity, or specific resistance. The electrode should be in a spot where it can be kept moist and preliminary tests may be necessary to find the most suitable point.

Earth Electrode Tests

Fig. 4 shows one method of testing the resistance to earth of an earth electrode A. It involves the use of two other electrodes B and C of fairly low resistance. Tests are first made between A and B giving a resistance R_1 which is equal to $R_A + R_B$. Then a test is made between A and C to give R_2 equal to $R_A + R_C$. The third test between B and C gives $R_3 = R_B + R_C$. Then the resistance R_A of A will be equal to:

$$\frac{R_1 + R_2 - R_3}{2}$$

A better method of testing an earth electrode is shown in Fig. 5. Alternating current from a test set is passed between the main earth electrode A and an auxiliary current

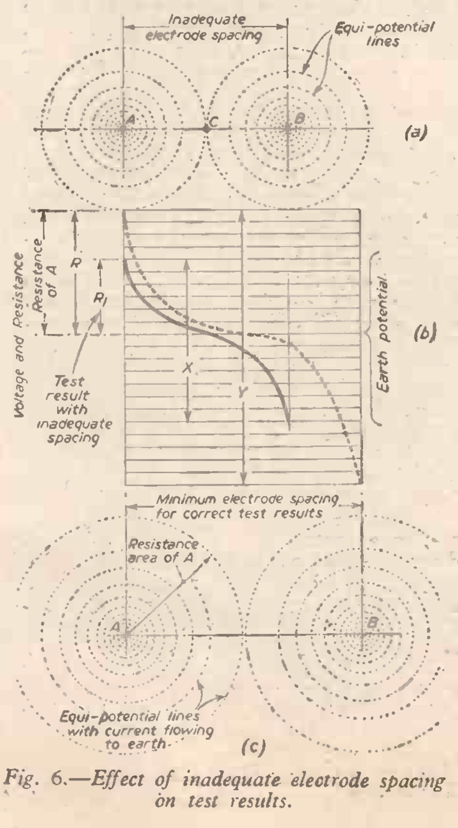


Fig. 6.—Effect of inadequate electrode spacing on test results.

electrode B; the latter must be at sufficient distance from A that the resistance areas of the two electrodes do not overlap. The instrument gives a reading which is equal to the volt drop between A and a third voltage electrode C, divided by the current which is passed between B and A, when the handle of the tester is turned. The voltage electrode C need not have a very low resistance but it should be placed outside the resistance area of A.

If the electrodes A and B are too close together the volt drop applied to the instrument will only be part of the volt drop across the resistance area. As shown in Fig. 6(b), the indicated resistance R_1 of A will then be less than the actual resistance R. Since the current is merely being passed through the earth between the electrodes, instead of from electrode B to the general

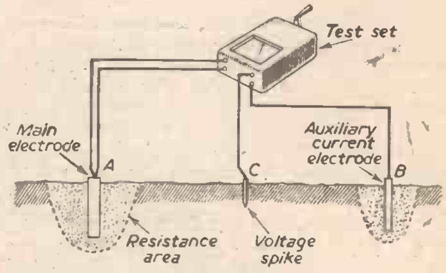


Fig. 5.—Volt drop method of testing earth electrode.

mass of earth and from the general mass of earth to the electrode A, the voltage between A and B will be X as compared with the correct value Y. It is advisable to determine if the electrodes have adequate spacing; two more sets of readings should be made, one with B 20 feet nearer to A and the other with B 20 feet farther from A. If the results are practically the same the mean value may be taken as the resistance of A; if there is an appreciable difference in the readings the tests should be repeated with much greater electrode spacing.

Maintenance of Safe Conditions

If the earth continuity conductor becomes broken, corroded through, or is disconnected, or if the resistance of the earthing circuit is so great that the fault current is insufficient to operate the protective fuses or excess-current trips in the event of an earth fault; the framework or sheathing of the plant may remain alive at a voltage which may be as high as the phase to neutral voltage of the system. The value of the shock current, which determines the degree of shock which is experienced by a person, is equal to the voltage applied to the body divided by the resistance between the points of contact. The shock current may have a high value in places such as a quarry where the person may make good contact with earth or with some conductor in contact with earth.

In order for an earth fault protective system to be efficient, it is necessary for the earthing circuit to have a low resistance in order to pass an appreciable fault current; it is also necessary that the fuses or excess-current fuses shall operate when the fault current flows. In order to ensure this the fuses should not be too large nor excess-current trips set too high and the excess-current trips must be free to trip the circuit breaker. These points should be checked periodically. Protective trips may be rendered inoperative by being set too high, by contacts being rough, welded up, or having excessive pressure, by strained mechanism, weak return springs, worn hold-on catches, dry operating parts, or dirt on no-volt coil armatures.

Making a Telescope Eyepiece

Constructional Details of a Simple Eyepiece for Use With the Telescope Described In Our June and July Issues

THE eyepiece is of the negative type of what is known as the "Huygenian" form, after its inventor, Prof. Huygens. It is composed of two simple plano-convex lenses, each of different foci and one larger than the other. The larger, known as the "field" lens, is placed in front to come nearer to the O.G.; the other is called the "eye" lens.

For correct proportion the field lens should have a focus equal to three times that of the eye lens, and they should be placed a distance apart equal to one-half the sum of their foci. The lenses, both having one side flat and the other convexed, are mounted with the convexed sides towards the O.G., and the distance separating them is measured from one flat surface to the other.

In response to many requests from readers we are reprinting part of an article on telescope eyepieces and lenses by E. W. Twining which appeared in our September, 1951, issue. This reprint gives constructional details of the eyepiece necessary for the building of the "Simple Telescope," details of which appeared in our June and July issues.

Making the Eyepiece

To carry the lenses and convert them into an eyepiece a length of brass tube will be required and some pieces of Bristol board of the thickness known as "four sheet." What is actually wanted is a board of such substance that when four pieces of it are laid together their combined thicknesses will measure 5/64in., or nearly 3/32in.

The brass tube should be of the thin or mandrel-drawn kind, smooth both inside and out, should have an outside diameter of 1in., and be 4in. in length. The ends of the tube should be turned true, but if no lathe is available the truing may be done with a fine-cut file by the aid of a steel square. Remove the burr from the inside and outside edges with fine emery cloth and polish the tube outside all over, but merely clean the inside with petrol; do not polish.

Drawing the Linings and Stops

Now turn to the drawing-board, tee-square and set-square and pin down on the board the sheet of Bristol board which is to be used to make the mounts for the lenses.

Fig. 1 is a longitudinal section on the centre line of the eyepiece; from this it will be seen that the lenses are held by bands or rings and perforated discs. Fig. 2 is a lay-out of the bands and discs exactly as they must be drawn on the Bristol board, the measurements shown being faithfully copied exactly full size. The lines drawn must be fine and preferably be inked in after pencil work is completed. Each piece is shown assembled in its proper place in Fig 1 and lettered, whilst corresponding letters are shown in Fig. 2, thus it should be quite possible to recognise the place in which each piece is to go when all are cut out and ready for assembly. Write the letters on the pieces before cutting.

Piece "a" is a lining for the brass and must be, when rolled, an exact fit in the internal circumference of the tube, the ends of the card butting together accurately. To fix it, the inside surface of the tube is smeared with an adhesive, such as varnish or Japan gold size. Whichever is used, let it become tacky and then pass the cardboard cylinder into place, letting the end come flush with the eye-end of the tube.

If the field lens, F, has a diameter of exactly $\frac{7}{8}$in.. as ordered, it should fit into the cardboard. If it does not fit snugly but is loose, then an additional lining a^1 will have to be put in and cemented to "a" in order to bring the inside diameter down to that of the lens. In both Figs. 1 and 2 this contingency has been foreseen by showing a double lining. The lens must be a nice fit without slackness or excessive tightness, and the inside surface of the card must be cylindrical, which means that there must be no fullness due to the circumferential length of the card being insufficient to make the two ends butt together tightly.

Next cut piece "b," roll into a cylinder and stick in the exact position in which it is shown in Fig. 1.

Midway between the lenses a stop or diaphragm, C, must be placed. This stop is shown as drawn on the Bristol board, Fig. 2; it must be cut truly circular and the $\frac{3}{8}$in. diameter hole both true and central.

It will be found that the best plan is to cut all the cardboard upon glass, using a pointed knife having a keen edge, and in dealing with the stop and eye-lens apertures to cut them with a slight bevel.

Next cut and insert the cylinder "d," which will hold the stop C in place. These pieces which are now in position should, at this stage, be painted dead black including the stop, and the field lens F can then be dropped into place and secured with the band "e," which should be blacked before being inserted.

For mounting the eye lens E, four discs are required, two of them, "f" and "f," having openings of the same diameter as the lens and two, "g," "g," with openings slightly smaller.

The two "f," "f," are to be cemented together, and the edges of the openings blackened; then black the two "gs" and stick on one of them; put the eye lens in place and secure with the other disc "g"; thus a complete little cell is formed which is placed next to cylinder "d" with the convexed side of E towards the lens F.

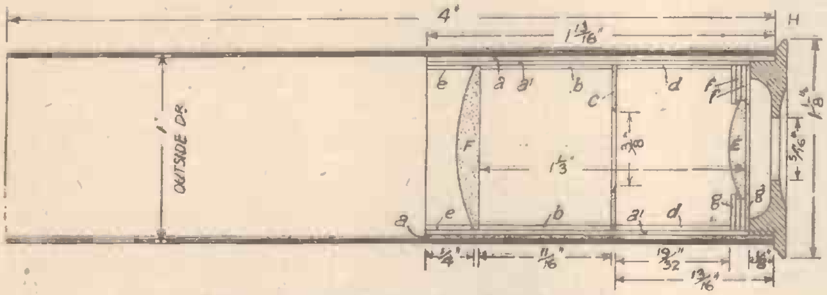


Fig. 1—Longitudinal section through eyepiece.

The End Cap

The bare interior of the brass tube from "e" to the end must also be black and the eye-end of the tube finished with the cap H, which will also secure the lens cell. Now this cap requires, if made as shown in the section, Fig. 1, to be turned in the lathe out of either black vulcanite or a hardwood such as box or beech and stained black. If the telescope builder has no lathe, nor access to one, and cannot get anyone to make caps for him, he may be able to adapt an already manufactured article for the purpose. I have before me as I write three glass bottles of different capacities and quite different contents, all with screw-on caps of black plastic, commonly referred to as bakelite. I find that all three have an internal diameter of one inch, so that they would be capable of servicing as eyepiece caps if they were drilled 5/16in. diameter at their centres and fitted over the tube ends instead of inside of them.

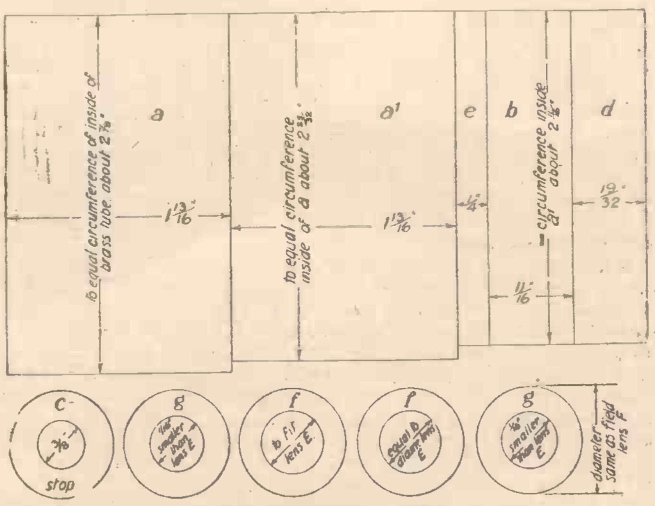


Fig. 2—Linings and stops for eyepiece.

Restoring Decaying Buildings

How Modern Science Solves the Problem of Decaying Stonework

By J. F. STIRLING

(*Concluded from page 350, July issue*)

IN the case of limestone buildings in towns and cities a different mechanism is set up. The soot deposition only occurs on the sheltered surfaces of the buildings. The natural carbon dioxide content of the rain-water erodes the surface skin of those areas of the limestone which are most directly exposed to it, changing the natural calcium carbonate of the limestone to calcium bicarbonate, which is soluble in water. Thus the surface of limestone under ordinary weathering conditions is self-cleaning. Soot cannot get a hold on it, and a rain-washed limestone building always remains white in even the dirtiest of surroundings. Often enough, however, the dissolved material of the limestone is redeposited on the more sheltered surfaces of the buildings, where, mixed with normal town soot, it forms black masses of considerable thickness.

It has been suggested, again and again, that biological agencies may operate in bringing about the decay of stonework. Although such a fact cannot be denied, and although certain species of sulphur bacteria may be concerned in the sulphate destructive mechanism as applied to stonework, such a supposition has never been proved.

Normal growths on stone, such as those of mosses and lichens, do not seem to deteriorate the stonework in any way, although it seems to be an accepted fact that ivy growth can bring about the ruination of stonework whenever its aerial roots are able to find access into the joints and interstices of the masonry. Possibly, the ivy rootlets secrete a substance which has a dissolving effect on the stone.

Granite is normally one of the most enduring of stones, but even this can succumb to sulphur attack in impure atmospheres. It is also liable to slow disintegration by the unequal expansion of its constituent particles. By this process the surface of the granite slowly erodes. Water gets into the pits and pores of its surface and, when subsequent freezing occurs, the expansion-strains loosen further the surface particles, causing them in time to drop away.

Generally speaking, therefore, it may be said that the causes responsible for a building stone's decay are natural weathering plus the chemical action of contaminated atmospheres. The natural weathering agencies are slow ones. Those due to impure atmospheres are rapid in their action, or comparatively so, at least.

Soluble Salts

In addition to these "general" causes of deterioration there are specialised ones. A frequent example of this kind is the contamination of stonework by soluble salts which are introduced from external sources, i.e., from the use of unsuitable jointing or backing materials, from the soil, or from the employment of chemical cleaning agents. All such salts bring about very pronounced decay of the stonework because they spread through the material to its surface, enlarging its pores and collecting as an efflorescence on its surface. Changes in the state of hydration of these salts in the stonework under varying conditions of temperature and humidity give rise to volume changes, and these latter set up continual disruptive strains in the stonework which quite clearly bring about its ultimate disintegration.

It is now quite clear that any factor which will result in the absorption of soluble salts into stonework of any kind is most potent in bringing about its decay. Hence, all methods of chemical cleaning of stonework are to be discouraged unless it can be shown that they do not result in the stonework being impregnated with soluble compounds. Processes of impregnating the stonework with water-resisting materials are put into practice with varying results. In America valuable stonework has even been impregnated with wax dissolved in a volatile solvent in the hope that the wax may penetrate into the stonework pores.

In Britain, the use of a silicon ester, such as ethyl silicate, has been largely recommended. This penetrates the stonework and ultimately deposits hard, insoluble and pure silica therein. The success of the treatment must necessarily depend on the depth to which the stonework is penetrated.

Regular Washing

The best method of preserving stonework and putting back its decay is regular washing with clean, pure water only. Dirty limestone is easily cleaned by water, and even in the case of soot-begrimed sandstones, much improvement in appearance is forthcoming after such treatment. Before commencing the treatment, any surface efflorescences should be scraped away, since these are mainly soluble matter which would be carried back into the stonework if water were simply swilled over them.

Caustic soda, washing soda, phosphates, synthetic detergents and so on should not be applied to stone or even to brickwork. Although the washing with such solutions may be thorough, some of the dissolved material gets into the pores of the stone and is liable to set up reactions the nature and the ultimate extent of which we are not yet aware of.

The same, too, applies to brickwork. If you want to remove the unsightly white "growth" from a brick surface, scrape as much of it away as possible. After this scrub the area thoroughly with water only, and repeat the process two or three times until no trace is left of the efflorescence.

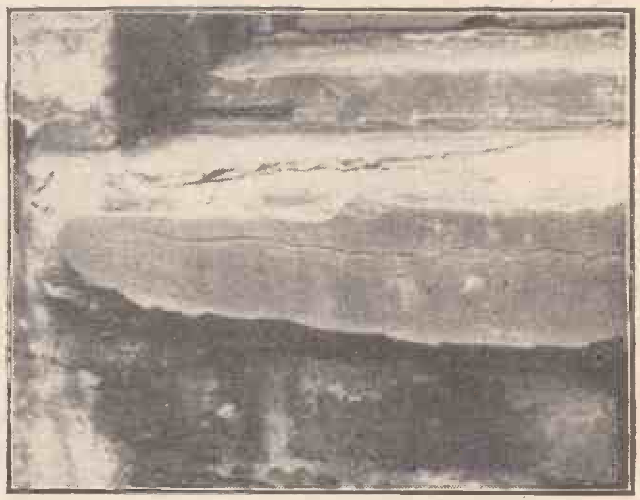
Paint and distemper films on stonework are said to be protective, although, from an artistic point of view, they are usually undesirable; but too little is known of this subject to be certain yet of any of its implications.

As a final word, stress should be laid on an important fact which has emerged as a result of years of technical and laboratory investigation of building material problems. It is this: when a building, either of stone of brick, requires repointing, a porous, moderately fine mortar is far preferable to a dense and hard cement mortar. For with the latter material, its density is such that evaporation of absorbed water cannot readily take place from its surface. Consequently the water must preferentially evaporate from the brick or stonework. If, however, the water has any salts dissolved in it, the resulting concentration of these salts in the brick or stonework brings about the decay of these materials.

If the mortar which is used for pointing is reasonably porous, much evaporation will take place therefrom. Soluble salts will tend to accumulate in the mortar, it is true, and will, therefore, cause it to decay.

But of the two evils, it is better for a mortar to perish than for the brickwork or masonry which it unites to decay. Repointing is cheaper than re-building.

An isolated brick which has been reduced to a powdery condition by salt absorption from a badly drained subsoil.



A sandstone window-sill in a state of active decay due to salt contamination and interior stresses consequent on water impregnation and freezing.

