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EDITOR : F. J. CAMM

MARCH 1952

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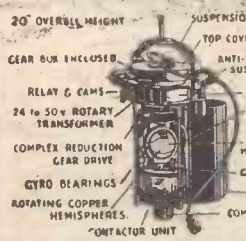

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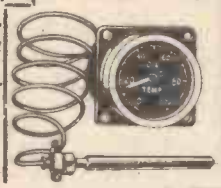

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PRACTICAL MECHANICS

EDITOR F. J. CAMM

MARCH, 1952
VOL. XIX. No. 219

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

FAIR COMMENT By The Editor

Changes in Patent Law

MANY important changes in the patent law are incorporated in the new Act, the first really comprehensive statute relating solely to patents since the Act of 1852, which was responsible for setting up the Patent Office under a commissioner or agent. Before that date an inventor had to visit a number of different departments and pay a number of different fees totalling about £65, and he was personally responsible for carrying his documents from one department to another.

This may seem a lengthy process, but it was far quicker than our present system under which over a year elapsed between the filing and granting of a patent.

The commissioners continued to administer the Patent Office until the passing of the Patents, Design and Trade Marks Act of 1883, when they were replaced by a Comptroller General of Patents, Designs and Trade Marks under the Board of Trade. At that time there was not any search for novelty when a patent was filed, with the inevitable result that several inventors obtained patents for the same invention.

An inventor, it will be seen, did not have to prove novelty and originality as he does to-day. It was not, however, until 1902 that an Act was passed which insisted on the institution of the search for novelty, although the Act did not become operative until January 1st, 1905, when a separate Act dealing with Trade Marks was passed. Two years later came the Patents and Designs Act, 1907, and in 1949 the present Act. There have, of course, been amendments to the previous Acts and these are, to some extent, incorporated in the new Act.

One of the fundamental changes made by the 1949 Act is in connection with the Dating of Patents and the date from which the various time-limits prescribed by the Act are calculated. Previously, the date of the patent was the date of the application, and the time allowed for putting the application in order was 18 months from the date of the application. The dates at which renewal fees became due were calculated from the date of the patent, but the term of the patent, subject to the payment of renewal fee was, for patents granted after August 1st, 1948, 16 years from the date of filing the Complete Specification.

Under the new provisions, the date of filing the Complete Specification is the basic date for all purposes. It is the date of the patent, the date from which the term of the patent is reckoned and which determines the dates on which renewal fees become due. The time allowed for putting an application in order is calculated in all cases from the filing date of the Complete Specification, and the search for novelty extends to Specifications and other documents published before this date. The Provisional Specification is now merely a document of record to be referred to if it is necessary to establish a priority date for any of the claims in the applicant's Complete Specification. Thus, the Complete Specification is not now limited to what is disclosed in the Provisional Specification, and this is an important concession. It saves an inventor from having to apply for permission to amend, and from having to take out secondary patents or patents of addition.

Another important change in patent law concerns prior publication of the invention. Hitherto, the Comptroller could refuse to accept a specification if the invention was wholly described in the prior publication; even though the patent was not turned down on those grounds he could insist upon a paragraph being inserted drawing attention to the prior publication.

Under the new Act the Comptroller is empowered in all cases to refuse to accept a specification unless the objection is avoided to his satisfaction, and the provision for the insertion of a reference is not reclaimed.

There are some new grounds of opposition, such as prior user, want of subject matter or invented merit. Under the original law it was necessary for the inventor to apply for a patent either alone or jointly with another person or persons, even though he had agreed in advance that the patent when granted should be vested in another firm, usually the inventor's employer.

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Perspective view of the finished harmonograph.

Making A Harmonograph

A Machine for Recording the Path of Free-swinging Pendulums

By F. J. CAMM

THE harmonograph is a machine for recording vibration figures produced by swinging pendulums. A large number of devices all based on the same fundamental principle have been designed for this purpose, some making use of three or more pendulums.

The simplest harmonograph, however, is one which makes use of two pendulums, one universally pivoted so that it can swing in any direction; and the other, which carries the stylus arm, pivoted so that it swings in only one direction, and it is this type which is here described.

The machine enables the students of vibration to study the laws governing them, for the result is far more graphic than complicated formulæ, because the swing of a pendulum is of much longer period and larger amplitude than with smaller and more rapid vibration, such as the movements of the particles of a heated body. Apart from this scientific interest, however, the tracing of pendulum curves has a fascination all its own. It is of endless interest to watch the stylus tracing out a figure, and to observe how it is finally developed. It is impossible ever to produce two recordings exactly alike, although some may be very closely akin. The variety and intricacy of the designs produced are infinite, and there is the added pleasure of being able to vary the design by adjustments of the position of the pendulum weights, the height of the recording table above the point of suspension, raising one pendulum, lowering the other, and vice versa.

The illustration shows the simplicity of the construction. A table supported on three legs and having holes cut in to clear the pendulum rods is the basis of the construction. The rest consists of a gimbal arrangement carrying the table, and another pendulum carrying the arm into which the stylus is fixed.