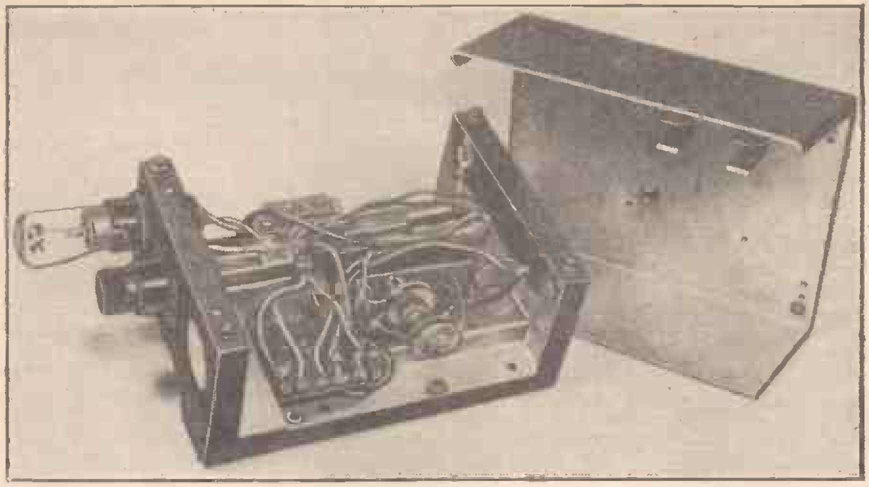
SAFETY DEVICE FOR AQUARIUMS

An Automatic Control Unit for Use with Tropical Fish Tanks

By H. R. HODGKINSON

THE tank in which tropical fish are kept has to be maintained at 75 deg. F. $\pm$ 2 deg., which is usually accomplished by a thermostatically-controlled immersion heater. Should this heater burn out whilst the tank is unattended for a few hours, the water temperature will fall below the safe minimum and the fish will die. As some of the species of tropical fish are expensive, it will readily be seen that the heater reliability is a serious consideration.

The circuit shown in Fig. 1 has been devised so that, if the main heater fails, a standby heater is automatically connected, and a warning light is switched on and remains so until the breakdown is attended to. The components used are surplus military stores, and the cost of the control device is but a few shillings. Two relays are required, the one marked A having two sets of contacts which are closed when the relay is not energised, and B having one set of contacts which are open when the relay is not energised. If D.C. relays are to be used on A.C., four small half-wave rectifiers are required in addition, the Air Ministry type 5C/1772 Resistance Rectifier Unit being suitable.



The completed control unit.

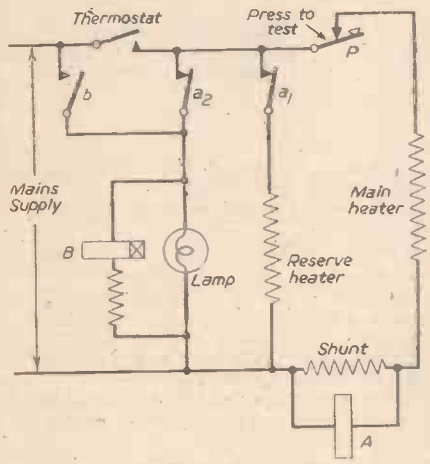


Fig. 1.—Circuit diagram showing main and reserve heaters and relays.

Operation

Relay A is energised by a fraction of the current flowing through the main heater, the greater part of the current being passed by the shunt. Thus so long as the main heater is intact and the thermostat closed, the contacts a_1 and a_2 areo pen and there is no circuit to the standby heater. When the thermostat opens, contacts a_1 and a_2 close, but there is still no circuit to the standby heater because it also is controlled by the thermostat. When the main heater burns out, however, the closing of contacts a_1 and a_2 will connect the standby heater and the warning lamp to the supply. The standby will now be controlled by the thermostat exactly as was the main heater. In order that the warning lamp will remain on after the thermostat has opened, relay B is connected in parallel with the light and B closes the contact b_1 which connects the light direct to the mains. For the circuit to function correctly it is necessary for the relay B to be slower in operation than relay A. So long as the main heater is intact, between the instant of the thermostat closing and relay A operating, the standby and the light will be energised for the duration of the operating time of relay A, and relay B must not close during this period. This may be simply accomplished by choosing for B a slugged relay, a small solenoid with oil or air dashpot or a Siemens thermal relay. The push button P is marked "Press to Test," and simulates the breaking of the main heater for the purpose of periodical testing of the control. To reset the device it is necessary to disconnect the mains for an instant.

Calculations

The construction of the control unit is straightforward, the only point requiring care being the choice of the shunt for relay A and the series resistor for relay B. A typical calculation is shown below. Suppose the heater is 200 watts and the mains voltage is 250. Then the current is 0.8 amps. On checking relay A it is found that to close it smartly 12 volts are necessary. Then the shunt resistance is $\frac{12}{0.8} = 15$ ohms, and must be capable of carrying 0.8 amp. A 20-watts vitreous enamelled wire-wound resistor is quite adequate. Relay B also requires 12 volts to close, and has a coil resistance, of 500 ohms. Then the operating current is $\frac{12}{500} = 0.025$ amp. The total circuit resistance, then, is $\frac{250}{0.025} = 10{,}000$ ohms. The series resistor is therefore $10{,}000 - 9{,}500 = 500$ ohms. A 10-watt radio resistor is ample for the load this has to carry.

Simplified Circuit

The control may be simplified by discarding relay B and replacing it by a press button Q: the circuit is now as shown in Fig. 2. The warning lamp will now only light up automatically on failure of the main heater when the thermostat is closed, and there is no indication of the main heater failure when the thermostat is open, except by pressing Q. The standby will, of course, continue to operate should the main heater fail, but it will now be necessary to check the condition of the main heater, say each morning, by pressing Q. If, on doing this, the lamp lights, then the heater will be burnt out.

It should be pointed out that with the main heater intact, each time the thermostat closes there is a momentary flash of the lamp with either of the two circuits.

Rectifiers

Laminated relays of the Londex type may be used on A.C. direct, but if P.O. type 3,000 or similar relays are used, then small rectifiers must be connected to them. It is not necessary to use full-wave bridge rectifiers, two half-wave units being sufficient, as shown in Fig. 3. The direction of the rectifiers is important, the positive of one being connected to the negative of the other as depicted in the diagram.

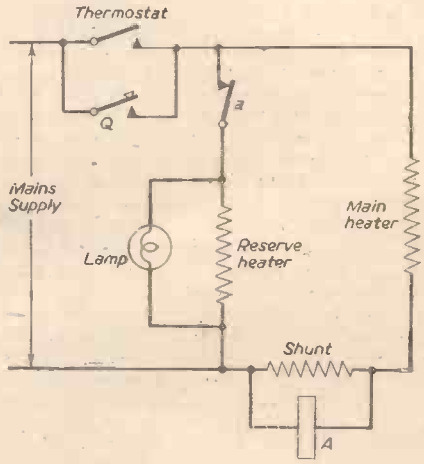


Fig. 2.—Simplified circuit diagram.

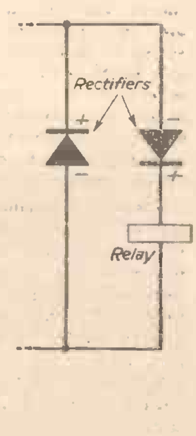


Fig. 3.—Diagram of connections for half-wave rectifiers.

A WIND-CHARG

Constructional Details of an All-metal Self-regulating Pr

The finished wind-charger unit mounted on a 34ft. mast. On the left is a two-bladed propeller unit.

THE control of propeller speeds makes a very interesting subject for any mechanically-minded person who wishes to experiment. There have been various methods created by the old-time millwrights to enable the sweeps of windmills to be set to the varying wind conditions. The earliest was by covering the framework of the arms with canvas, which was furled or reefed by being rolled back and lashed to the framework with ropes, very much after the style in which the sails of sailing ships are reefed, by gathering in the sheets and lashing them back on to the yardarms of the mast. These old mills could also be swung round, in or out of the wind, as they were usually pivoted on a central upright post and they were moved by a long beam or lever at the rear of the mill. This long lever also acted as a thrust sprag. Some were fitted with a crude form of brake on the main wind-shaft.

Later there was introduced the method whereby the whole cap together with sweeps was made to move round the top of the main structure or tower, and this was actuated with a large bevel or crown-wheel and a pinion driven by a small fantail at the rear of the cap. Finally, there came the system in which the sweeps were fitted with slats or shutters, after the style of a Venetian blind. These movable shutters were set crossways in the framework of the sweeps, and were operated by cranks, rods and levers, through a hollow wind-shaft with a long chain over a pulley which passed to the bottom of the mill. The end of the chain was loaded with heavy weights, put on, or taken off, to balance the wind pressure against the shutters. This method was often combined with the revolving cap.

General Considerations

Although this article mainly concerns the construction of a self-regulating all-metal wind-charger propeller, a brief description will be given of the wind-charger shown in the photographs, as the wind-shaft or main shaft layout, etc., may give the reader some ideas to work on. The photographs (Figs. 1, 2, 3 and 4) and drawings show clearly the principle adopted. There is a great advantage in having a separate wind-shaft unit, as it allows for experiments to be made by using different types of dynamos. Also, an all-metal propeller does not deteriorate like a wooden one.

The constructor can, of course, make a two-bladed or three-bladed propeller on the lines described later. The writer has made a large two hollow-bladed one which, in this case, is bolted directly on to the dynamo shaft, the root axles being clamped on to the driving plate, with two pairs of clamps per blade; by slackening the clamps, the blades can be turned or twisted round to alter the pitch and when re-clamped it becomes an orthodox type of propeller.

Making the Propeller

The four-bladed propeller is made from a soft form (quarter-hard) duralumin sheet, about 24 s.w.g., but ordinary aluminium sheet would do just as well. The sheet metal is bent over a hard wooden former the shape of a single propeller blade to make hollow shell blades.

To make the wooden former, use a straight-grained hard board, 3ft. x $4\frac{1}{2}$in. x 1in. thick. Mark each edge of the board with a diagonal line, roughly from one end corner, down to the other end corner, but make the lines at one end finish $\frac{3}{16}$in. in from the edge of the board's face, as indicated in Fig. 5. Carefully saw across the width at one end of the board, down diagonally, and the result should be two long tapered, boards, but the one to be used will be the thicker one of the two. Take the thickest tapered board and again carefully saw down from the wide part of the taper, across the width diagonally, from what is to be the thin or trailing edge, to roughly half-way across the board and down to the thin tapered end; follow down as near as possible to the end with the saw cut (see Fig. 6). This last cut will remove quite a lot of surplus wood to help in shaping up the trailing edge. All the sawing operations are done on one side of the board only,

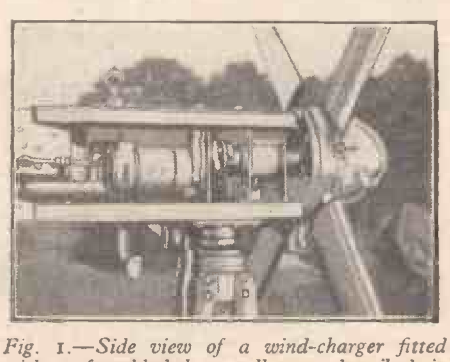


Fig. 1.—Side view of a wind-charger fitted with a four-bladed propeller as described in this article.

the reverse side is left flat for the driving face. At this stage, it is important to remember in which direction the finished propeller is required to rotate, left- or right-handed, when facing towards you. If the flat side of the blades is facing you, with the thicker rounded streamlined edge on your right and the thin trailing edge to your left, this will run in a right-handed or clockwise direction, or vice versa if made and shaped in the reverse order to above. The roughly sawn board is now shaped with the aid of a sharp plane and spokeshave, to a nice streamlined profile, and then finished on both sides with glass-paper. The result should be a curved convex face, which starts at the rounded front or leading edge, at $\frac{7}{8}$in. inwards, gradually increasing in thickness to 1in. at about a quarter of the way across the width, then gradually decreasing down to the thin or back trailing edge. The streamlined shape gets thinner and flatter as you proceed down towards the tip of the former's thin tapered end. The flat driving side is also finished smooth, with the leading edge rounded. This is now reduced across the width, along the length, by cutting off from the thin or trailing edge a thin tapered strip from the thick end, or the root of the wooden former at $3\frac{3}{4}$in. roughly, to $2\frac{3}{4}$in. at the tip or thin tapered end. The trailing edge now tapers in on the width, but the rounded leading edge is left straight along its length. Leave the tip square and cut to a length of 2ft. 8in. overall. The trailing edge should be about $\frac{1}{8}$in. thick along the length, at the edge. After the last operation trim up and finish with the plane, etc.

Fig. 2.—Front view of propeller boss with nose cap removed.

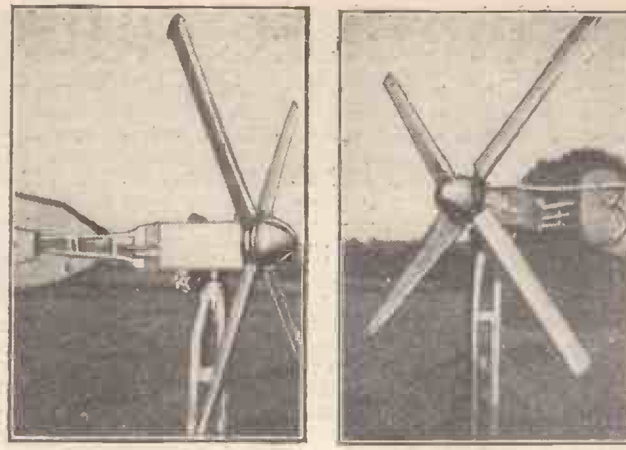
Using a Template

When the wooden former is made, the next operation is to make a template with thick paper or thin cardboard by folding it right round the wooden former, to get the correct length and width. Allow $\frac{3}{8}$in. extra on each side to form overlapping edges for bending over to make the joint on the trailing edge later. Start the folding at about 2in. up from the root or thick end of the wooden former, as this 2in. left projecting will be needed for gripping in the vice.

Having prepared the template, it is now spread out flat on the sheet metal and carefully marked round with a pencil to transfer the outline of the template on to the metal, which is cut round on the marked line with a pair of metal shears. When the shape is cut out, the lines for bending are marked $\frac{3}{8}$in. from each side, along the length. Bend up along the edge line what will be the flat or driving side, which is now face down, to an angle of 45 deg. inwards, while on the opposite side (which will be the curved or streamlined face) the marked edge line is bent up at right-angles so that we now have

ER PROPELLER

›peller for a Wind-charging Unit By R. E. THOMAS



Figs. 3 and 4.—Two views of the finished wind-charger.

the metal shape with the outer edges bent up facing you. Place the metal on a wide flat board, with the bent edges upwards, then put the wooden former on, hook the 45 deg. bend on to the thin or trailing edge, along the length, at 2in. up from the root end, then place your feet or knees on the wooden former to keep it in place. Now bend the metal round the front rounded leading edge up, and then right over the back of the curved or streamlined surface, so that the right-angle bent edge is now facing downwards over the first 45 deg. bend which is hooked on to the wooden former's thin or trailing edge. Press the last edge bend down all along the length, past the 45 deg. bend, and bend sharply underneath inwards (Fig. 7). Use a piece of smooth 3in. by 2in. by 1ft. 8in. long wood to beat the metal as you bend and shape it and take care not to dent the metal. When the last bend is beaten round under, it will lock the two halves of the shell together. Continue to beat the metal on the curved face, so as to get the shape of the wooden former, then place the 2in. projecting end of it in the vice and pull the shell blade off. If it is still tight, keep tapping along the edges and faces with the piece of wood till it slips off.

Figs. 5 and 6.—Details of the wooden former for shaping the metal propeller shell.

Trimming the Blades

The hollow shell blades are now trimmed up, square at the root or thick end, while the tip is made in a streamlined backward curve from the front edge (this is when looking at the blade when laid flat). Keep the blades the same length, and when riveting use the same number of rivets per blade to preserve the balance. Before riveting, mark a line along the length of the trailing-edge joint, at about 3/16 in. inwards, and continue it right along the edge and round the curved tip. After carefully tapping the edges flat, equally space mark the rivet holes at about ¾in. apart; centre-pop these and drill ⅛in. diameter holes. Use ⅛in. round-headed aluminium or copper rivets, and draw them up well through their holes; nip off the surplus shanks and neatly rivet over, starting at the tip and working down the edge until within about 6in. from the finish at the root end; this is advisable until you have the root end axle rib frame ready to slip in the end.

The root axle rib frame (Fig. 8) consists of two shaped metal ribs of light gauge metal (brass or steel) about 1/32 in. to 1/16 in. gauge, bent up to form webs. These are cut out in the flat, drilled for the two tubes, and made to conform with the end shape or profile of the wooden former (Fig. 9). The larger hole is to take ¾in. conduit tubing, and the other at the leading or front edge is for ½in. outside diameter tubing. The ribs when bent and shaped can be hard soldered or brazed, likewise the tubes when they are placed in their holes. The tubes and ribs must be kept square when brazed or soldered. The inner rib is made slightly smaller than the outer one, which will be nearest to the boss. The ribs are set at 3¾in. centres apart, and the amount of the ¾in. conduit tube left projecting from the bottom edge of the blade is about 2½in., to take the hollow root axles. The ribs can be riveted to the tubes, if desired, right through the webs and tube, but each end of the steel or iron rivets must be countersunk flush on the surface, to allow the shell to pass over.

When the root axle rib frame is made, it is pushed and tapped into the hollow shell, flush with the blade's bottom edge, and then bolted right through the shell and in the middle of the webs. The bolts are put through on each side of the ¾in. tube forming the root axle, as shown in Fig. 8. When the rib frame is in position, the edge riveting can be finished.

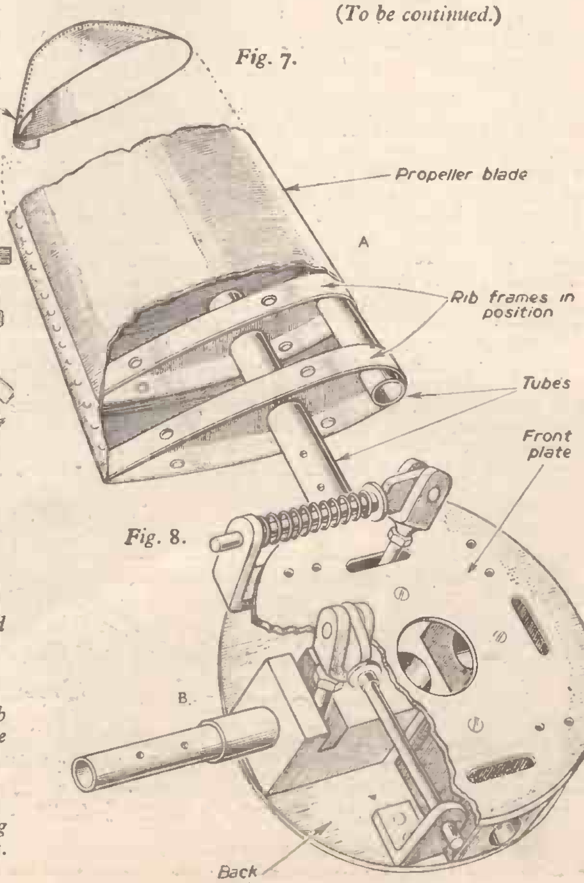
Stub Axles

It must be noted here that the ¾in. conduit tube forming the hollow root axle is set off centre to the blade, towards the leading or front edge, roughly a quarter of the blade's width in from the leading edge, so that the back or trailing edge has a greater overhang; this is to enable the wind pressure to press the overhanging trailing edge round backwards, so that the blade goes into the open or "feathered" position. It will be obvious that if the root axle was placed central, the wind pressure would be equal and the twisting or turning effect would not take place. The hollow blades can now be fitted to their stub axles.