For the stylus I used a ball-point pen refill. This has a left-hand thread, and if the hole in the wooden arm is carefully drilled the refill may be screwed in and will remain firmly fixed. The top of the table should preferably be covered with glass, otherwise the ball end of the pen will follow

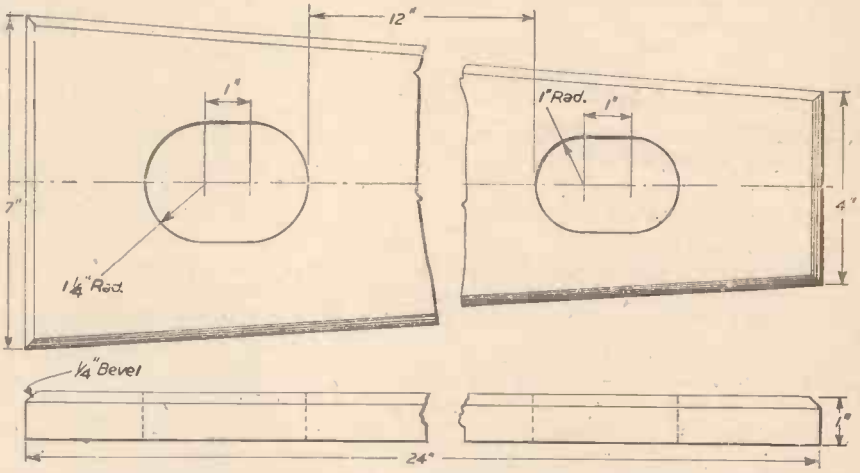


Fig. 2.—Plan of the stand top showing the position of the holes for taking the pendulum rods.

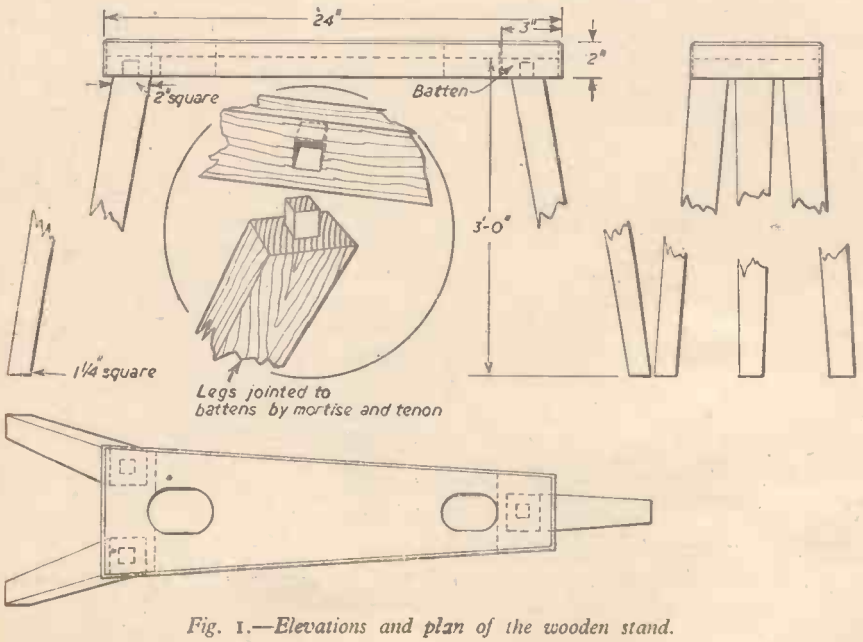


Fig. 1.—Elevations and plan of the wooden stand.

the grain of the wood and destroy the continuity of the lines.

Another method of recording is to smoke a piece of glass which, after the tracing is complete, may be used as an ordinary photographic negative. In this case the ball pen refill can be replaced by a piece of rod having a gramophone needle soldered into one end. The designs reproduced in this article were made in that way. Further designs appear on the cover of this issue.

The Gimbal

It will be seen from Fig. 3 that this consists of two parts, the first a large washer, and the second a collared disc. This latter is secured to the pendulum by means of a grub screw. Those readers who do not possess a lathe will be able to make this by soldering a collar into the centre of a brass disc and drilling a ¼in. hole to suit the 3ft. pendulum rod. Into this disc are soldered two gramophone needles. Fig. 3 shows the details of the large washer. It will be seen that this has to be recessed and grooved in a particular way with alternating grooves and recesses above and below to accommodate the needle points on the upper disc, and the