The hollow root axles are a tight fit on and over the stub axles which in their turn are a firm but free fit in the block bearings. The block bearings are set opposite each other equally spaced on to a back plate. The back plate is bolted to a driving plate, which is locked on the main or wind-shaft. There are two short ⅜in. diameter bolts, which bolt both plates to each block bearing at the back.

The stub axles revolve a full quarter-turn in their block bearings, the latter having slots cut in them to allow the short fulcrum levers to move from side to side. These levers face forward, one end being screwed into the stub axle, after it is put in its bearing, by screwing in at the slotted hole.

(To be continued.)



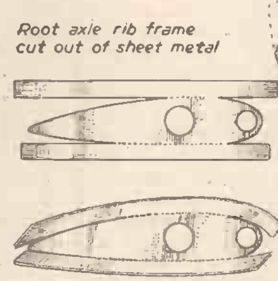


Fig. 7.—Bending the end of propeller blade.

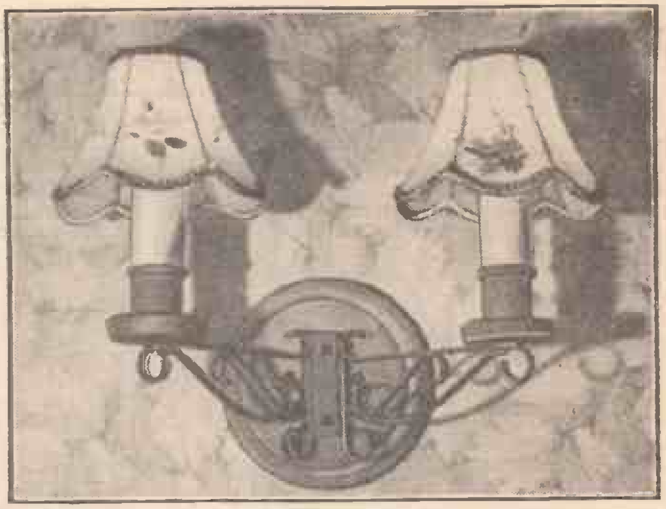
Fig. 8.—Details of rib frames and part of the control assembly.

Fig. 9.—Method of cutting and bending the rib frames.

AN ELECTRIC WALL BRACKET

An Inexpensive but Attractive Fitment for the Home

By J. E. HUTCHINSON



The finished wall bracket complete with shades.

THE wall bracket described here will provide a useful and attractive addition to any hall or bedroom, and can be constructed with the minimum of expense.

As will be seen from the photographs, this particular model is constructed half from wood and half from brass.

Construction

First, the back should be made out of a piece of 1in. hardwood. If a lathe is available a neat job of turning can be done, remembering to keep about 1½in. from the centre to allow for the bracket mounting block. At this point a ¾in. recess should be drilled in the reverse side of the back for connecting purposes.

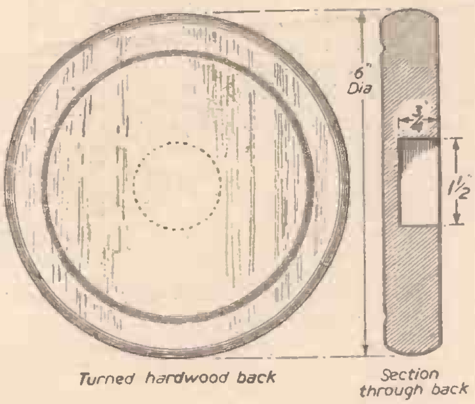


Fig. 1.—Front view and section of the circular back.

The bracket mounting block (Fig. 2) is a piece of hardwood, 3in. x 1⅜in. x ½in., with the sides shaped off to an angle of 45 deg. This is screwed centrally to the back using round-headed screws or, better still, flat heads with chrome or brass domes.

The Brackets

The measurements for the brackets are given in Fig. 3. They are bent up from ⅜in. brass valance rail, there being four pieces to each bracket. No difficulty should be encountered in the bending if it is set about in the right manner. First, a piece of bar or pipe approximately ⅝in. dia. is needed. This is placed horizontally in the vice, at the same time catching the end of the strip to be bent between the front jaw and the pipe, as shown in Fig. 4. The strip should now be bent round as far as it will go. Slacken off the vice slightly and, holding the pipe steady, bring the strip back into the vertical position, tighten up the vice and repeat the process until the required curve is formed. The pipe can now be removed and, by careful use of the vice, the curve can be tightened up till the required diameter is achieved. When cutting the strips prior to bending, allow ½in. or so for trimming purposes.

The scrolls should not be too pronounced as difficulty may be encountered in getting certain screws home. The method of fastening these parts together will depend on the type of finish decided on. If the brass parts are to be polished and varnished, brass rivets can be used. If, on the other hand, the job is to be enamelled, then they can be sweated together and all surplus solder cleaned off.

Drilling of the brackets and back can now be carried out, the brackets being drilled first. Place each bracket in position and mark screw and flex holes through on the wood block. Drill ¼in. holes right through into the recess, to take the flex, and small pilot holes for the fixing screws. Round-headed screws are used for fixing the brackets.

The Candleholders

These were turned from one piece (Fig. 5), but could, if desired, be made from a disc of wood 2in. dia. x ½in. thick, utilising a cotton reel for the central piece. A ¼in. hole is drilled through the centre of the holder to take the flex. Two bayonet socket adaptors will be required, and these should be fixed to the top of the holders with small counter-sunk screws. The bracket in the photograph is shown with the flex carried along the underside where it is not noticeable when finished off, but in another model it was run along the top and was more or less out of sight. If the latter method is used, a recess will have to be cut in the underside of the holders before they are mounted, and a ¼in. hole drilled about ⅜in. from the edge at an angle up into the central hole so as to leave room for the fixing screw.

Assembling the Parts

The various parts are now ready for fixing together, care being taken when securing the brackets to the back that the holes are in line. Wiring should be carried out with flat, plastic-covered flex. Take a piece of flex of sufficient length to enable joints to be made comfortably in the recess and thread one end up through the holder, leaving just sufficient sticking through for wiring the lampholders. Smear the underside of the bracket with "Durofix" and press flex firmly into place, securing it into position with twine until cement dries. The other end is pulled through the hole provided in the back.

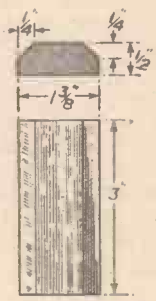


Fig. 2.—Bracket mounting block.

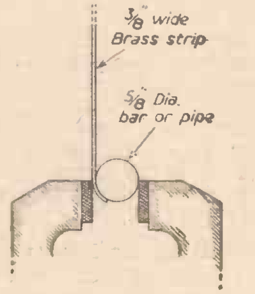


Fig. 4.—Method of bending the brass strip.

The whole bracket should now be finished off to suit the individual taste before the lampholders are wired up. All joints should be well insulated, at the rear of the bracket.

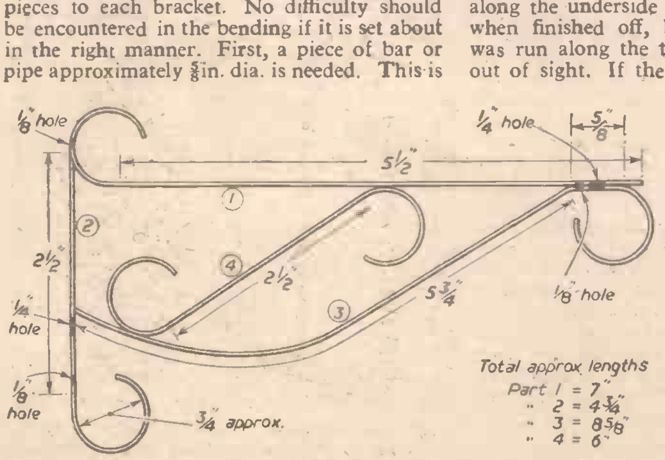


Fig. 3.—Showing the shape and dimensions of the brass strips for forming a bracket.

Fig. 5.—The brackets, candleholders and lamp sockets.

Mechanics of the Mineral-water Bottle

A Century's Progress in Containers for Soda-water

By "ENGINEER"

IT was a famous clergyman, the Rev. Joseph Priestley, who first invented artificial mineral-waters by hitting upon the principle of soda-water and, in so doing, laid the foundation of the present-day industry of aerated beverage manufacture.

Priestley, who divided his time between the study of Divinity and that of chemistry, obtained great eminence in both subjects, and, indeed, much more than an average celebrity in the two. His chemical studies brought him to the highest ranks of scientific fame, whilst his unorthodox theological opinions conferred on him a degree of unpopularity which finally resulted in his having to forsake his native land and emigrate to America.

Chemistry was Priestley's hobby and it was during the course of some chemical experiments, on his favourite subject of "airs" or gases, which he made in the summer of 1767, that Priestley first stumbled upon the basic principle of our nowadays ubiquitous soda-water and other aerated beverages.

The gas, carbon dioxide, which is generated by the action of mineral acids on limestone and other carbonates and which is also evolved during the process of brewing, was well known in Priestley's day. It is a colourless, invisible gas with a slightly acid taste and a faint, pleasantly pungent smell. Priestley made many experiments with carbon dioxide gas and, in common with other chemists of his day, he called it *fixed air*, because it was believed to comprise a gas or "air" which, in some manner, had been bound down or fixed in ordinary limestone and which was capable of being driven therefrom by heating. We now know it as carbonic acid gas, or, more simply, as carbon dioxide.

The celebrated "Drunken Bottle" first devised by Nicholas Paul and used originally by Jacob Schweppe, founder of the famous firm of mineral-water manufacturers. Second from left is a very early stone ginger-beer bottle. (*Illustration by courtesy of Schweppes, Ltd.*)

Discovery of Soda-water

Priestley, in 1767, was living in Leeds and in the immediate neighbourhood of a prosperous brewery. One supposes, therefore, that he had ample opportunities to collect quantities of this gas, or "air," which, as we have seen, is a product of all fermentation processes.

Carbon dioxide gas is quite soluble in water, and one volume of water at ordinary temperatures will dissolve one volume of carbon dioxide gas. The resulting solution is mildly acidic, on account of which property it was once given the name of "carbonic acid," a term which is now more or less obsolete. If, however, the gas is under pressure, the water will dissolve considerably more of it. Double the pressure of the carbon dioxide and you will find that the water dissolves rather more than twice its volume of the gas.

Here is the essence of Priestley's epoch-making discovery. He found that the greater the pressure of his "fixed air" (carbon dioxide) the more soluble in water it became. He saw, also, that when the pressure was suddenly released the dissolved gas flew upwards through the clear fluid in a veritable torrent of bubbles.

By dissolving a little carbonate of soda in the water, Priestley found that he could increase the ease with which the gas dissolved in the liquid, and he found, too, that the solution was rendered better tasting. Carbon dioxide (unlike its near relative carbon *monoxide* gas, which is a deadly poison) is not poisonous. The escaping bubbles of the gas from the pressure-released solution imparted to the liquid a pleasant and a beneficial sharpness, thereby conferring on it the properties of an exceedingly refreshing and, at times, desirable beverage.

Soda-water thus made its debut, but this is as far as the Reverend Priestley ever went with it. The technique of impregnating waters, lemonades and other beverages had eventually to be developed by others on a practical, and ultimately on a manufacturing, scale.

The Bottle for the Job

Instantly, however, a problem arose, a problem which has only reached a satisfactory solution in our own times. Having manufactured the gas-impregnated beverage, in what sort of a bottle or container should it be kept and presented to the consumer? Obviously, it must be a perfectly gas-tight one, otherwise the dissolved gas, being held under considerable pressure, would slowly leak away, leaving merely a flat, stale, lifeless, discouraging and anything but a pleasant beverage, alcoholic or otherwise.

Here began a long line of container-development, in which considerable ingenuity was manifested for a century or more by various container designers. At first the aerated beverages were despatched by their manufacturers in stone or earthenware receptacles provided with corks bound down tightly with stout string or wire. These were not satisfactory, the bungs or stoppers leaking badly, consistently, and more or less continuously, and being unable to withstand even the smallest gas pressure. Stout glass bottles—an obvious alternative—were tried, but they were no better than the stonewalled containers. The corks shrank and allowed the gas to escape from the contents, particularly under the increasing pressures which were then being used to heighten the degree of aeration and consequently the "liveliness" of the liquids.

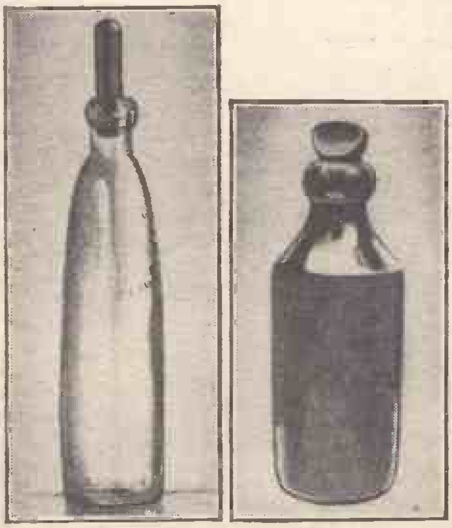
Paul's Bottle

About the year 1790 a Swiss named Nicholas Paul, who was interested in chemistry no less than in mechanics, and who seems afterwards to have made aerated mineral-waters in a small way in London, devised a glass bottle of an oval shape, something, indeed, like a baby's feeding-bottle. The main feature of this bottle, apart from its very stout walls, was that it was impossible for it to stand upright. On account of this characteristic it was dubbed the "drunken bottle." But there was method

Three of the earliest stout green glass bottles used for holding mildly aerated liquids. They had wired-on corks. Date 1790-1800.

in Paul's madness here, for his bottle had, perforce, to lie on its side and its cork, therefore, was continuously in contact with the liquid within the bottle. Hence, the cork was always kept damp and moist, and, being thus prevented from shrinking, it always remained a tight fit in the bottle-neck, thereby actively militating against gas escape.

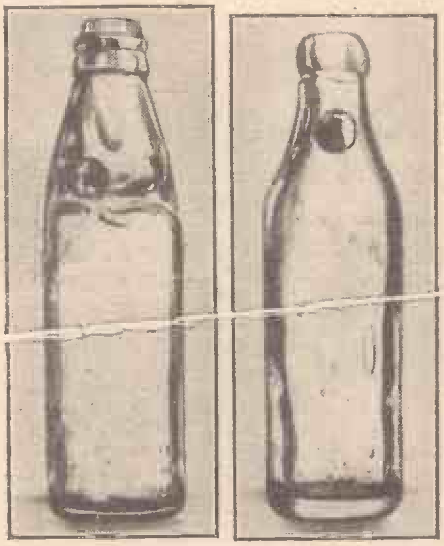
Paul's bottle was the first really successful mineral-water bottle. It was promptly adopted for commercial use by Jacob Schweppe, a fellow-countryman of Paul, who had come over to England and had set up for himself in Bristol as a maker of



Left—the original wooden stopper bottle, designed by M. Valett, about 1840. *Right—the plain screw-topped bottle which is not yet quite obsolete for mineral beverages.*

aerated beverages. It remained in popular commercial use in the mineral-water industry for well over a century.

About the middle of the last century, another type of bottle for "table-waters," as these aerated beverages then began to be called, came into use. This was a tall, glass bottle which was provided with a long, slightly tapering wooden peg-like stopper fitting tightly into the neck. The stopper protruded from the bottle-neck like a long, wooden dowel or skewer. The pressure of gas in the bottle sufficed to keep the stopper in its place, thus effectively sealing the bottle. It was opened merely by pushing



Left—the celebrated Codd's bottle. Right—a bottle with a captive wooden ball stopper within its neck. This one is reputed to have been sold at the great exhibition of 1851.

the stopper down sharply and forcibly by means of a light blow. Many types of these bottles were devised by Vallet, Barrett, Morton, Adams and other workers in the then growing mineral-water industry, but M. Vallet's bottle, the one having a long, tapering wooden stopper, proved to be the most effective and, despite its competitors, held its superiority as a technical device over many years.

The Plain "Pop" Bottle

During this period the old and, perhaps, well-remembered "stone ginger-beer bottle" came into prominence and general use, and it remained a popular favourite until well within living memory. Usually it was a plain "stone" or white-earthenware bottle, having a wood, ebonite, or earthenware stopper. In such bottles the ever-popular ginger-beer or "pop" was retailed. The bottle was a sturdy one and mechanically strong. It had no movable parts, apart from its screw stopper, but it laboured under the distinct disadvantage of not permitting its contents to be seen. It was, in later years, discovered that the stone or earthenware material of the bottle was slightly porous to carbon dioxide gas, and that, under pressure, it permitted a slow leakage of the gas through the bottle walls themselves. Ginger-pop could never be kept for any prolonged period in prime condition in a "stone" bottle. And so, after the first World War, the old screw-top stone "pop" bottle, after very nearly a century of popularity, fell into a practical desuetude from which it never recovered.

Codd's Famous Bottle

The idea of causing a mineral-water bottle to be sealed by its own internal gas-pressure reached perfection in the famous Codd bottle which for many years, up to about 1925, held a foremost position in the esteem of the British mineral-water industry. Most people will remember the mineral-water bottle with the glass marble in its neck. This was the famous Codd bottle, the invention of an erstwhile minor genius of that name.

William Codd was, indeed, "the man who put the marble in the bottle." The fundamental idea was simplicity itself. The bottle-neck was slightly constricted to give inner ledges which prevented a clear glass marble or ball from falling into the liquid. In the bottle-neck proper a narrow rubber ring was fitted. The glass stopper or marble was kept firmly pressed against the rubber ring by virtue of the internal gas pressure within the bottle. Thus a perfect gas and liquid seal was effected. When the bottle had to be opened, the glass stopper or ball was forced into the bottle-neck — usually by means of a wooden cap having an inner projecting peg which was slipped over the neck of the bottle. A blow with the hand on the wooden cap was then sufficient to "break" the gas pressure in the bottle, the superior force of the hand-blow overcoming the gas pressure on the stopper ball. The advantage of the Codd bottle was that the stopper, having been forced downwards in the neck of the bottle, never fell into the liquid; after being forced downwards against gas-pressure it was caught by the constriction formed in the upper part of the bottle. There it was held securely yet freely and was able to roll about within the bottle-neck but without actually making contact with the bottle contents. When the bottle was upturned for pouring purposes, the glass marble rolled neatly to one side and did not interfere with the free escape of the liquid.

Codd's Bottle Departs

Codd's bottle lasted in popularity for nearly 70 years. Its great objection, apart from its somewhat higher cost of production, was that, during storage, dust and dirt were liable to collect on the upper surface of the recessed ball stopper and that this dirt was very readily pushed down into the beverage when it was opened. The bottle, although an efficient, enormously convenient and easily-opened one, was a notoriously unhygienic, dirt-harbouring device. That is why it was eventually discarded by the mineral-water manufacturers of the present day for the modern "crown-capped" bottle, the contents of which are well sealed and protected by an overlapping metal cap, fitted over the bottle-neck and being pressed down thereon and mechanically pinched into position after the filling of the bottle by the manufacturers. The bottle cap does not allow dust, dirt and other impurities to enter the contents for, during its removal, the metal is lifted away from the bottle-neck and is not pressed down into it like the glass stopper in the Codd bottle and the various elongated wooden stoppers in the Vallet and other types of bottles which preceded it.

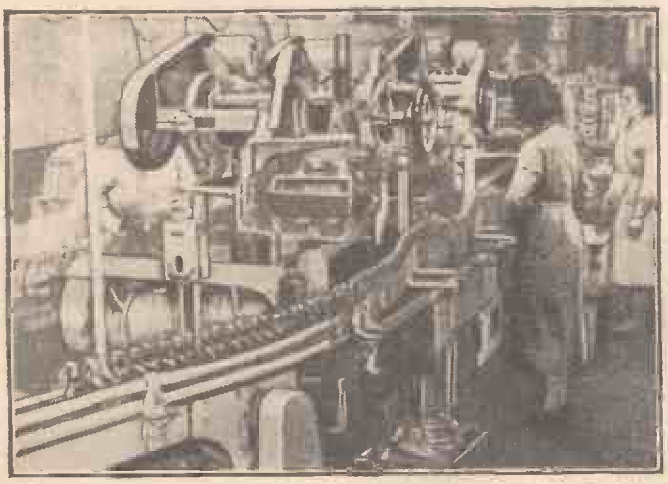
The modern "crown-capped" mineral-water bottle, secure and hygienic.

One great objection to all these mineral-water bottles still remains. After opening any of these bottles they cannot be re-sealed effectively and adequately. That is the reason why some mineral-water manufacturers have clung conservatively to the use of bottles of the older screw-stopper type, for with these containers it is always possible after opening the bottle to re-seal it and thus to preserve, at least for a short time, its unused contents.

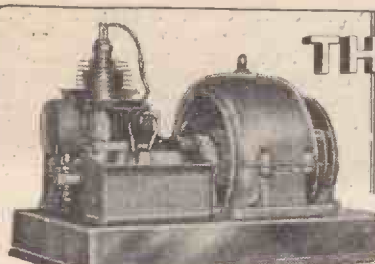
The First Soda Syphon

It was the demand for a bottle which would allow its aerated liquid contents to be drawn off in fresh, sparkling condition at various times which brought into being the present-day soda- or mineral-water syphon. The first of these syphons was invented and patented by an individual named Charles Plinth in 1813. He called it a "portable

(*Continued on page 389*)



Filling bottles in a modern mineral-water factory. Note the long line of "crown-capped" bottles which are being automatically filled and sealed. (Courtesy of Schweppes, Ltd.)



THE WORLD OF MODELS

By "MOTILUS"

Elliott Model Railway Exhibition : Model Loco. Building in Lucerne

READERS will recollect that on previous occasions I have described the remarkable Elliott Model Railway Exhibition, which completed its second season at Olympia, Winter Gardens, Blackpool, last October. The total number of visitors to the exhibition during the three years up to last March reached the amazing total of 793,757 people.

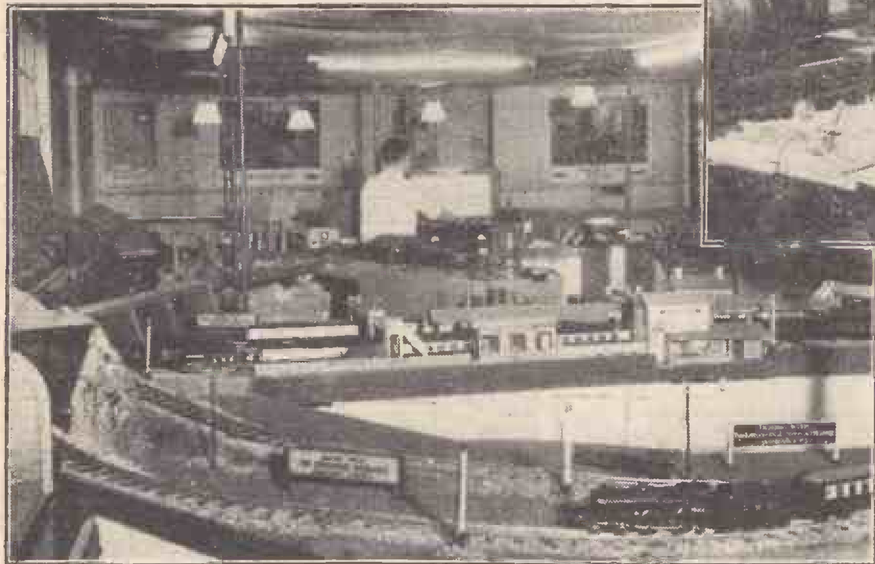


Fig. 1.—A comprehensive view of the Elliott Model Railway Exhibition at Blackpool. In the centre of the operating space can be seen the electric turntable and coaling place.

For the 1951 presentation in Blackpool the railway was considerably extended and improved. Much attention was paid to the provision of better scenic features, including the painting of a back-cloth 25ft. long and 3ft. deep, showing mountains and lakes. This back-cloth was ingeniously merged into tunnels, cuttings, etc., built over wooden frames by using thick, crumpled brown paper sprinkled with glue and sawdust. When dry the whole was sprayed with a grass green solution and small pieces of rock and patches of brown paint of various shades completed the effect with remarkable realism.

On one of the extensions to the railway, Mr. G. Tyson, Mr. Elliott's scenic expert, built a model village, complete with pond and imaginative touches such as clothes hanging on lines in some of the back gardens.

The railway now has a locomotive stud of 31, ranging from the humble shunting tank engine, Midland compounds, Precursors, 2-6-4 Derby tank, etc., to the big London Midland Region Duchess class locomotives two of which, the " Duchess of Gloucester " and the " Duchess of Devonshire " are still fully streamlined. A number of the locomotives are fitted with a patent smoke device. This is most effective, and it creates much interest among visitors.

As readers may remember, steam-driven model engines are also operated on this lay-out.

During the present season further improvements and extensions have been incorporated in the railway, including waterfalls, aerodromes, etc. Another development has been a miniature children's signal box, into which young enthusiasts can climb (and perhaps older ones as well!) to exercise their skill in controlling part of the lay-out.

In the winter months the railway, on a slightly reduced scale, goes on tour and the exhibition receives a considerable amount of publicity wherever it goes. Mr. Elliott's scrap books are full of interesting cuttings and photographs from newspapers and periodicals all over Britain. Several of his operators can give lectures on transport subjects and the Education Authorities encourage schools to avail themselves of the opportunity of hearing these lectures when the exhibition is on tour in the winter.

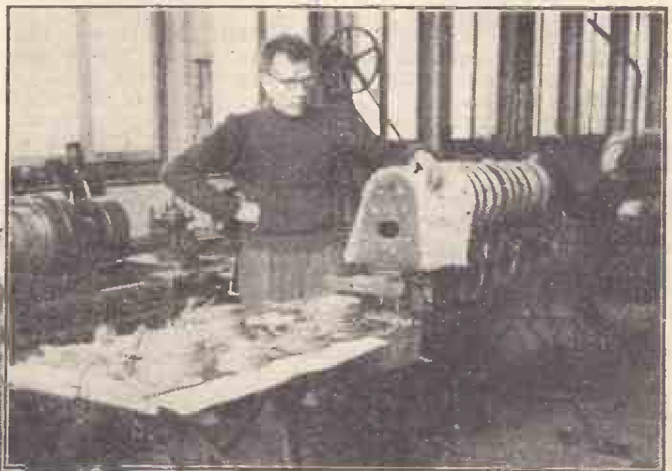


Fig. 2.—Mr. Victor Brast, of Lucerne, is seen here in the workshop of the Brast Brothers' garage. On the bench is the new 7¼in. gauge model steam locomotive under construction.

7¼in. Gauge Model "Pacific" Loco.

In my January article I commented on the new site of the model passenger-carrying steam railway run by the Brast Brothers in Lucerne, Switzerland. I wrote then that the work of re-building the railway had meant that there was no time for making new model locomotives. Since then, however, when I visited the brothers in April this year, I found a new locomotive under construction in their workshop: a 7¼in. gauge 4-6-2 Pacific steam model, " Sunstar," to be finished in British Railways colours.

Readers will also be interested to see the photograph I took at Vitznau, on Lake Lucerne, of the first steam engine used on the rack and pinion railway up the Rigi. This railway was opened in 1871, so has been running over eighty years. Now, of course, it is fully electrified and one mounts the Rigi in a modern train of bright red

Fig. 3.—On view at Vitznau, Lake Lucerne, is this ancient steam engine : the first to be used on the railway up the Rigi, 80 years ago, and still in working order !

Centrifugal Force

SIR,—The following is an extract from the "Popular Cyclopædia of Natural Science," by William B. Carpenter, M.D., dated 1843:

"The term centrifugal force is very liable to be misunderstood, since it would seem to imply a force which, acting alone, would cause a body to fly directly away from the centre, which we know to be very far from the truth. We must constantly bear in mind that its only proper use is to express the tendency."

Perpetual Motion?

Mr. E. W. Chambers' interesting letter urges me to say: Cranks are people with original ideas, right or wrong—but the point is that they are "original." The "cranks" of to-day are the wise men of to-morrow.

With regard to his reference to the Orffyreus wheel, I would say that if people would put out of their minds the thousand-and-one fantastic ideas of so-called perpetual motion and concentrate on finding the missing link of this wonderful piece of mechanism which *undoubtedly did work*, they would find their labour intensely interesting. Any intelligent schoolboy could construct a model of its known working parts from the illustrations given.

The answer is there for those who care to find it. When the secret of the box under the weights is discovered it will reveal what is in the wheel. Alternatively, when the secret of the wheel is discovered, it will reveal what is in the box. Should anyone be unfortunate—I repeat unfortunate—enough to discover its secret, the *pleasure* of finding it will be at an end, so don't deny others the pleasure of trying to solve this, "The Master Puzzle," by disclosing the answer.—H. A. D. JOSEPH (Epsom).

Centripetal Force

SIR,—The centripetal monstrosity again asserts itself. By what name are we to recognise centrifugal force, "which does not exist and the exact opposite of which is centripetal force"? Inertia is not a sufficiently precise definition as external forces constitute the issue.

This is a practical journal and why do cheese-paring theorists wish to disrupt well-established facts?

Latin derivations of the two words are, respectively:

Centrifugal.—Centrum, centre; fugus, flying. Centripetal.—Centrum, centre; petus, seeking, both meanings of which are blatantly opposed, no doubt in relevance to "all forces being equal and opposite." Centrifugal force by virtue of its "circumstantial energy" is deservedly recognised by its ubiquitous name, and for the sake of peace and my greying hairs, again I refer to the Editor's concise definition in February issue last.—R. G. L. (Nottingham).

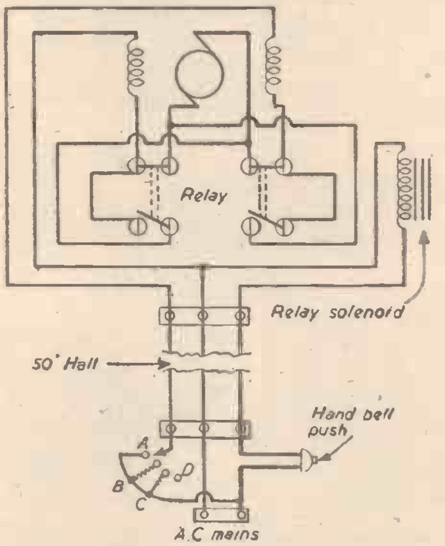
Charging and Lighting Circuit

SIR,—With reference to the reply to N. Burkle, of Watford, in PRACTICAL MECHANICS, June issue, I believe that I can be of some assistance.

The generator originally formed part of an ex-Govt. charging outfit comprising a single cylinder petrol engine, Jap I believe, which was direct coupled to the generator, which fed into a charging and general control board. The complete charging unit was fitted in a cradle to make it portable. The output of the generator was controlled from the switchboard, which was designed to give several different charging circuits at the same time.

The three leads from the generator are as follow: A+ goes straight to the ammeter on the charging board, and then, via various resistances and cut-outs, splits up to supply the various charging circuits. L− is the common negative lead. F is the lead which controls the field coils of the generator through the field resistance on the charging board. It should go direct to the charging board.

Each of the output circuits has its own variable resistance and ammeter. The actual charging board designed for the generator in question, I have reason to believe, is still obtainable at shops specialising in ex-Govt. technical equipment. I also believe that the original complete charging set, comprising engine, generator and charging board, can still be picked up on the market.—G. E. D. GROGAN (Edinburgh, 9).



Circuit diagram and details of electrically-operated screen curtains.—L. R. Fisher

Electrically-operated Film Screen Curtains

SIR,—In answer to your request in PRACTICAL MECHANICS for ideas on electrically-operated curtains, I have drawn out the electrical circuit and a plan of the mechanical gear.

The motor is a fractional h.p. series wound, which means that you have to reverse the fields in relation to the armature. This is done with a double-pole, double-throw relay.

As you will see from the circuit, I am using three-wire cable down the hall. When the relay is being used, which is when the motor is to be reversed, the resistance of its coil is in parallel with the motor, and therefore increases the current. This does not affect the speed of the motor to the extent of being noticeable. You will observe that I have put a hand bell-push, to open and close the relay, in order to ensure that the relay is never left with current going through it, as it might get rather hot, and eventually burn itself out. The control originally belonged to a fan, but it suits this purpose very well.

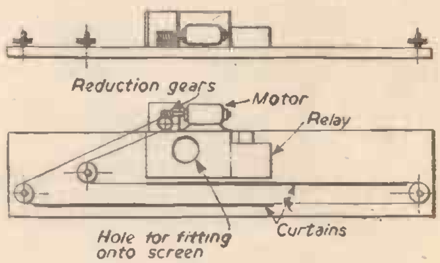
The screen I had to work with was 8ft. long × 6ft. wide. It consisted of a telescopic pole with a tripod to keep it vertical. The screen itself is suspended on it.

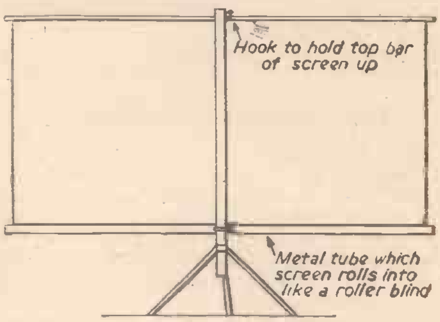
On to a plank of wood 9in. × 9ft. long I fixed a block of wood 12in. × 5in. × 5in., which had a 2in. dia. hole in the centre of it, so that the whole arrangement could be placed on the top of the pole. I fixed the motor and gear box on to the block of wood, and I used a 40 : 1 worm and worm wheel reduction, as this was rather necessary to stop the curtains opening and closing at supersonic speeds. This is how I finally ended up after a lot of experimenting.

Every screen is different though, and you have to know the exact conditions surrounding it; therefore, it is rather difficult to make the apparatus for one screen which will be suitable for another.—L. R. FISHER (Glasgow).

Sixteen Exposures on "120" Film

SIR,—There is one point W. Houghton did not mention in his article "Sixteen Exposures on a 120 Film" (June issue).





The trailing end of a 120 (or 620) film ends about 2in. beyond the "16." To cover the new picture space $1\frac{5}{8}$in. + $\frac{13}{16}$in. = $2\frac{7}{16}$in. of film are required. The $\frac{13}{16}$in. is, of course, the width of the top part of the mask from the top of the original picture space.

Obviously, only about two-thirds of the picture space will be covered. This will be further reduced by the tape holding the film to the backing paper. In short, the first exposure will be lost.

To avoid this it is only necessary to ignore the "16"; make the first exposure on "15," carry on to the "1," which will be the 15th exposure, and make the last exposure when the *sleeve* of the "hand" appears in the red window.

Another point which may interest readers is that before re-rolling the film I move it about 1½in. back towards the trailing end, using the original tape to secure film temporarily, wind the film on to the other spool, fix the trailing end with new tape and load it in my camera.