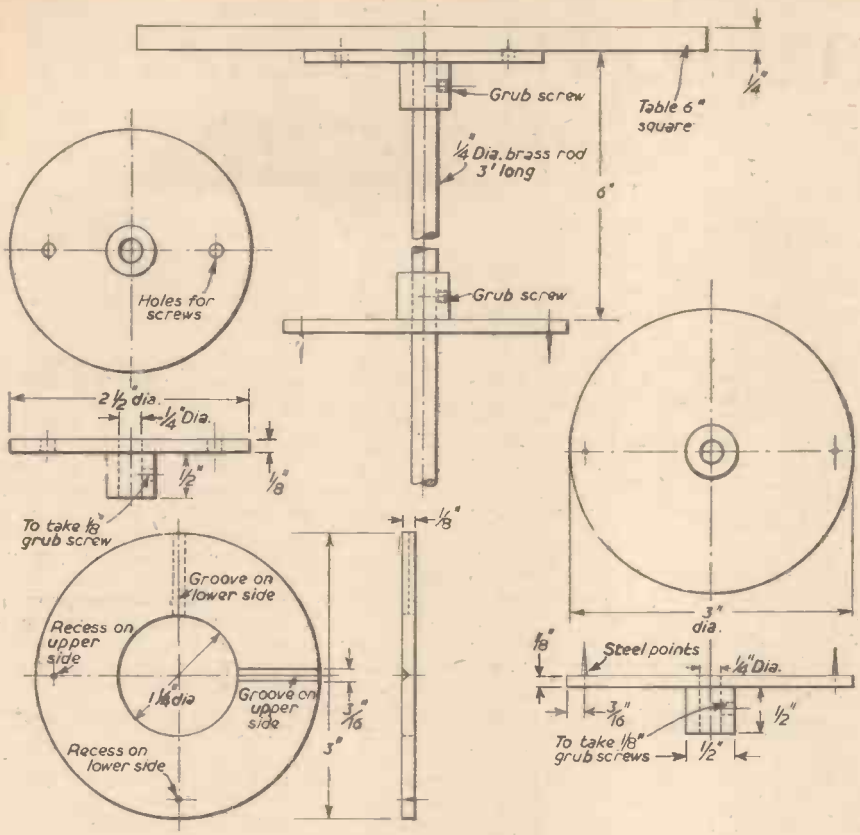
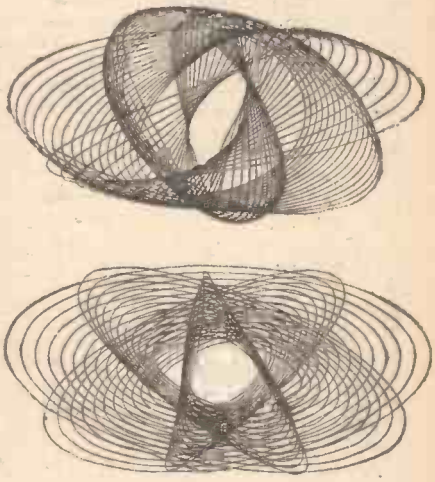


Fig. 3.—Details of the table, pendulum rod and gimbal.



Two more examples of harmonograph designs.

needle points fixed to small plates screwed to the table top. The recesses can be cut with the point of a ⅛in. drill. The grooves should be filed at an angle which will permit the maximum swing of the pendulum without the gramophone needle fouling the sides of them. The drawings clearly show the construction of this item.

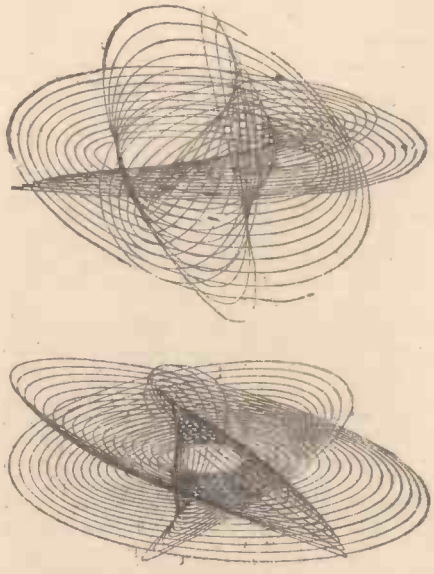
The pendulum weights can be made by filling tins with molten lead, and drilling a hole down to suit the pendulum rod. The pendulum weights are adjustable up and down the rods by means of locking screws.

The Recording Pendulum.

The pivot points for this are soldered into a brass bar drilled to take the pendulum rod and is fastened to the rod with a locking screw. At the top of this rod is fixed a wooden beam fastened by a tape hinge to another piece of wood of equivalent length and section, to the top of which is screwed the wooden arm carrying the stylus. In the inert position the stylus is at the exact geometrical centre of the recording board. The latter is attached, of course, to the top of the front pendulum. The rear pendulum pivots on two plates with grooves in them, and which are fixed one on each side of the rear hole in the table top.

It will thus be seen that the height of the recording table, the height of the pendulum weights, the height of the hinged arm, and the degree of swing of the pendulums are all variable, enabling an infinite variety of designs to be produced. The careful student will keep recordings of the positions, and endeavour to produce two alike.

A useful experiment after one design has been completed is to change the stylus for one containing a different coloured ink such as red, and superimposing a fresh design over the first. In this way by using a variety of colours the most complicated and fascinating harmonographs can be produced. Needless to say, the very smoothest of papers should be used to reduce the friction between the stylus and the paper. The lower the friction the longer will the pendulum swing, and the finer will be the design.



Two examples of designs produced with the harmonograph.