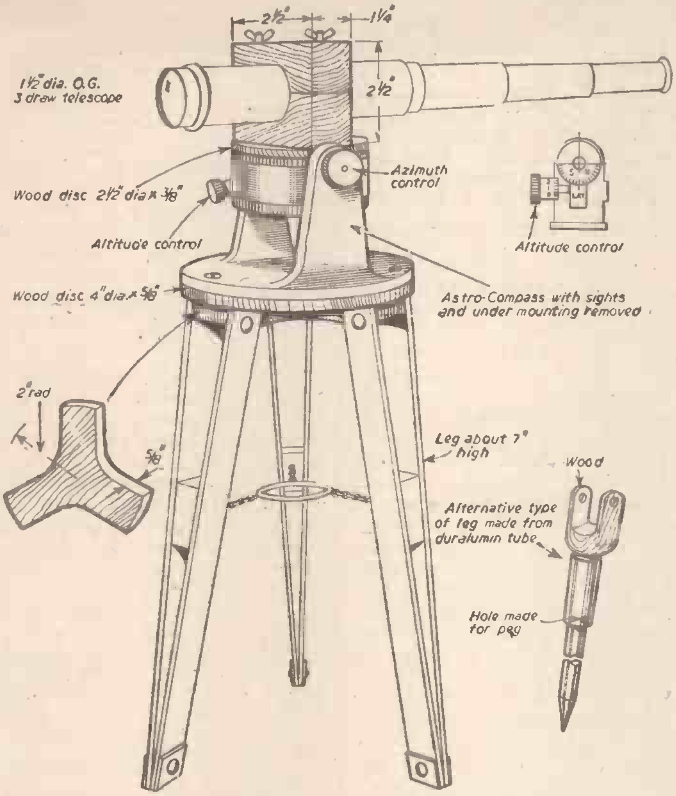
I can then make the first exposure on "16" and a 17th on the hand!

Finally, some readers may assume that this "16 on" conversion has altered "this, that, or the other" of the camera. It has not; it has merely masked off what is too frequently an uninteresting, or distracting, background The novice, in particular, is enabled to *use* the film previously wasted.—J. R. DORRITT (Smethwick).

Telescope Mounting

SIR,—The article on making a small telescope by Mr. Twining in the issue of PRACTICAL MECHANICS, June, 1952, is most interesting, and I thought the following note may be of interest to other readers.

I have constructed a novel alt-azimuth mounting for a small telescope (3 draw. 1½in. O.G.) by using the main top piece of the well-known Astro Compass, which can be obtained from shops selling ex-R.A.F. equipment. The astro compass head has a fine, neat gear drive for azimuth, and a spring-loaded worm drive for altitude. My construction is simplicity itself and the wood blocks and tripod can easily be made by any handyman.—F. W. COUSINS (Greenford).



A novel alt-azimuth telescope mounting—F. W. Cousins

The Steam Car; Training of Draughtsmen; Evolution of the Electric Motor

SIR,—I have been interested in recent articles regarding the revival of the steam car.

Such a vehicle would be a big advantage here, a country of great distances and with no natural petrol supply of its own. If operatable by some form of solid fuel, so much the better. It would be slower in starting, no doubt, but probably no worse than the not very quick-acting gas producers seen here during the war, and better no doubt in an emergency.

I was also interested in your recent editorial on the training of draughtsmen. My mind goes back to a place where none of the draughtsmen had had drawing office experience. Sometimes, things that were "designed" in the drawing office were made in the workshop first of all.

Your recent article on the evolution of the electric motor calls for some slight comment. Reference to books by Sylvanus Thompson and other even earlier authors shows that it was Gisbert Kapp, as well as the Hopkinson brothers, who evolved the practical electric motor. Only those who have perused the history of magnetism as well as electricity since the time of William Gilbert can realise just how much evolution was involved.—E. W. CHAMBERS (Victoria, Australia).

MECHANICS OF THE MINERAL-WATER BOTTLE

(*Continued from page* 386)

fountain." It was a very simple device, consisting of a large bottle provided with a tube passing through an opening at the top of the bottle almost to the bottom of the latter. This delivery-tube had a simple stopcock at its external end. When the tap was turned on, the pressure of gas within the bottle forced the liquid up the tube and so out of the bottle. Essentially the modern soda-water syphon, with its instant delivery, operates upon precisely the same principle as Plinth's original apparatus, the patented "portable fountain" of the years immediately preceding the Battle of Waterloo, with the single exception that Plinth's crude stopcock arrangement has long been replaced in the modern syphon bottle with a spring-operated valve actuated by a simple lever arm mechanism which is now used universally for the opening and closing of the bottle.

A great number of attempts have been made to construct an ideal mineral-water syphon bottle since those far-off days of Charles Plinth and his pioneer invention, yet, the working principle, despite its essential simplicity, has never been superseded by the ingenuity of subsequent inventors.

The modern soda-water syphon bottle, in which a liquid is actually aerated or "carbonated" within the container by means of carbon dioxide gas, released from a small steel pressure-capsule and thus dissolved in the liquid as it stands in the bottle, is not quite in the same category of inventions. These syphon containers are not so much concerned with the actual small-scale making of aerated waters as they are with their effective storage and delivery for use.

The old-time "pop" bottle has chronological priority to the more costly, dignified and convenient soda syphon. It has also had a greater popularity than the latter at all times. That is why, perhaps, the simple ingenuities of inventors have ever been directed more fundamentally, and, perhaps, more successfuly, to the preservation of "pop" than to the more elaborate and graceful saving of soda.

Club Reports

Birmingham Society of Model Engineers

THE society, after many requests from model engineers outside the Birmingham area, have now altered rules and bylaws covering a scheme to bring into the society new members who shall be a person resident outside a 25-mile radius from the Birmingham City centre.

They will be known as "County Members" on payment of 10/- entrance fee and a yearly subscription of 10/6.

Such members are entitled to run locos at Campbell Green, use of workshop, rolling stock, fuel, etc.

Anyone interested should write to the Hon. Secretary: R. Phillips, 92, Gilberstone Avenue, South Yardley, Birmingham, 26, asking for a copy of the rules and facilities offered.

The Ramsgate and District Model Club

THE Ramsgate Model Club announces its exhibition to be held on August 28th, 29th and 30th, 1952, where all visitors and especially members of other clubs will be very welcome.

Among the some 300 exhibits we hope to have on show will be the "OO" gauge layout now operating under automatic signalling, a model of Ramsgate Harbour, passenger-carrying locos and tracks, and another "OO" layout which the youngsters will be able to operate themselves.

The club is open on every Wednesday and Friday evening, when we would be pleased to see anyone interested in our activities. Secretary: Mr. E. CHURCH, "Avis," St. Mildred's Avenue, Ramsgate.

Tramway and Light Railway Society

FOLLOWING upon the total abandonment of the last few miles of London's once vast tramway system, on July 5th, an exhibition of models, photographs and documents portraying the history of London's tramway systems will be held on Friday and Saturday, August 15th and 16th, in the Royal Scottish Corporation Hall, Fetter Lane, London, E.C. The exhibition opens at 5 p.m. on Friday, August 15th. There will also be a working demonstration layout showing ¾in. scale cars working on the overhead and conduit systems. The exhibition is organised by the Tramway and Light Railway Society, and the open-top London United car recently in the Festival of Britain Exhibition will be shown working on this layout.

F. J. ROCHE, 106, Holland Road, East Ham, London, E.6.

Trade Notes

A Review of the Latest Appliances, Tools and Accessories

Karlena Products

ALL the Karlena products, including the mould-making materials and the stone-casting compounds, are easily worked, and they provide a fascinating hobby for the amateur as well as an economic proposition for the craftsman and manufacturer. They are used by artists, sculptors, hobbyists, home-craftsmen and manufacturers, and there is an increasing demand from youth clubs, art schools, rehabilitation centres, model clubs, etc. They are finding a growing application in the ceramic, engineering and building industries, and are exported to places as far afield as Malay, U.S.A., Australia and Brazil.

The flexible mould-making materials are in three grades, known as Elastomold X, Plastimold and Resilomold, and differ in degrees of flexibility and strength. The actual process of making the mould is a simple one: the shredded material is melted into a highly mobile liquid and poured round the pattern, which is, of course, first surrounded by a containing wall. When it sets the mould is in the form of a rubbery substance, which, due to its flexibility, may easily be stripped away from the pattern.

The mould, when it is no longer required, may be cut up and remelted. The three materials are all fully compatible and may be mixed together to obtain any desired

On the right is the original terra-cotta figure of a roadsweeper and on the left a copy. Plastimold was used for the mould and it was cast in Karlenite No. 2.

degree of flexibility, and moulds may be prepared from a variety of materials, including wood, metal, stone, plaster, cement, porcelain, bakelite, ivory, terra cotta, clay, etc. For the preparation of foodstuffs, Karlena products are producing a flexible compound known as Confectiomold.

"Karlenite" art stone casting compounds are produced in several grades, known as No. 1, 1A, 1B, 2, 2A and 3. This "Karlenite" plastic marble is a new material which, in plastic form, is very easily modelled and when set closely resembles marble. The compounds are supplied in powder form and their mixing is a very simple procedure. Series 1, 1A and 1B require the addition of a petrifying fluid which is supplied with the material, while series 2, 2A and 3 need only the addition of water.

To improve the attractiveness of the finished product, veining may be introduced, and the necessary pigments and instructions are supplied.

Among the other products of this company is "Resinamel," which is a resin lacquer, specially developed for sealing the surface of porous materials for use as patterns; it gives a hard finish without destroying fine detail and affords perfect protection. "Resinoil" has a two-fold effect when applied to patterns treated as above. It affords protection against the exudation of steam, air, etc., whilst the mould is setting, and "wets" the surface of the mould, allowing the mould material to flow into all the crevices without trapping air.

Blemishes on finished products are often caused by bubbles which are due to inter-facial tension, and to minimise this "Meniscoloid" may be added to the slaking water. The addition of this intensely active organic compound also increases the "wetting" effect, which means less water is required and the set material is very much stronger.

"Stonax" is a treatment evolved by the Karlena laboratories for hardening, strengthening and polishing plaster and art stone. It follows the established practice of immersing plaster castings in molten wax, but "Stonax," a transluscent crystalline wax-like substance of incredible hardness, is claimed to be the ideal impregnate, and imparts, in addition, a brilliant liquid-gloss polish.

Miscellaneous Karlena products include "Stiktite," which is a transparent plastic cement for use with "Karlenite" in building up separately cast pieces. "Waxsol" is a solvent particularly suitable for dissolving wax-Stonax mixture, and will dissolve nearly all oils, wax, fats and resins, both synthetic and natural. "Amax," when applied to plaster-of-Paris, accelerates the time taken for setting, improves the hardness of the castings and intensifies its whiteness. Italian Gypsum Plaster is a snow-white hard-baked sculptor's plaster, ideal for pattern making, dental work, etc.

For prices and any other information, inquiries should be addressed to the Karlena Art Stone Co., Ltd., 55, Deansgate Arcade, Deansgate, Manchester, 3.

Johnson Photographic Competitions for 1952

OF the two competitions for 1952, the first has now been judged and the results published. In both competitions there are four classes in which prints may be entered —Class 1 for landscapes, street scenes and seascapes, Class 2 for portraits, children, animals and figure studies, Class 3 for any subject not covered by 1 and 2. Class 4 is a special novices class for beginners and is divided into two sections, for those under 18 and those over 18. The closing date of the Autumn competition is October 31st, 1952, and as in the Spring competition, the prizes for the first three classes are one first prize of £10, one second prize of £5, five third prizes of £2 each and five fourth prizes of £1 each. In section one of the novices class there is one first prize of £3, one second prize of £2, two third prizes of £1 each and three fourth prizes of 10s. each. Section two offers two first prizes of £3, two second prizes of £2, four third prizes of £1 and five fourth prizes of 10s. each. In addition there are thirty consolation prizes offered in each competition, each comprising 10s. worth of Johnson chemicals.

The first prizes in the first three sections of the Spring competition were won by Mr. E. Granger of Hammersmith, Mr. P. Mercer of Tonbridge, Mr. R. J. Smyth of Seaton respectively. The first prize in Section 1 of the Novices Class went to Mr. G. Atkinson of Skegness and the two first prizes in Section 2 were won by Mr. J. V. Mellors of Chesterfield and Mrs. W. J. Varley, University College of Gold Coast, Accra.

There are no entry fees for the competition and details of the camera, type of film, negative developer, etc., must be given. The processing must be the competitor's own work. Entries should be addressed to Competition Dept., Johnsons of Hendon, Ltd., Hendon, London, N.W.4, and full details of the rules may be obtained from the same address.

Collaro Micrograms

AMONG the comprehensive range of gramophone units and pickups which Messrs. Collaro, Ltd., are exhibiting at this year's Radio Show at Earls Court are a new series of portable electric gramophones which represent a remarkable achievement for Collaro designers. Without unduly increasing the micrograms' original overall size, they have made available six models of exceptional tonal qualities for both single-playing and automatic operation and for single- and three-speeds.

The famous Collaro Microgram portable electric gramophone—now available in six models.

Each is fitted with a 6½in. speaker and incorporates plug-in pickup heads; attractively finished and light enough to be instantly portable. For use on A.C. mains the models include:

De Luxe Micrograms 514*M* for single-speed and 3/514*M* for three-speeds.

Automatic Micrograms *RC*521*AM* for single-speed and 3*RC*522*AM* for three-speed automatic operation (non-mixing).

Automatic Micrograms *RC*522*AM* for single-speed and 3*RC*522*AM* for three-speed automatic operation, playing 10in. and 12in. records *mixed* in any order. Further particulars can be obtained from the above firm at Ripple Works, By-pass Road, Barking, Essex.

SPARKS' DATA SHEETS

are the Safest, Simplest and Finest Constructional Sheets of Guaranteed and Tested Radio Designs.

SPARKS' SETS THE STANDARD

THE "ENTERPRISE" A Very Efficient 3-Valve plus Rect. TRF. Med/Long-wave Receiver for A.C. Mains. 4½ Watts of Quality on Radio and P.U. Good Range and Selectivity for a circuit of this type. External or Mains Aerial. A Fine Economical Set for the Home. D/Sheet, etc., 3/2½ Post Paid.

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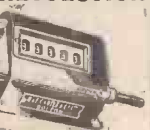

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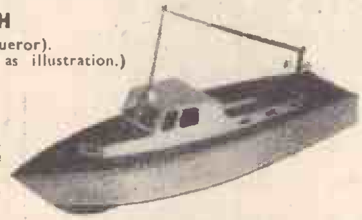

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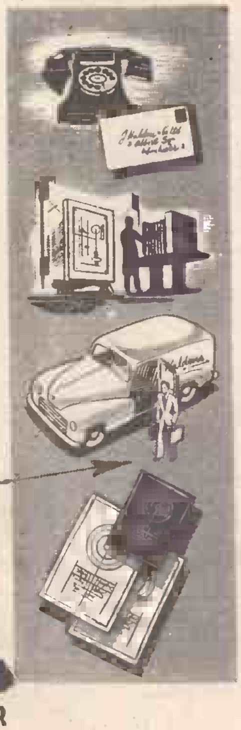

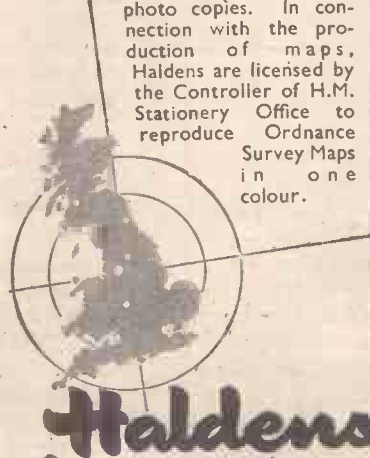

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MAINS TRANSFORMERS (NEW), 200/250 volts input, in steps of 10 volts, output, 0, 6, 12, 24 volts 6 amps, 42/6 each, post 1/6. Another as above but 10-12 amps, 55/- each, post 1/6; another, as above but 25/30 amps, 75/- each, carriage 3/6; another, input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

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EX-RADAR MAINS TRANSFORMERS, 230 volts input 50 cycles 1 phase, output 4,500/5,000 volts approx. 80 m/amps, 6.3 volts 2 amps, 4 volts 1½ amps, 2 volts 2 amps, these transformers are new, immersed in oil, can be taken out of the oil and used as television transformers giving output of 10 m/amps, overall size of transformers separately 5½in. × 4½in. × 4in. and 3in. × 3in. × 2½in., price 75/- each, carriage paid.

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Please note: All Transformer prices have been increased by 10% due to rises in cost of materials. Prices quoted in this advt. supersede all prices previously quoted.

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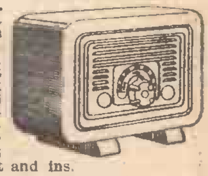
The sound to be recorded is simply picked up on a microphone or taken from the L.S. terminals of the radio set. The recorder is fitted with a special magnetic device which "prints" the sound upon the special tape. The tape is in spools which play for approximately 1 hour, but the recorder can rapidly wind or unwind the tape to get to particular parts where one spool contains several recordings. The instrument, just as it automatically prints, also automatically erases unwanted recordings, and as there is no mechanical contact, the tape can be used over and over again. The recordings are free from distortion and no knowledge is required for operation. Complete kit of parts with 6 valves and portable or table model cabinet and full instructions, £29 5s. 0d. (or £9 15s. 0d. deposit), plus 15/- carriage and insurance. Alternatively the unit ready built complete with reel of tape and crystal microphone £36 15s. 0d. (or £2 5s. 0d. deposit), plus 15/- carriage and insurance.

Instruction Booklet.—Shows in close detail exactly how to assemble and operate the recorder, is free with kit or available separately at 2/6 (credited if you buy the kit or completed recorder).

HOLIDAY RADIOS



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QUERIES and ENQUIRIES

A stamped, addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 88 (THE CYCLIST), must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

Processing Cow Horns

PLEASE send me particulars of how to process "cow horns" before turning and how to polish.

Are there any books on the above and where can they be bought; are there books on bone and horn turning?—G. Duncan (Forres).

IN order to clean and process a cow or ox horn for ornamental mounting or other use, first of all remove all roughnesses from the horn by means of a spokeshave or a sharp knife, or rasp. This is followed by abrasive treatment by means of a file and various grades of sandpaper. Pumice powder, made into a paste with water, is next applied. Finally, a paste of whiting and oil is applied to give the horn its final smoothness. An extra final treatment for smoothness with whiting mixed to a paste with vinegar is sometimes applied, but this is not usually necessary. The use of calico mops mounted on high-speed revolving buffing wheels will improve the final smoothness of the horn and will save much time and labour. Many ornamental workers in horn apply the palm of the hand to give the desired degree of smoothness to the horn. Leather dust has also been used to impart a final sheen.

If the horn is dirty and greasy, washing with soap and water, the latter containing a little soda or ammonia, is called for. Apart from this preliminary cleaning, you will note that the process of preparing and "dressing" the horn for ornamental use is solely concerned with trimming it and with smoothing its surface by rasping, cutting, filing and abrasive treatment, using first a coarse abrasive and, finally, a fine, gentle one such as common whiting. As a finishing operation, we recommend the rubbing of a little thin mineral oil, such as sewing-machine oil, into the horn by means of a soft cloth. Do not apply wax to the horn since the wax film will tend to pick up dirt and dust. The final oil treatment will slightly deepen the colour of the horn material and will add depth and richness to it.