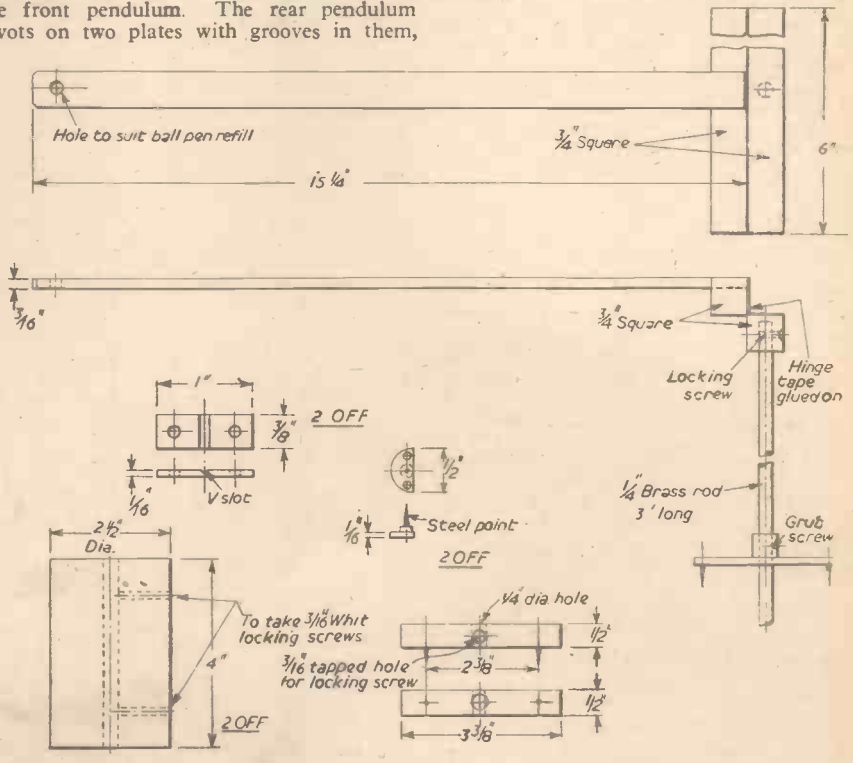


Fig. 4.—Plan and side view of the hinged stylus arm and details of one of the pendulum weights.

PRACTICAL STEREO-PHOTOGRAPHY

How to Take Stereograms with a Single-lens Camera

By S. H. S. MOXLY

THERE is no reason why a photographer should wait for a two-lens camera to enjoy the magic of stereoscopy. The ordinary one-lens camera can be used to make a beginning, indeed, there are those who never use anything else. Moreover, the underlying reasons of stereoscopy will be more quickly understood this way.

A stereoscopic camera has two lenses spaced apart the same distance as the human eyes, and takes two pictures that represent the views seen by the two eyes separately. These two views are slightly different, as can be seen with exaggerated effect should the hand be held outstretched at arm's length before one, and the view looked at through the fingers, which form a part of it. The two prints of a stereoscopic pair viewed in the stereoscope combine to give an illusion of natural solidity, roundness and relief.

To use a one-lens camera to make stereograms two negatives must be made separately, the camera being moved 2½in. or 65 mm. sideways between the exposures. To make a slide (as stereograms are often called for short) two identical prints from the same negative will not do—in the stereoscope they look quite ordinary.

Suitable Subjects

Of course, with two exposures made one after the other, moving subjects are barred, but plenty remain that do not show movement, including interiors, architecture, landscapes, garden scenes and all table-top subjects. Much good portraiture has been done in this way, the sitter usually getting most of the credit and deserving it.

With interiors there is a painless way of starting. With these, in ordinary photography, it is very usual to make two exposures, one four times the other, to provide against errors. As every photographer knows, the resulting negatives will almost invariably give identical prints. If the camera is shifted about 2½in. sideways between the exposures by sliding camera, tripod and all, the prints will make a stereoscopic pair.

Camera-supporting Tray

A simple fitting is shown in Fig. 1, that makes sliding the camera sideways between exposures easy. It is a tray that clamps to the tripod head with the ordinary screw. The upturned rim acts as a guide for keeping the camera straight, prevents minor accidents, and acts as a measure of lens separation, having a scale of millimetres along the back edge. This sort of tray can be elaborated by adding holes or slots to take the camera tripod screw, in which case only one side of the rim is needed, to keep the camera straight and provide a scale.

A stereoscope is necessary for viewing the slides, except for those gifted people who can teach themselves to view slides with the naked eyes. Stereoscopes are not easy to find in shops, either new or second-hand, but they can be put together at home without expense or difficulty. Precise details for their construction are not given here, for the final form that such an article is to take depends on the material available, and the skill of the worker.

Simple Stereoscope

The main features of a stereoscope are shown in Fig. 2. In its simplest form, a stereoscope consists of the lens panel alone, the slide being held in the hand, but the manipulation of this needs experience. A beginner is advised to attempt something more ambitious, and construct the apparatus as shown in Fig. 2. For a "mock up" the lenses can be stuck to the panel with sticky plaster; the panel itself, of three-ply or cardboard, can be nailed to the two strips that form a baseboard. The slide carrier can, crudely, be of three-ply with elastic bands to hold the slides at their ends. It is not strictly necessary to fit the carrier so that it slides on the baseboard for focusing, but it is preferable, especially if the lenses are of six inches focus, or more.

Now about measurements: the lenses can be two magnifying glasses from a stationer's, as near the focus of the camera lenses as possible. They will almost certainly be of longer focus, but no matter, for lenses of

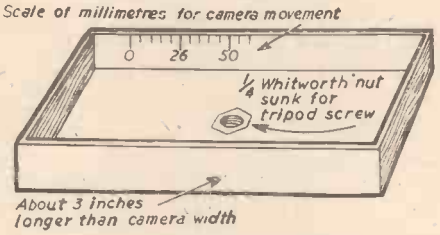


Fig. 1.—Camera-supporting tray.

double focus give pleasurable viewing, if not scientific exactitude. The distance apart to mount the lenses, centre to centre, is again 65 mm., or 2½in., the same as the normal taking separation, and mounting separation, too, as mentioned later.

The distance from lens panel to carrier will be such as to give a comfortable focus, and with 3½in. lenses is often fixed. The size of mount the carrier is to carry is for the present not strictly standardised. The stereoscopic societies use a mount 7 by 3½in., but there are several other sizes that have been standardised since their foundation, and one of these, 6 by 13 cm. is recommended as being small enough for easy stowage and large enough to accommodate any pair of prints properly mounted at 65 mm. centres. A slide 7 by 13 cm., an uncommon standard, is also used and the same carrier can take both.

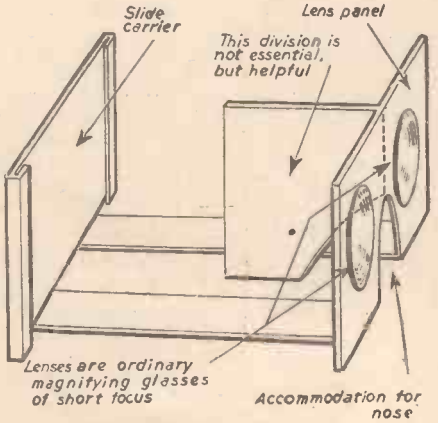


Fig. 2.—Perspective view of a simple stereoscope.

Mounting the Prints

As to mounting the prints, it is as well not to be too fastidious at first; perfection can be left for later. The first thing that is wanted is to know which is the right-eye print and which the left-eye print. If in any doubt it can be settled by looking at the pair loosely assembled under the stereoscope: if the prints are the wrong way round they will not give the natural relief that is expected. When identified, mark the prints R and L on the back. That having been settled, trim the two prints to exactly the same size, with their levels the same, i.e., so that the top and bottom edges cut across objects at the same height. Then mount the prints, preferably on a dark mount, with their distance points 65 mm. apart (foreground objects will be a few millimetres closer), and, of course, on the same level. The distance apart is not too critical; an error of 5 mm. will not matter in a first attempt.

Window Effect

Viewing such a slide in the stereoscope it will be found that the edges of the prints are themselves stereoscopic, and that they combine (or "fuse" as the steroscopist has it) to form a frame around the view at a definite distance of its own; this is called "window effect." If the window happens to come between the view and the viewer it will be in the usual place for a window, and all is satisfactory, but if it appears behind the view or at any intermediate distance it will seem strange. In this last case it is possible to adjust the window for distance (supposing the prints not to be stuck down) by trimming off, a millimetre at a time, from both inside edges to move the window away, and from both outside edges to bring the window nearer. In the case of table-tops, they sometimes look very well if the window is behind.

About the separation to use with close-ups: should no part of the view be closer than 10ft., the normal separation of 65 mm. is correct; otherwise use a lens separation equal to *one fiftieth* part of the distance of the nearest object. Thus a flower growing in a bed two feet away should be taken with a separation of half an inch.