So far as we have been able to trace, there are no available books dealing with the subject of working in horn and bone material. You may possibly be able to obtain a secondhand book on the subject from Messrs. W. & G. Foyle, Ltd., Charing Cross Road, London, W.C.2, or from any other good secondhand bookseller. Another good firm for your inquiries in this direction is that of Messrs. Wm. Bryce, Ltd., 54, Lothian Street, Edinburgh.

Re-staining and Varnishing a Violin

I HAVE an old violin which I would like to re-stain and varnish. Would you please let me know how to make the stain, also the right kind of varnish to put on?—J. G. Huggins (Enniskillen).

IF you think anything of your present violin, and if its tone is good, you will be advised not to attempt to re-varnish it, because this is a very skilled business, and the tone of the instrument may easily be altered during the process. For such an instrument, a mere rubbing down, now and again, with a very small quantity of raw linseed oil is sufficient. If, however, you decide to re-varnish and re-stain the fiddle, the old varnish must, first of all, be removed entirely. This is done by very careful scraping with a sharp penknife blade. It is not safe to use any chemical solvent on the instrument. After the varnish has been removed, rub the instrument all over and as evenly as possible with very fine glasspaper, paying particular attention to the back and the belly.

The instrument will now be ready for staining and varnishing. To effect this, proceed as follows:

Lightly rub the violin all over with pure turpentine (NOT turpentine substitute). Wipe it as dry as possible and apply to it by means of a flexible flat varnish brush the following spirit varnish.

Shake up quarter-pint of methylated spirit with a mixture of equal quantities of red sanderswood and turmeric. It will take several days to prepare this coloured solution, because the ingredients will have to soak in the spirit for at least 60 hours, being shaken up frequently.

In another quarter-pint of spirit, dissolve 1oz. of gum sandarac. Then mix the two batches of spirit together, add a tablespoonful of venice turpentine and 1oz. of white shellac. Finally, filter the resulting liquid through fine cloth. The product will be an elastic spirit varnish of a warm amber colour. It should be applied in several coats (at least four or five) to the violin, allowing the one coat to dry before the next one is put on. It dries fairly quickly. When a good body of the varnish has been put on and allowed to dry and harden, it must be rubbed down with pumice powder until it is dull and smooth all over, the surplus pumice powder being wiped off with a damp rag. The final polish is obtained by rubbing with a paste of tripoli powder and water or a paste of crocus powder and raw linseed oil. The last finish of all is imparted by rubbing the instrument vigorously all over with the palm of the hand. This should give a glass-like surface. This surface should NOT be waxed, but it may be rubbed very occasionally with the smallest possible quantity of a high-grade raw linseed oil.

Making Boot Polish

COULD you give me the formula for black boot polish and the method of boiling or mixing? I tried pure turpentine and black wax unsuccessfully.—J. N. Scott (Co. Antrim).

YOU have been using entirely the wrong materials for your manufacture of shoe polish. Such materials could only give you a sticky, non-drying, greasy product, which would never be satisfactory. Here is a good formula for the preparation of an effective black boot or shoe polish:

Grey Carnauba wax	..	70 parts (by weight).
Beeswax	.. .. ..	50 " "
Ceresine (white) wax	..	40 " "
Oleic acid (dyed black with nigrosine dye)	.. ..	12 " "
Turpentine	.. ..	35 " "

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.

First of all warm the oleic acid (olein) and dissolve sufficient nigrosine or other black oil-soluble dye in it to colour the liquid a deep black. Next mix the waxes and gently melt them together. Add the dyed olein acid and then the turpentine (which may be mixed, if required, with an equal volume of turpentine substitute (white spirit) to lower the cost). It may be desired to add an ounce or two of nitrobenzene to perfume the product, nitrobenzene having a strong almond-like odour.

The above mixture, after thorough stirring, is run into shallow tins or other convenient containers to cool. It is then ready for use. It gives a hard, brilliant polish film, which is beneficial to the leather and is not sticky. Moreover, the product is economical, very little of it being used to give a good polish. The materials can be obtained from any firm of laboratory chemical dealers, as, for example, Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2.

By using a brown or orange oil-soluble dye in place of a black dye, you can make brown polishes in the same way.

Ultra-violet Ray Lamps

I WISH to construct a sun-ray lamp either of the carbon-arc or mercury vapour tube type, and should like to know:

(1) Which of the two types of lamp gives the highest output of ultra-violet ray?

(2) Where I could purchase both tungsten-cored arcs and the discharge tube?

(3) If I decide on the discharge tube, where I can obtain a circuit diagram?—R. Oram (Birmingham, 15).

THE greatest output of ultra-violet rays is likely to be obtainable from arc lamps. The amount of ultra-violet light which is generated in addition to the visible light will depend on the amount of various salts impregnated in the carbons. Plain carbon arcs, which may operate on A.C. or D.C., produce light very similar to daylight, whilst the inclusion of a core of nickel causes a higher proportion of long-wave ultra-violet light to be generated. Pure tungsten-cored carbons generate shorter waves and are useful for surgical or local therapy. Electrodes of pure tungsten operate on D.C. only. The output from an arc lamp may be transmitted through quartz lenses to minimise the risk of heat burns.

You may be able to obtain tungsten-cored carbons from one of the following firms:

Electro-Alloys, Ltd., 12, Brunel Road, London, W.3.

Finsen Institute, Copenhagen.

Blackwells Metallurgical Works, Ltd., Thermatel House, Liverpool, 19.

Everitt & Co., Ltd., 40, Chapel Street, Liverpool.

Tungsten Manufacturing Co., Ltd., 68, Victoria Street, London, S.W.1.

A discharge lamp may be obtainable from one of the following firms:

London Commercial Electrical Stores, Ltd., 20-22, Cursitor Street, London, E.C.4.

Perihel, Ltd., Edge Street, London, W.8.

Watson & Sons (Electro-Medical), Ltd., East Lane, N. Wembley, Middx.

Buckley (Uvral), Ltd., Beta Works, Riverside, London, S.W.15.

L. C. Hawkins & Co., Ltd., 30, Drury Lane, London, W.C.2.

Alternatively, you could use one or more 125-watt lighting discharge lamps having a quartz tube. We would advise you, if possible, to obtain a circuit diagram from the suppliers of the lamp.

Preparing Goat and Calf Skins for Vellum Making

(1) CAN you tell me the various methods of de-hairing goat and calf skins?

If lime steeping is used, what is an easily obtained cheap solvent to remove lime residue?

(2) How is the transparent effect obtained in calf vellum?

(3) What is the method of removing natural grease after de-hairing?

(4) What are the quantities of alum and salt if skin is to be cured white?

(5) Is there any book obtainable on vellum-making?—James Hutchinson (Londonderry).

(1) THERE are many methods of de-hairing calf and goat skins. The main method is, after having de-fleshed the skins, to immerse them in a "milk" of lime and water in a stone trough for 14-16 days. During this time, the skins are turned over daily and at the end of the period they are removed from the liquor. This lime and water treatment loosens the hairs. Any excess of lime is removed from the skins by placing them in cold water and running them backwards and forwards over a sort of large drum or paddle wheel. Usually, a mechanical arrangement is made use of for this purpose, the wheel making about 40 revolutions per minute. Many of the hairs fall out during this operation; the remainder are pulled out by rubbing a blunt edge over the skin.

(2) The translucent effect in calf vellum is obtained by very prolonged liming (sometimes with the addition of a little caustic soda in the water) followed by very effective de-hairing. The skin is sometimes de-fatted by immersion in a grease solvent such as trichlorethylene or by treatment with a mildly alkaline solution. A sheet of thin white paper is finally pasted down on to the inner side of the skin, the whole then being passed through pressure rollers.

(3) Natural grease is usually removed from the skin by a prolonged process of lime soaking. The lime slowly saponifying the grease and converting it into insoluble calcium soaps, which are subsequently removed by scraping or other forms of abrasion. Alternatively, the skin can be de-greased by a short immersion in a warm, dilute caustic soda solution (1 in 5). The newest form of de-greasing methods comprise the use of organic solvents such as naphtha, trichlorethylene and petroleum distillates.

(4) The quantities of alum and salt to be used in the curing of skins depends entirely on the nature and type of the cure which is being attempted. As a general rule about equal quantities of alum and salt are appropriate.

(5) You will probably be able to obtain a small handbook on vellum manufacture from Dryad, Ltd., St. Nicholas Street, Leicester.

The following books would also be of help to you in your work:

H. G. Bennett: "Animal Proteins."
H. Crockett: "Practical Leather Manufacture."
H. C. Standage: "The Leather Workers' Manual."
J. T. Wood: "The Puering Bating and Drenching of Skins."

You may be able to obtain some of the above second-hand from Messrs. W. G. Foyle, Ltd., Charing Cross Road, London, W.C.2. They can all be obtained new from a good firm of booksellers such as Messrs. H. K. Lewis & Co., Ltd., 136, Gower Street, London, W.C.1, or Messrs. Wm. Brice, Ltd., 54, Lothian Street, Edinburgh, whilst, of course, some of them may be available in your nearest reference library.

Overhauling a Car Battery

WHAT is the best way to take out the cells and plates from a motor-car battery? I wish to wash out the cells of a 6-volt battery and replace plates if necessary. What acid should I require to make up a solution—say, 40oz.?—E. A. Owen (Hereford).

ABOUT once a year it is a good plan to empty the electrolyte from a battery, filling the battery with distilled water, which is emptied out after a short period; the battery then being refilled with fresh acid having a specific gravity of 1.280 to 1.300 and the battery recharged.

The cells are in one block, but can be opened up as follows, if necessary. First empty and wash out the cells. Then remove the lead connecting bars from between the cells. In order to do this a ⅜in. diameter hole can be drilled centrally through each connecting bar until the bar is free enough to be prised off. The pitch-sealing compound is then melted by means of a hot iron or a fine flame and cut out from around the edges of the lid; the plates may then need prising out of their cells, using a lever and a wooden block. The cells should then be cleaned out and the lead bars, etc., cleaned with a caustic soda solution.

When assembling the plates, use new wooden separators, with their corrugations or ribs facing the positive plates. The plates and cell lids may then be replaced and the lids sealed with melted pitch, a fine flame afterwards being run along the joints to ensure tightness. The connecting bars may then be soldered on using a small blowlamp flame, plumbers' solder and tallow for flux, whilst protecting the pitch and the top of the casing with asbestos cloth. After cooling the battery may be filled with acid and recharged.

Commercial sulphuric acid has a specific gravity of about 1.84. In order to obtain the correct density for the solution, add the acid to distilled water a little at a time, allowing the solution to cool down if necessary during the mixing.

Re-liming Woodwork

COULD you let me have an outline of the process of liming oak furniture? We have a suite which has gone shiny through wax polishing, and I wish to remove the surface by scraping and to re-lime it.

If you can recommend me a small treatise on cellulose finishing of woods I should be grateful. —E. H. Moore (Ipswich).

IT is quite understandable that any wood surface which is regularly wax polished will take upon itself a shiny, glossy character. Hence the shininess of which you complain cannot justifiably be ascribed to the liming of the woodwork. However, since you wish to re-lime the woodwork, the existing wax polish should be removed by scrubbing the woodwork with hot paraffin. After this, the woodwork should be scrubbed with a hot solution of one part of caustic soda in six parts of water, and, finally, well rinsed down with hot water. The "lime" which is used for furniture treatment is usually common whiting which has been passed through a very fine mesh, such as muslin. This product is mixed to paste consistency with a solution of one part of glue in 10 parts of hot water. The paste is brushed over the surface of the wood and then pressed into the grain with a soft pad. Before the paste has had time to dry, a damp cloth is wiped over the wood so treated so that the surplus paste on the surface is wiped away, leaving the paste in the pores of the wood. The wood is then put aside to dry out thoroughly (without heat) for a few days, after which it is surface-treated by any of the usual methods. The normal surface treatment for this type of furniture finish is clear cellulose spraying.

Books of interest on the subject of cellulose finishing are:

A. E. Robinson: "The Application of Cellulose Lacquers and Enamels."
R. C. Martin: "Lacquer and Synthetic Enamel Finishes."
S. Smith: "Cellulose Lacquers."

Boat Engine Problems

I HAVE converted two 20ft. pontoons into a river cruiser, and now have a 32ft. by 6ft. flat-bottomed craft, displacement 2 tons.

I wish to fit an engine and propeller as cheaply as possible, and am hoping to convert an old car engine. I should like advice as to horse-power required, number of revolutions per min., and diameter and pitch of propeller. I wish to travel at about 10 knots. Is there a formula?—J. Lappage (Yiewsley).

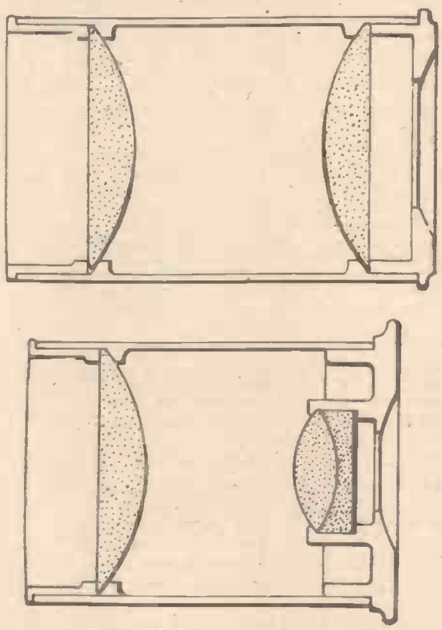
TEN knots is too high a speed for a craft of this type, the pontoons were not designed for such a speed in the first place. The maximum economical speed for a displacement boat is given approximately by the formula: speed in knots $= 1.2\sqrt{L}$ where L = the length of the boat on the waterline. Assuming a waterline length of 30ft. for your boat, this gives a speed of 6.6 knots.

There are no simple formulæ for the engine h.p. and propeller size, but for a 30ft. boat of normal design, having a beam of 8ft. 6in. and going at 6¼ knots, a 12 b.h.p. engine would be required with a propeller 16in. diameter × 11in. pitch running at 1,000 r.p.m. As your boat is not of normal shape but is narrow for its length, having a beam of only 5ft. 9in., a considerably lower power engine would probably be satisfactory. I would suggest a 6 b.h.p. engine with a propeller 12in.-13in. diameter and 10in. pitch running at 1,000 r.p.m. This would give a speed of 6 knots, which is quite sufficient for normal river use.

A secondhand marine engine would be preferable to an amateur-converted car engine. If a car engine is used, remember that a thrust bearing must be placed between the engine and propeller and that if river water is used direct for cooling the engine, the water jacket is liable to silt up in muddy water.

Remedying Flare in a Telescope

I HAVE built my own telescope using an achromatic object glass of exceptionally large diameter in relation to its focal length; the ratio is 1 : 8. I am using it with eyepieces of the Kellner type in which, like the Ramsden eyepiece, two plano-convex lenses are mounted with their convexed surfaces towards each other. The trouble is that when the telescope is directed on any bright object such as the Moon or Venus, the whole field of vision is flooded with light which impairs definition. Stopping down the object glass aperture, making the ratio 1 : 40, banishes the flare or at any rate renders it invisible.—F. Marshall (Cardiff).



The illustration shows a sectional view of, top, the Ramsden eyepiece and below, the Kellner.

THE Kellner and the Ramsden eyepieces give a flat field with a wide angle of vision, but they both have the great disadvantage of giving what has been described as a "ghost" of bright objects. With a very large-aperture object glass of comparatively short focal length, this "ghost" would be intolerable and might render observation impossible. This false light is the result of reflection from the inner or convexed surface of the field lens, the lens nearest to the O.G., forward through the lens itself and back again from the front, flat surface to a focus very near to the focus of the eye lens. The accompanying diagrams show both the Ramsden and Kellner lens arrangements.

With a large open aperture O.G., the remedy is to use the Huygenian type eyepiece, the form and construction of which are drawn and described in our September, 1951, issue.

A Kellner eyepiece can be very useful for the observation of faint objects, nebulæ and star groups or for moderately bright ones, if the O.G. aperture is stopped down a little.

Hand Cleansers

HOW can I make hand cleansers (on a small scale) of the abrasive paste and jelly types? I find that as I use a lot of these the commercial article is expensive. Can they be home made cheaply from easily-obtained ingredients?—L. Wilton (Staffs).

(1) An abrasive paste type of hand cleanser may be made quite simply by mixing about 10 parts of soap powder with 90 parts of a gently-abrasive material, such as powdered pumice or a similar substance. The product can be compressed into blocks by means of hydraulic power of about 1¼ tons per sq. in. Alternatively, it can be tamped down into tins.

(2) The jelly forms of hand cleansers are much more expensive, for which reason they are not seen as frequently as are the abrasive cleansers. They are, however, for the most part, exceedingly effective. Try the following:

A.	Petrol, paraffin, white spirit or benzole	2 parts
	Carbon tetrachloride	½ part
	Oleic acid	1 "
B.	Ammonia	¼ part
	Methylated spirit	¼ "
	Acetone..	½ "

Add B to A with rapid stirring until a smooth, thick jelly results. If the jelly is not thin enough add water, drop by drop, until the desired consistency is attained. Store the jelly-like produce in jars having tightly-screwed tops.

You will be able to obtain the above ingredients from any local firm of laboratory furnishers, such as Messrs. W. and J. George and Becker Ltd., 157, Gt. Charles Street, Birmingham, 3.

Welding and Brazing at Home

I WISH to do my own welding and brazing. Can I weld and braze with town gas and compressed air which I already have? Welding would consist of items such as 2in. × 2in. × 3/16in. angle iron, this being about the largest.

If I have to use oxygen is there any danger in either storing or using same?

Can you give the name of any firm who make a torch for this? Are there any books on jobbing type welding and brazing?—P. M. (Derby).

COAL gas as drawn from the mains consists of a mixture of methane hydrogen, carbon monoxide and other hydrocarbons. Applied principally as a fuel gas in blowpipes for the cutting of steels and brazing, the rather low flame temperature, coupled with the fact that the gas contains certain impurities, have limited the field of application for general welding purposes. Air-coal gas flames have a temperature of approximately 1,600 deg. C., whilst oxy-coal gas reaches 2,000 deg. C.