Softer Negatives

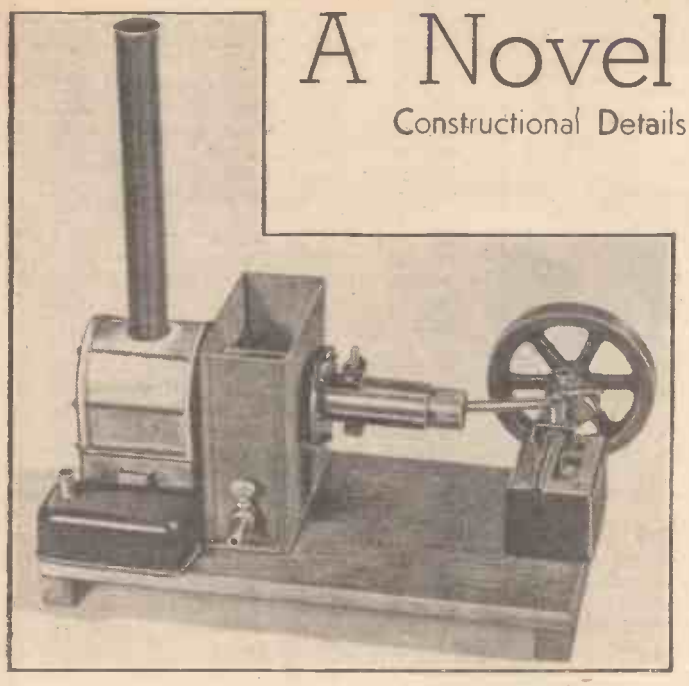
Stereoscopy demands a somewhat softer negative than ordinary photography. An ordinary photograph relies mainly on shadows for its relief, and so needs strong, dark shadows to give "snap and sparkle." A stereogram gets its relief almost entirely from the fusing of the two different prints, and unless the shadows, as well as the highlights, have good detail, they will fuse as blank masses and show as planes. A general rule for stereograms is to allow a double exposure three quarters development time, and a grade softer paper. Experts are also agreed that P.O.P. is much better for stereograms than bromide paper, having a longer range of tones and giving more detail in the extremes of light and shade.

Two warnings: always get a separation of as near to 65 mm. as possible in mounting (to avoid eye-strain); and always bear in mind that it is what you see in the stereoscope that matters, and not the slide held in the hand.

A Novel Hot-air Engine

Constructional Details of an Experimental Double-acting Model

By A. D. MANSON



The completed experimental hot-air engine.

THE hot-air engine here described works on a new principle devised by the writer. As will be seen by the sketch (Fig. 1) it is simple and, therefore, should not be difficult for the average mechanic to construct.

The illustration shows the piston, which is tubular, to be directly connected to the displacer so that they move together as one piece.

The working cycle is as follows: starting on the out stroke. As the piston moves out the cold air contained in the cold portion of the displacer chamber A is displaced to the hot end and the pressure gradually rises, so driving the piston. At the end of the out stroke the piston comes to a position where the two ports X register, and therefore all the air above atmospheric pressure escapes from the hot end. On the return stroke the small quantity of hot-air remaining in the hot end of the displacer chamber is displaced to the cold end and cooled, therefore, a partial vacuum is formed, which increases as the stroke continues and the piston is thus forced in by the pressure of the atmosphere until near the end of the stroke, when the air-inlet port registers with that of the working cylinder. Air now rushes in to fill the vacuum and the cycle of operations is thus completed.

The following are the advantages for this type of hot-air engine: the heated air during the out stroke remains in the hot end till the end of the stroke and it is discharged directly from the hot end to the atmosphere and thus heating of the cold end is avoided to some extent. The incoming air is always at atmospheric temperature and pressure.

The engine is double-acting and can be reversed. There are few moving parts, no additional mechanism being required to drive the displacer.

Constructional Details

Starting with the displacer chamber, this is made from a piece of mild steel tube, or it can be constructed from sheet metal not more than 1/32in. thick. One end is closed by a piece which is cut a little larger than the diameter of the chamber. It is then beaten out hollow or dished, as in Fig. 1, and fitted in the end of the tube, being secured air tight by brazing or welding.

A ring made from ¼in. square iron rod, or cut from plate, is fitted on the outside of the other end. It can be brazed on or soft soldered. The chamber should then be placed in the lathe and the ring trued up, as it has to carry the working cylinder.

Working Cylinder

This cylinder is made from a piece of mild steel pipe, the finished size being 1⅛in. bore by 3⅛in. long. The outside should be turned bright, and the step to receive the flange should be cut for a distance of 3/16in. at one end. Before smoothing out the bore the air-inlet ports and the exhaust port should be drilled, care being taken to ensure their correct positions.

The cylinder flange is made from a piece of mild steel plate 3/16in. thick. It should be turned, and a spigot of 1/32in. deep made on the inside to fit the mouth of the displacer chamber. A light groove should be cut in the other side to mark the pitch circle of the eight fixing screws, the holes for which should now be drilled. The flange can now be used as a jig to drill the tapping holes in the chamber flange ring. The flange can now be pressed or lightly driven on to the cylinder and solder should afterwards be applied all round the joint. A thick paper gasket rubbed with oil and graphite will make an air-tight joint when the cylinder and chamber are finally united together.

The Displacer

The displacer can be made from a piece of tube or from sheet metal about 1/32in. thick. The outside diameter should be 1/16in. less than the inside diameter of the chamber. One end is dished like that of the chamber, while the other is about ⅛in. thick and flat. All joints on this part should be brazed or welded and air tight. A hole should be drilled in each end at its centre to take the ¼in. bore exhaust pipe, C.

The Piston

The piston, which is in the form of a tube, can be brass or other anti-friction metal. It should be 4½in. long by 1⅛in. outside diameter and a fairly tight fit in the cylinder. A flange 3/16in. thick, having four equally pitched countersunk holes for the ⅛in. screws that unite it to the displacer, is fitted at one end. It can be brazed or soldered to the piston and afterwards this part should be trued in the lathe and the outside diameter of the flange made equal to that of the displacer.

There is also a disc soldered in the piston tube flush with the flange at this end. It is about ⅛in. thick and is bored at its centre to take that part of the exhaust pipe which is fitted inside the piston. The air-inlet pipe should then be made and fitted; care is necessary to fit them in their correct positions. (See Fig. 1.)

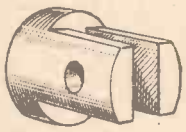


Fig. 2.—Fitting for taking the small end of connecting rod.

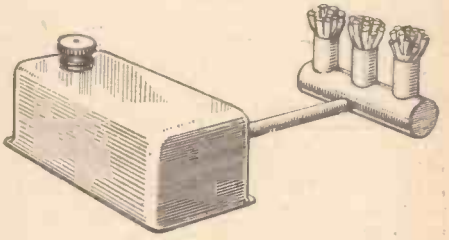


Fig. 4.—The methylated spirit lamp.

A short piece of brass rod (Fig. 2) having a slot to take the small end of the connecting rod has also to be fitted and soldered inside the piston. The hole for the gudgeon pin is then drilled square through the piston tube and the piece of brass, which thus forms the bearing for the gudgeon pin.

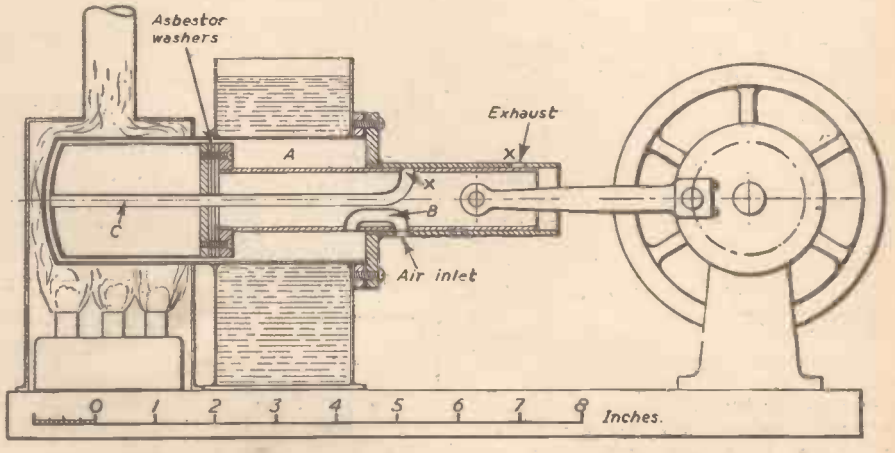


Fig. 1.—This sectional view of the hot-air engine shows the simplicity of the design.

The gudgeon pin is held in position by a short screw passing through the upper side of the top end of the connecting rod and for a short distance into the pin itself. A hole in the piston tube allows the screw to be fitted.

Having got the piston to this stage it should now be made a good sliding fit inside the cylinder by lapping, using metal polish as a grinding medium.

Two or three asbestos washers are fitted between the piston flange and the displacer to prevent, as far as possible, heat getting to the cold end. By varying the number of the above-mentioned washers the length of the displacer can be finally adjusted.

When assembled the piston should move freely the full stroke of the engine, and allowing 1/16in. for clearance; the displacer should not rub on the inside of the displacer chamber.

The exhaust should be on top and the air-inlet port on the underside of the cylinder. The connecting rod does not need to be heavy. A disc or a double-web crank can be used. The crankshaft may be 5/16in. diameter and the flywheel about 5in. diameter.

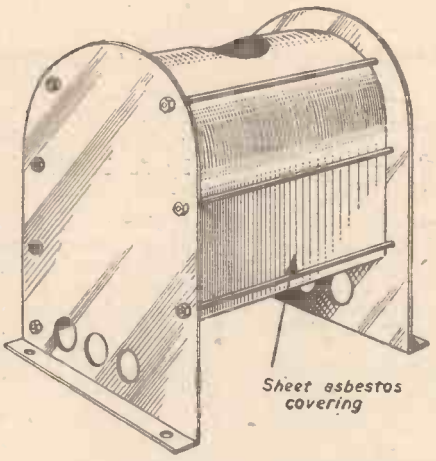


Fig. 3.—Perspective view of the fire-box.

Cooling Water Tank

This tank can be constructed of galvanised iron. It will have to be soldered to the displacer chamber, and the bottom, which should be 1/16in. thick, will have to project ½in. at each side to take the holding-down screws, as the thrust and pull of the piston is taken on this part.

The fire-box (Fig. 3) is made of 1/32in. galvanised iron. Long studs pass through the ends and hold the centre part, which carries the funnel, in place. It can be lined inside the ends and the centre part covered with asbestos sheet to conserve the heat.

Three air holes, ½in. diameter, are drilled on each side at the bottom of the ends of the fire-box. A small fire door is fitted at one side to allow the lamp to be removed and to prevent too much cold air entering here.

The lamp for burning methylated spirit is provided with a rectangular reservoir, having a short length of ½in. tubing soldered at the bottom, on the other end of which is another piece of tubing fitted with three ⅜in. diameter burners (Fig. 4).