There is no danger in storing oxygen if you take reasonable precautions, and the British Oxygen Co., Grosvenor House, Park Lane, London, W.1, publish a booklet on this subject which we think you should read carefully. It is entitled "Safety in the Use of Compressed Gas Cylinders," and is obtainable gratis from them. We suggest that you read also Technical Information Booklets Nos. 1–15, all these are free. This company also markets an oxygen hand-cutter in various sizes under the trade name of "Cutogen"; we think this will fulfil your requirements.

Messrs. Johnson, Matthey and Co., 73/83, Hatton Garden, E.C.1, are manufacturers of brazing and soldering materials, and they, too, issue considerable literature to anyone interested.

We give information on this subject in our Reference Book, and we feel you can obtain books dealing exclusively with welding from your local library. The book, "The Welding of Cast Iron by the Oxy-acetylene Process," published by Sir Isaac Pitman, Ltd., is well worth reading and gives much detail regarding the systems, torches, rods, etc.

Workshop Floor

WHAT is the best type of floor for a small workshop? Where can I obtain the materials for it—unless you advise a wooden floor?—N. Johnson (Erdington).

IN our opinion a wood floor is by far the best for a small workshop. It is resilient and warm to the feet. It is not easily affected by oils, paints, chemicals, etc. In case of local damage, it is easily replaced or repaired in such areas. It does not crack and it will stand vibration well. Articles which are accidentally dropped on to it are not so readily broken as they are in the case of other floors—concrete, for example.

The next-best floor is one of concrete, made from Portland cement or coarse and fine stone "aggregate." This is a hard, enduring floor, which is easily swept and kept clean. When well laid, it is fairly damp resistant.

Asphalt floors are expensive and, although they are clean and resilient, they are cold to the feet and are sometimes apt to crack if the asphalt is too hard. Their outstanding feature is their very high damp and water resistance, but they are deteriorated by oils, paints and many other agents.

Your choice should lie between a wooden and a concrete floor. If you decide on a concrete floor, Portland cement can be obtained from your nearest builder's merchant, whilst aggregate of stone or other variety can be obtained from Mr. A. M. MacCarthy, 37, Sandford Road, Moseley, Birmingham, 13.

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

Comments of the Month

By F. J. C.

The Road Safety Debate

THE House of Commons on June 20th debated the question of Road Safety, and supported the motion expressing concern "at the enormous number of accidents, fatal and non-fatal, on the roads of this country and requests that further measures shall be taken to improve road safety."

One speaker said that he thought the peak had been reached of what could be done by educational methods. Safety in future would depend more and more upon improvement of the roads and in reconstruction. Another speaker drew attention to the fact that last year 46,000 riders of motor cycles were involved in accidents and he thought that speeds of 70 miles an hour were an embarrassment to other road users, and that it had been suggested that a speed-capacity-limiter should be fixed in the manufacture of motor cycles.

At present a youth, once he has attained a provisional licence, can sally forth on the most powerful machine on the market capable of speeds up to 100 miles an hour. By the time he has become reasonably experienced such a youth must have a goodly score of accidents both to himself and others to his discredit.

Another speaker said lectures and inspections of school-children's bicycles had been conducted for some time by the police, and he commented "to my mind the fact that a child's bicycle was examined and that the headmaster was informed if the brakes were not safe, and if the bicycle was dangerous, contributed very largely to road safety."

Unfortunately, statistics do not confirm this. Most accidents to children are caused by inexperience and the carelessness of other road users, and not by inefficient machines. Naturally, as was to be expected, cycle tracks came in for comment. One M.P. wanted to know why cyclists did not use them and said that instead of using those on the Southend Arterial Road cyclists ran races on the main roadway.

Replying to the debate, Mr. Gurney Braithwaite, Parliamentary Secretary to the Ministry of Transport, said that the new requirements which would appear in the revised Road Traffic Acts were directed at pedal cyclists and pedestrians as well as at motor vehicle drivers. The primary factor, he said, in the vast majority of accidents, was human error on the part of drivers, motor cyclists, pedestrians and pedal cyclists. The cyclist and the motor cyclist are extremely vulnerable, and if a motor cyclist were involved in an accident he and his passenger, if any, were almost inevitably killed or injured, whereas a similar accident involving a four-wheeled vehicle frequently results in nothing more than damage to the vehicle.

We are glad to note that the revised Road Traffic Acts will be directed to pedestrians. It is our view as a result of a careful observation over a long period of years that they cause far more accidents than is generally realised, accidents in which they do not themselves become involved. Motorists are observing the right of pedestrians on the zebra crossings. Their use by pedestrians must be made compulsory. Whether such compulsion will be extended to make the use of cycle tracks by cyclists compulsory is not yet known. It is certain, however, that all road users are going to sacrifice some of the liberty they have enjoyed in the past.

The law must be brought into line with present conditions. The ever-increasing volume of traffic crowding on to our largely out-of-date roads, and the fact that for some years to come the Government will be unable to spend money on modernising them, make drastic measures necessary.

Motorised Bicycles—A Legal Point

A YOUTH who had stolen or taken away without the owner's consent a motorised bicycle was recently charged with taking the machine and of driving without a Third Party Insurance and a driving licence—three charges altogether. It was successfully pleaded that as he pedalled the machine away and the motor had not been used he did not require a certificate of insurance nor a driving licence, and the three summonses were, therefore, dismissed. This may seem hard on the owner of the machine, and suggests that the police were careless in framing the charges or not bringing alternative charges.

Motorised Bicycle Developments

THE sales of motorised bicycles continue to rise, and as a result of experience many improvements are being introduced. Reinforced front forks, for example, are now available as an accessory, sprung in the manner of a motor cycle, and there are improved clutches and free-wheeling devices. A discussion among a group of motorised bicycle owners recently took place with the object of ascertaining whether an association under the title of the Motorised Bicycle Association could be formed to watch the interests of the owners of these vehicles, and to disseminate information concerning them. It was decided to form a foundation committee to explore the matter. At the meeting, which was attended by some motorised bicycle users who are members of a cycle touring club, it was stated that there was no organisation at present which was friendly towards this type of vehicle, and that the only alternative was to form an association of their own. In this view we concur.

Road Safety On The Radio

IN a recent radio programme a discussion took place between representatives of the various classes of road user. We do not know what purpose this discussion was intended to serve. Certainly it could not have been intended to reach a conclusion or final solution. Like discussions of a similar nature such as politics or music this one merely enabled the various speakers to defend a particular class of road user they represented, to air their views and also to leave the listener in the air.

A representative of the Automobile Association stressed the danger of too many cyclists riding abreast. Although we disagree with this practice, as indeed does everyone else associated with the cycling movement, there is little evidence to suggest that it is responsible for accidents.

"Britain's Cycling Frankenstein"

JAMES KAIN has produced a *magnum opus* under the above title dealing with the struggle for British cycling road sport from 1888 to 1952. He says, relating to one organisation, that it is a Disunited Colossus and the *raison d'être* of this document is, in the words of Omar Khayyám, "To grasp this sorry state of things entire, shatter to bits, and then remould it nearer to the heart's desire." He plumped for the formation of an English Cyclists Union, a new body to take over the control of road sport. The document in its 27 foolscap pages traces very accurately the turbulent history of cycling sport.

It commences with the famous resolution passed at the 1888 A.G.M. of the N.C.U.: "The N.C.U. as a public body desires to discourage road racing, and calls upon clubs to assist it by refusing to hold races upon the roads, and it prohibits any of its officials from officiating or assisting at any road races, and refuses to recognise any records made on the road, and that this be added to the rules."

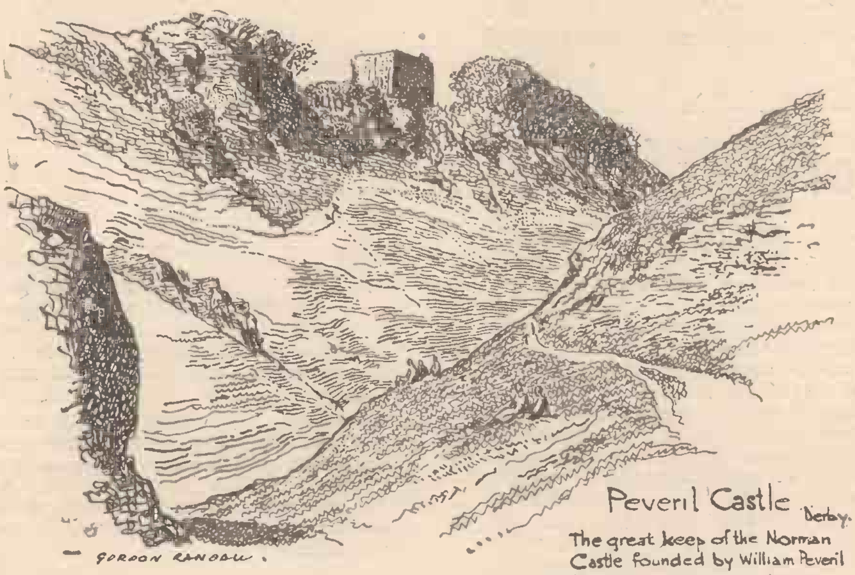
The N.C.U. must not be permitted to forget that resolution which threw the first spanner into the works of road sport, and has been responsible for the formation of so many bodies which it has described as "dissident" and which it has alternately threatened, cajoled, proclaimed, promised amnesties to, and in general tried to stifle. Its general attitude has been: Here is a strange thing which we do not understand—let's kill it! However, Kain, who had so much to do with the B.L.R.C. in its formative years, traces the whole history of the League and its relations with the Union, the Government, and the R.T.T.C. and outlines the internal trouble within its ranks. He pays tribute to our own efforts on behalf of the League, and summarises our interview with the Minister of Transport when we extracted the intriguing information that no complaints had been received from police or public concerning massed start racing, and that the only complaints received had come from rival cycling organisations.

This is a document which fairly presents the case and should be read not only by all participants in the dispute, but by all those who have not yet formed an opinion as to the merits of the League case.

Cycle Racing Gossip

A Monthly Summary

By W. J. MILLS



Peveril Castle Derby.

The great keep of the Norman Castle founded by William Peveril in 1068. Impregnable on its crag of limestone until the days of gunpowder.

AFTER last year's successful début, the *Daily Express's* Tour of Great Britain for 1952 will undoubtedly be one of the major cycling stories of the year, perhaps even overshadowing the world's championships, which will be running at the same time.

The race has been extended to cover 16 days, starting at Hastings on August 22nd, and finishing at London on September 6th. In between, the field of sixty selected riders will race west to Weymouth, then up through Wales to Carlisle, as far north as Dundee and then south through Newcastle and Norwich.

Last year's winner, Ian Steel, of Scotland, who this year scored such a brilliant win in the Warsaw-Berlin-Prague race, will find competition much keener. Teams have been promised from France, Belgium and Italy, but perhaps even more interesting will be the team from Western Germany, unknown factors as far as we are concerned.

With £1,000 in prize money at stake, and 1,600 miles in which to earn it, the race takes on more and more a resemblance to the world famous Tour de France.

For this year, the *Express* confirm that the race will again be run under British League of Racing Cyclists Rules, which means that, even though the N.C.U. have at long last decided to recognise road racing, no Union riders may compete.

The obvious solution, of course, would be for R.T.T.C. and B.L.R.C. to combine, not only over this race, but over all road racing, with the League given the actual organisation to handle—for they have the officials, capable of running such an event, which the Union lack.

But it cannot happen this year. The big stumbling block is the fact that the N.C.U. do not, so far, recognise the "independents" or semi professionals, and without these riders, an event such as the Tour of Great Britain could not be run.

* * *

HELSINKI results will by now have proved the National Cyclists' Union right or wrong over their Olympic selections . . . but if they have been right, it is more thanks to the riders than the Union.

There has never been a more sorry story than that of this year's N.C.U. Olympic planning. It boils down to too many committees . . . Olympic Training Committee, Olympic Committee, Racing and Records Committee, Massed Start Committee . . . all these had a finger in the Olympic pie, and with the personal rivalries between N.C.U. officials, some selections took on a "political" aspect.

Pity the poor riders, subject to the whims of conflicting committees!

For 1953, why don't the N.C.U. appoint just one, all-important and over-riding committee, charged with supervising all riders in the running for international selection, planning their training and racing, naming the events in which they will compete abroad, and without any last minute reversals of elections by some other committee?

* * *

WORLD'S cycling championships, at the end of this month (August) will be more than usually interesting. In normal years, the far-off countries don't send riders for the world's events, but, in Olympic years, with riders already in Europe for the Games, naturally, the teams plan to compete in the "double."

This year's world's series are split up, the organising nation, Luxembourg, staging only the two road races, amateur and professional, on a small circuit outside Luxembourg town.

Lacking a modern track, Luxembourg tried to farm out the track events to near-by Roccur stadium in Belgium, but the financial details could not be mutually solved, and so the track events will be held in Paris, on the Parc des Princes track.

British interest centres on Reg Harris, of Manchester. Can he win the world's professional 1,000 metres sprint championship for the fourth year running?

There is only one rider who might stop him. Sid Patterson, of Australia. The best of friends off the track, these two are deadly rivals in action, and with Harris now slightly past his peak, and Patterson coming up fast and strong, I wouldn't like to forecast the result.

Russell Mockridge, of Australia (if he hasn't taken the plunge into the cash ranks by then), should be the winner of the world's amateur sprint title, but I rather fancy the chances of our own Cyril Peacock, the Tooting glassblower. Here is a rider who can develop into a second Harris.

* * *

WITH the professional class of riders now fully established at Herne Hill, it is to be hoped that the N.C.U. will send, to the world's championships, a full professional team, at the Union's expense if necessary. After all, the N.C.U. take an extra cut in the gate money for every event in which British riders compete, and the Luxembourg-Paris combination should result in a good gate.

Naturally, Harris and fellow Mancunian Cyril Bardsley will be in the sprint race; Jack McKellow is good enough for the 5,000 metres pursuit race; he clocked 6m. 46.4secs. over the distance at Herne Hill, and this is a time good enough to get him into the last eight of the world's series.

But we can field, for the first time in living memory, a team in the professional road race, with diminutive Dave Bedwell, of Romford, at the head of the team. Bedwell, for his many wins in British League road races, has been steadily improving ever since he switched over to the N.C.U. as a professional this year. Lacking professional road races in this country, he has had to go abroad for experience, and has shown up well in a variety of road races against international fields. He could be backed up with Derek Buttle (also from Romford), the Hendry brothers, Alex and Andrew, of Scotland, Les Wade, of London, and Alec Taylor, of London, to make a full team of six.

Isleworth Middlesex.

A quiet Thameside backwater still retaining its old world charm

AROUND THE WHEELWORLD

By ICARUS

Farnham, Surrey

The elegant Georgian houses of Castle Street that flank the wide approach to the Castle.

Frank Urry Honoured

MY congratulations to colleague Frank Urry on being awarded the M.B.E. in the recent honours list. The award was made for his services to cycling, and there is no one alive to-day who can claim to have done anything like the amount of unpaid work and propaganda to popularise cycling which Frank has done. I am ignoring here even the work of the paid advocates who have a reason for their work—they are paid to do it, not necessarily because they believe in it.

Frank, on the other hand, is purely altruistic. The honour comes to him as a private individual and not as a member of any organisation. He resigned all connections with the C.T.C. some time ago. He obtained his love of cycling on the open road from his father, the late Jack Urry, the editor of *Bicycling News*, which was founded in 1871, and which was the oldest cycling journal in the world. It was on that journal that Alfred Harmsworth, later Lord Northcliffe, served his apprenticeship to journalism. He was assistant editor.

Frank Urry wields a pretty pen and he is a poet of no mean merit. It is true to say that he set the style for all modern descriptive writers on the pastime of cycling—often imitated but never equalled. Whilst others pay lip service to the wonders of cycling but seldom use the two-wheeler, Frank cycles regularly every day and his writings are from first-hand experience of the districts with which he deals.

In this he differs from so many other writers who mug up their articles from guide books, and lend verisimilitude to their writings by interlarding a couple of photographs of the district obtained from some of their friends. When it was considered that an award should be made to someone associated with the pastime of cycling Frank was indeed the obvious and only choice.

The 100 Miles

THE 100 miles record continues to attract the aces. Each time the record is broken it would appear that it has been put on the shelf for a long time, awaiting the arrival of some future Goliath to knock a few seconds off of it. Yet it was only in 1950 that Wilmot, of the Midland A.C., broke the record with a ride of 4 hrs. 12 min. 22 secs. Ken Joy has cast envious eyes at this record for some time past, and when he set out to beat Wilmot's time no one thought that he would knock five and a half minutes off of it and return a time of 4 hrs. 6 min. 52 secs. It is not so many years ago that it was thought almost impossible to beat the five-hour mark. The Bath Road Club Limited 100 has always provided opportunity for riders with aspirations to break the record.

It was in 1919 that the B.R. Limited 100 was won by a ride which took over five hours. The redoubtable Frank Southall lopped it down to 4 hrs. 45 min. 27 years ago, and this was beaten by Temme in 1926.

Southall, however, was not content to rest on his past glories, for in 1933 he brought the record to 4 hrs. 30 min. 10 secs. Only two years after that Capell returned a time just under the four and a half hours, this being followed by Mosedale's ride of 4 hrs. 27 min. 23 secs.

There the record stuck until 1950, when Ken Joy knocked another quarter of an hour off of it. Now he has beaten the record again.

Some time in the not too distant future someone will drop it to four hours—and then I wonder what the time for the ride will be when it is put on the shelf as unbeatable?

How Many Cycle Shops

THE Board of Trade has performed a useful service in analysing and classifying England's shops. The foreigner has always somewhat sneeringly regarded us as a nation of shopkeepers. The B.O.T. report shows that there is one shop for every 89 persons in Great Britain. The report also discloses that there are 7,548 cycle and accessory shops in Great Britain, or approximately one to every 15,000 cyclists.

Cycle shops form the smallest total of shops operating in a particular line. There are those who think even now that cycle shops are too few and far between.

What is a Musette?

HAVE you noticed how this term (a misnomer, I suggest) is creeping into cycling terminology? The argument now is whether one should use a saddle bag, a touring bag, or a musette. Consulting my dictionaries I find that a musette is a small oboe, an old French bagpipe, a simple pastoral melody, a rustic dance, a reed stop on an organ, but nowhere can I find the word used as meaning a bag or carrier.

It is obviously a word wrongly used.

The League and the Union

AT the moment of going to press, no word has reached me regarding the result of the meeting between the League and the Union with the Manufacturers Union acting as convener and mediator. I am not

A pretty Sussex village lying below the downs near Goodwood.

SINGLETON

hopeful that very much of use will emerge. The parties to the dispute are too embittered, particularly the two bodies which have been beaten, to reach an amicable settlement. The N.C.U. is already dabbling in massed start. A new era in cycling sport was born ten years ago and events have justified it. I forecast that within 25 years the R.T.T.C., or such other body as supplants it, will be running massed start racing. It is possible that by that time the B.L.R.C. will have absorbed the R.T.T.C.

The N.C.U. is being advised to run its own stage events next year. If it does so, conditions will be really chaotic. Only one body should run massed start on the roads—the League. It has more experience than either of the other bodies, it has pioneered it in this country, and I strongly suspect that the Union interest in these events is artificial. In the event of the Union adopting this unsound advice, and as a result the authorities jump down on all cycling sport, there will be only one body to blame, and that is the Union—a point which must be borne in mind when it comes to attaching blame.

Massed start is at present being run under two codes, and a writer in a contemporary asks how long it will be possible to conduct sport under these conditions. He says that the R.T.T.C. are doing everything that is possible to reverse this policy, and refers to the system of secrecy and hole-and-corner methods adopted by time trialists, who still operate their sport under conditions of fear of the police, as they did 50 years ago. So rigid are the rules that the courses are coded, preliminary announcements of the events are not allowed, and conspicuous costumes are taboo. Regarding this latter, is anyone in any doubt that a man in normal time trial costume is riding in a time trial? It is almost as farcical as the garb of an R.R.A. record breaker which was supposed to detract attention from his activities, but only succeeded in doing the reverse.

I suggest that if time trials were run openly and not furtively, if publicity both before and after were permitted, there would be far more adherents. As it is, League events are attracting large numbers away from time trials and keeping many others just entering the sphere of cycling sport away from them because of the attraction of publicity, and the feeling that the world is looking on.

Time trials engender the thought that the rider is doing something wrong, although strangely enough the police are usually told when an Open event is to take place! Yet the very rules of secrecy were introduced to prevent them knowing. All very stupid. When some of the old men of the movement have died off and younger men are able to have their say, a fresh outlook may be brought to bear. Certainly some change will have to take place in time trialing if it is to survive the onslaught of massed start racing. The young generation of cycling now coming along will not join an R.T.T.C. Club. They will be attracted to massed start by the press announcements, and will not enter the ranks of the time trial list as a result.

The modern generation prefer public spectacle to private pottering and pedalling in a surreptitious manner.

The S.R.R.A.

THE Southern Road Records Association, founded in 1889, grew out of the Southern Road Riding Association, which was formed on January 27th, 1893, on the initiative of J. Blair (Catford C.C.), J. Keen (Redhill Wanderers) and G. H. Smith (Anerley B.C.), in an effort to regulate the sport of road racing in the south, which had fallen into disrepute through lack of any kind of organisation. The S.R.R.A. undertook the checking of claims and the hall-marking of records set up on southern roads at 50 miles, 100 miles, and 12 and 24 hours.

G. H. Smith was the first hon. sec., and as a result of the energetic action of the Association order was soon restored among the southern racing cyclists, and thus having outlived its period of usefulness the Southern Road Riding Association went out of existence in 1898. It was soon found, however, that things were drifting back to the old state of disorganisation, and unscrupulous "record" breakers, mostly trade amateurs out for cheap notoriety, began to appear.

This resulted in the formation of the Southern Road Records Association on August 22nd, 1899, as a result of the efforts of F. Hortop (past president) and the late W. L. Woolveridge, to take up the work of checking and passing records where the Southern Road Riding Association had left off. No less than 176 records have been placed on the books of the Association, which has established an extensive system of checks.

The Association, in its 1952 Handbook, states that it is fully alive to the politics of modern fast road-riding, as is evidenced by their determination to discourage paced record breaking on the roads, the institution of two classes of records, thus preventing competition between amateur and professional, and the elimination of any artificiality in the conditions and courses used, most of the courses being "out-and-home." Such advantages as a favourable wind being limited to half the journey. There have been only five presidents and eight hon. secs. during the 53 years of its existence.

Daily Express "Tour of Britain" Cycle Race

THE *Daily Express* "Tour of Britain," the greatest event ever to be seen on the roads of Britain, will begin on Friday, August 22nd.

This year the race will last for sixteen days, covering 1,600 miles in fourteen stages, two more than last year.

There are two days' rest, one at Blackpool on Wednesday, August 27th, after the fourth stage, and one at Scarborough on Wednesday, September 3rd, at the end of the tenth stage.

The field will include last year's winner, Ian Steel, who won the recent Warsaw-to-Prague Race, and the first twenty riders in the forthcoming Brighton to Glasgow Race. There will also be a strong challenge from foreign and works-entered teams.

Starting from Hastings, Sussex, on August 22nd, the Tour will take riders through England, Wales and Scotland. The finish will be in London on Saturday, September 6th.

Route: Friday, August 22nd, Hastings to Southsea; Saturday, 23rd, Southsea to Weymouth; Sunday, 24th, Weymouth to Weston-super-Mare; Monday, 25th, Cardiff to Aberystwyth; Tuesday, 26th, Aberystwyth to Blackpool; Wednesday, 27th, rest day at Blackpool; Thursday, 28th, Blackpool to Carlisle; Friday, 29th, Carlisle to Glasgow; Saturday, 30th, Glasgow to Dundee; Sunday, 31st, Dundee to Edinburgh; Monday, September 1st, Edinburgh to Newcastle; Tuesday, 2nd, Newcastle to Scarborough; Wednesday, 3rd, rest day at Scarborough; Thursday, 4th, Scarborough to Nottingham; Friday, 5th, Nottingham to Norwich; Saturday, 6th, Norwich to London.

The lovely approach to the old Parish Church, past old houses of many types - some Tudor others early Stuart.

Leicester Square, PENSHURST
A lovely corner of Tudor work in the pretty Kentish village.

Wayside Thoughts

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

Out With Youth

IN mid-April I fulfilled an arrangement of the winter making to take my three grandchildren ranging in age from eight to fourteen on their first cycling tour. Anxious parents pressed me not to take them too far or too fast; they need not have worried on that account, for it was they who waited for me at cross-roads and junctions, greeted me as a slow old coach and generally developed the unkind habit of referring to me as the "old gaffer," which I suppose is the way of school children, free of restrictions or imposed restraint. How delightful it is to be out with youngsters who want to know so much of the countryside, then a bower of blossom loveliness, for it was the end of Easter week and the beginning of the next one we were roaming—flitting around the steeply pitched lanes of a beautiful corner of Worcestershire and Herefordshire. For six nights we made headquarters at a small village beyond Knightwick, in the valley of the Teme, in a fine old manor house looking across the small lake to the hump of the Ankerdyne, and there we slept in comfort and fed on the plain luxury of the countryside. We packed lunches and trickled out for the day; and what days among the woods and over the downs, by fields of daffodils and through cherry orchards foaming in their loveliness of bloom, with hedgerows painted with primrose and violets, and here and there fields gold-spangled with cowslips. The great main roads penetrating this locality are hilly, but their gradients are as nothing to the lanes developed from the farm tracks of old which wriggled over the low banks without any thought of engineering. And it was in these lanes we spent our glorious days, for no one else wanted them except the sparse local traffic.

Making Cyclists

THE only disability we found was the scarcity of "pop" shops where we could buy drink to have with our lunch, and often enough we managed to persuade some good dame to brew the tea we carried along, so that most of our mid-day meals were taken out of doors, with the blue sky above us, and the wonderful sunshine distilling the faint perfume of the cherry. To wander in this fashion, carefree and minus the need to make any destination, is one of the small glories of roaming, and the hills do not matter then, for after the climb there is always the swoop down again, taken by my young companions like wild young partridges with all the gaiety of irresponsibility, while I followed circumspectly with brakes hard on to enjoy the beautiful outlook and the sensation of riding through a bouquet, picking up the tribe at the next cross-roads, consulting the map, and trying to teach them something of the gentle art of direction. I remember the first morning after our arrival at Whitbourne we took one hour to make the four miles to Clifton-on-Teme, but it is four miles of climbing, with half a mile of unrideable slope running through a wood, and the temptation to explore that dim, forested hillside looking out on a sea of bloom was too good to miss. Then in a delightful little café in Clifton it was pop and cakes and ice cream, and the growing wonder in me is how those two boys and a girl could eat and still be so full of activity. The long swoop came on the way to Harpley (a village I had never before visited), followed by the usual long climb to High Lane on the Stourport-Bromyard road, and thence into the Herefordshire town for lunch. And it was hot when we reached the summit of the Downs and found a shady spot to rest and eat apples.

The Envy of Age

THAT evening we partook of an excellent dinner, a trifle of T.V. and billiards, and then early to bed. The sun was a powerful factor the next morning, and I was too heavily clad as well as lazy. It was a long climb to Linely Green, through orchard after orchard of cherry bloom, with the misty outline of the Ankerdyne behind us, and before the mistier one of the Malverns, edge on. It was too hot to toil up those vigorous pitches, so we walked, argued, heard the cuckoo and dozens of larks celebrating the coming of spring in all its glory.

"Loveliest of trees the cherry now
Is hung with bloom along the bough,
And stands about the woodland drive
Wearing white for Eastertide."

Houseman must have passed this way in the days of his youth, and been enchanted, as I was then. But the youngsters—they had found a tiny cottage where there was pop on tap and were thereby made jubilant. Some miles farther a cottager made us a large pot of tea, and on a primrose and jewelled bank we ate ham sandwiches, tomatoes and hard-boiled eggs, after which I believe I went to sleep, what time the youngsters had made a grass track in the field and were fiercely racing round to the bewilderment of the woolly inhabitants. How I envied them such energy. We slipped down to Alfrick and the Teme meadows, and it snowed on us the wind-blown blossom of the cherry. "A great fruit season" said one old farmer to me, "if we don't get any May frost nips; but shall we sell the produce if there's no sugar for preserving?" Yes, we all have our problems, one after another, which is the way of life, and I suppose without them life would lack a certain amount of fighting interest. Then the children saw an ice-cream sign and there was another longish rest before we made our headquarters, and that most refreshing of meals on hot days—tea.

The Enjoyment of Spending

"WE want to go to Malvern" was the chant that greeted me in the morning, so to Malvern we went over the lanes way through Alfrick, Smith End Green and Leigh Sinten, with the Leigh Brook our laughing comrade for part of the way. Leigh, I think, was the first place the children found their favourite refreshment, and they needed it, for the heat was the heat of midsummer, and a long, slow climb to the foot of the hills. Young people, like the ladies, can't enter a town without desiring to buy something, and the smallest of the bunch gallantly informed me I must "lend" him some money—he'd left his at the hotel. I left them to it for nearly an hour and enjoyed a quiet smoke, what time they returned loaded with the most remarkable collection of presents, most of which, from my point of view, were just impossible. Then we went to lunch in a most respectable way with clean hands and faces and appetites on the colossal scale. It was worth the cost to see those scions of the race enjoy the gastronomical exercise, and then want to start right away. And there I rebelled, for a smoke in the shade of a tree with a comfortable bench as a rest and the wide, misty vision of the Severn Valley at my feet was my idea of a happy half-hour—and I had it. We returned by the lovely vale of Suckley, and so hot was the air that we actually paddled in a little brook beyond the village. This, in their estimation, was a most delectable interlude, and I finally had some difficulty in getting them going again and home in time for tea and a bath to follow before an excellent dinner, at which I may add the youngsters helped to carry in and clear the meal—very good practice for them, too.

The End of It

THEN came the week-end spottled with occasional rain, and a visit from doting parents to assure themselves the children were cared for and as clean in hand and ear as they should be. A pleasant interlude, with lunch at the Court and tea at Clifton, and a trifle of time for collecting large bunches of primroses and violets. That night it rained hard, and the morning light was sharp and brittle compared with the misty, hot days we had enjoyed with a sun that burned your skin and made shaving a slightly painful process. The visit of the car party had been the chance for sending our spare raiment home instead of carrying or posting it, and now that the day descended in rain I daren't risk getting the youngsters soaked or I should not be allowed to borrow them again. Just after lunch the deluge did slow to a trickle, so we blew up a tyre and unfurled out macks, but before we could don them the splashing rain was jumping a foot high in the courtyard, so we resorted to billiards of a sort, and T.V. The next day we were due home, a perfect April morning, clear as a crystal with the Malverns seemingly so near you thought you could make them in half an hour. But our route, alas, was in the opposite direction, with the wind behind bringing up little drifts of storm through the fringes of which we scurried to shelter. Our eighteen miles to Droitwich—where we entrained to escape the heavy traffic of the big main roads—were charming, for the air was so vivid that the pictures became pleasantly purposeful etched on the ever-changing skyscape. An idle interval for refreshment, another little ride and then lunch—copious and plentiful—before boarding the train, and so ended a trim and delightful break.

CYCLORAMA

By H. W. ELEY

Brighstone, Isle of Wight. Main street of the village with its old stone church and pretty cottages

Sojourn to the Sea

AUGUST still remains the holiday month, and I suppose that the incidence of school holidays largely dictates when "Mum and Dad" decide to take their vacation. The August-by-the-sea custom is ingrained in the hearts of the British people, and this month will see the usual exodus to Blackpool, and Eastbourne, and Llandudno, and Scarborough, and all those delightful resorts in sunny Devon. Railway stations will be packed, luggage will go astray, innumerable sand-castles will be built . . . only to be washed away by the remorseless tide. And . . . there will be wise folk who will travel to the coasts by cycle! The bike plays its humble but noble part in conveying thousands of happy folk to the sunlit sea, and it is surprising to note the large number of cycles fitted with ingenious carriers for babies. And there are the tandems for father and mother, and the bright and gleaming sports models for hefty boys and girls. It's good to ride to the coast . . . whether the destination be romantic Devon, quiet Suffolk, or the breezy north-east coast, where Whitby and Filey always call me with insistent charm. . . .

Singing in the Rain

I RATHER think that there is a song, sung by "crooners," with this intriguing title . . . but it is not the crooner, with his curious moaning, that I have in mind, but a day when the rain fell in gentle cascades almost the whole of the day . . . a lush July day, when I had hoped to cycle over to Long Ditchbury, and inspect some brown leghorn pullets at Holly Tree Farm. But, despite the rain, I decided on a ride, donned my "weather-wear," saw that my pouch was filled, and set off. How good to feel the rain upon one's face! How good to hear the water gurgling in the ditches! And when I was approaching the village of Nettlecote, I heard the singing in the rain . . . and came up with two cheery cyclists on holiday tour. They did not mind the rain. They revelled in it. Both hailed from industrial Lancashire, and exuded all the geniality of that lovable shire. We rode together for a while, and when we reached the "Ram's Horn" at Thatchford Green, we were of one mind . . . to pack up our riding for a while, and talk over a pot of ale An obliging landlady allowed us to park our bikes in a barn, took our "macs" to dry, and served us with nut-brown ale in pleasing blue and white mugs. I mentioned the singing, and found that my Lancashire friends did a lot of singing at concerts—up in the Wigan district. We talked of Lancashire comedians, of Lancashire soccer teams, of the correct way of serving tripe and onions, and had a happy hour. A chance meeting . . . but how joyous these chance encounters can be, when one loves the open road, and loves his fellow men!

Defeating the "High Fares" Bogy

I TALKED with a cycle dealer recently about his sales of machines, and the general state of business. He had a well-stocked shop in a small Midland town, and reported that business was good. The interesting thing he told me was that several of his sales of new bikes had been to men and women who were starting to cycle to work, in an effort to beat the high transport fares. Of course, cycling to and from one's place of business has been advocated by the advertisers of cycles for many years: it has such obvious advantages. No bothering about train and 'bus times, no tedious waiting in queues, no crowding into stuffy train compartments! My dealer-friend had, wisely, taken advantage of the trend in his town, and had "tied up" with it by means of publicity in his shop. A colourful "streamer," produced quite cheaply by the local ticket-writer, was displayed on his window, and its message was . . . "Cycle to and from work, and *save those high fares.*" The message was repeated inside the shop, by means of a small card on the counter, and the dealer told me that he was arranging for a short series of advertisements in the local paper, on the same theme. Here is enterprise! I feel that it will be rewarded by increased sales!

I Meet a Tricyclist

ONE may ride many miles to-day without ever seeing a tricycle! But the other day, in a quiet suburban road, I met an old and quite venerable gentleman, riding a tricycle which must have been manufactured many years ago. I chatted with him, and found that he was quite an enthusiast for "three wheels." Not always had he trundled about the streets of the little town on a tricycle: he was proud to tell me of cycling exploits in his youthful days, of long touring rides into Scotland, into mid-Wales, and through Devon lanes. Seventy-six was the age of my tricycling friend, and he was a splendid advertisement for the health-giving virtues of wheeling!

A Letter from Hereford

MY mail-bag often contains letters from cyclists who tell me of the delights and scenic beauties of their native shires. Sometimes, I get a letter enthusing about leafy Warwickshire; sometimes the letter paints the charms of Cornwall, and advises me to ride into the magic west, and commune with pixies on the wild Cornish moors, and find enchantment in Cornwall's rocky coast-line. The other day, my "county letter" came from Herefordshire, and told of Hereford Cathedral, that noble pile in red sandstone, with its impressive Norman nave. Told, too, of the fine half-timbered, black-and-white house in Hereford, at High Town. This old structure dates back to 1620, and is one of the works of that famous Herefordshire architect, John Abel, who was given the title of King's Carpenter by Charles the Second, because of his notable work throughout the county. My correspondent mentioned Hereford cider, and (evidently being of an historical turn of mind) went on to tell of the days before the Romans came, and Herefordshire was inhabited by the Silures . . . ancient people who ultimately found a refuge in Wales. Leominster . . . the ancient "Leofric's Minster" . . . came in for mention, and I was reminded that Leofric was that Saxon earl of Mercia who wedded Godiva—the lady whose ride through Coventry is still remembered, and repeated in pageants even to-day. I must go to Herefordshire, and seek out my happy correspondent.

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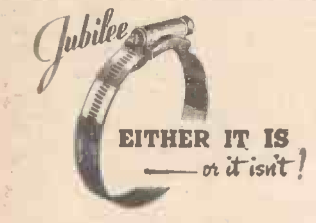

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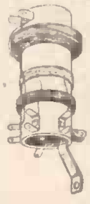

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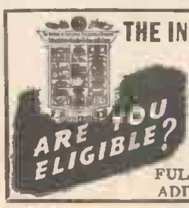

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