The wicks are made of asbestos cord twisted together. The lamp should be placed centrally under the hot end of the displacer chamber. The base-board may be of oak or other hardwood ½in. or ⅝in. thick. It should have two endpieces screwed on to prevent warping, as shown in the photograph of the completed model.

An Electric Alarm

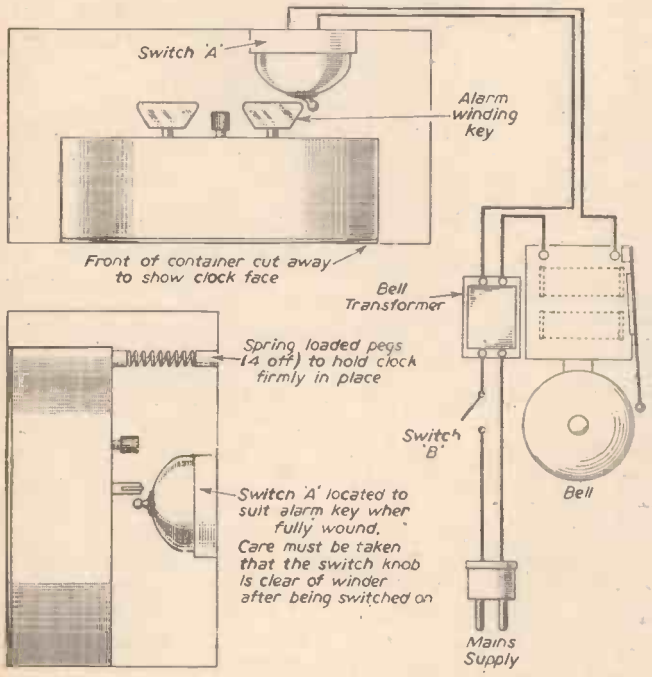
Details of a Simple Conversion

By C. HEYES

THESE notes concern the modification of an alarm clock, so that when the alarm is set to go off at a pre-set time, a circuit is completed and a bell connected to the mains commences to ring, and will continue to do so until the sleeper awakes and switches it off.

I have seen one or two designs that will do the above, but each one has certain disadvantages, these being—(1) that the clock is permanently disfigured through the fixing of contacts to the dial, and (2) that the alarm can only be set for one particular time.

The advantages of my arrangement are—(1) that the alarm can be set for any time in the twelve-hour cycle at a moment's notice, and (2) that there is no disfigurement or damage to the clock itself. Therefore, the attachment can be disposed of if and when it becomes necessary, and the clock then reverts to its normal operation.



Side elevation, and general arrangement of an electric alarm device.

Operation

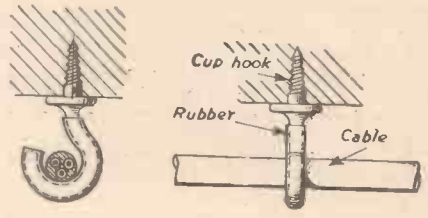
The sketches are self-explanatory and show the principle quite clearly, the sequence of the operations being that the back of the container is opened, the clock removed and wound up, the alarm is set to the required time, and the clock is replaced. The switch "A" is put in the off position, and the back is closed. The switch "B" by the mains plug is switched on. When the alarm is set off, the winding key turns and knocks on the switch. This completes the circuit and the bell rings.

Bell Circuit

I have not attempted to set out a design for the container as so many alarm clocks are of different sizes and shapes. The bell circuit can be operated either from the mains, via a transformer, or from batteries, in which case the container would be made larger and self-contained.

Temporary Fixing for Electric Wiring

WHEN putting up temporary electric wiring which is expected to remain in position for some time, the following fixing will provide a secure and efficient job. The idea is based on the old-fashioned wireless screw-eye insulator. A quantity of large cup hooks is obtained and a short piece of soft rubber tube is slid on to the hooks, as shown. The hooks are then screwed into any convenient place at frequent intervals along the path of the wiring, and the cable is then run out and slipped on to the hooks. This method does away with the usual practice of taping temporary wires in position and produces a very neat effect in a short space of time.—R. G. ILSTON.



Using an insulated hook for temporary electric wiring.

Hollow- or Slush-casting

Alloys Used in Casting : Types of Mould : Slush-casting Bench : Slushing Fixture : Cothias Process

By H. K. BARTON

ALTHOUGH the diecasting of metals, by both pressure and gravity methods, offers great scope to the designer, it is not entirely free from limitations. The most notable of these is the restrictions that it imposes on the form and nature of cores, as compared with other foundry processes. In diecastings the largest cross-section of a core must necessarily occur at its intersection with the cavity, i.e., no cored hole can be larger internally than it is at its mouth. It is true that by the use of "knockouts" and collapsible cores this limitation may, in part, be circumvented; this invariably entails a sharp increase in initial tool cost. Indeed, all dies embodying moving cores are disproportionately higher in cost than equivalent two-part dies, since not only the cores, but the mechanism for actuating them, demand much time on the fitting bench to assure correct operation and smooth running.

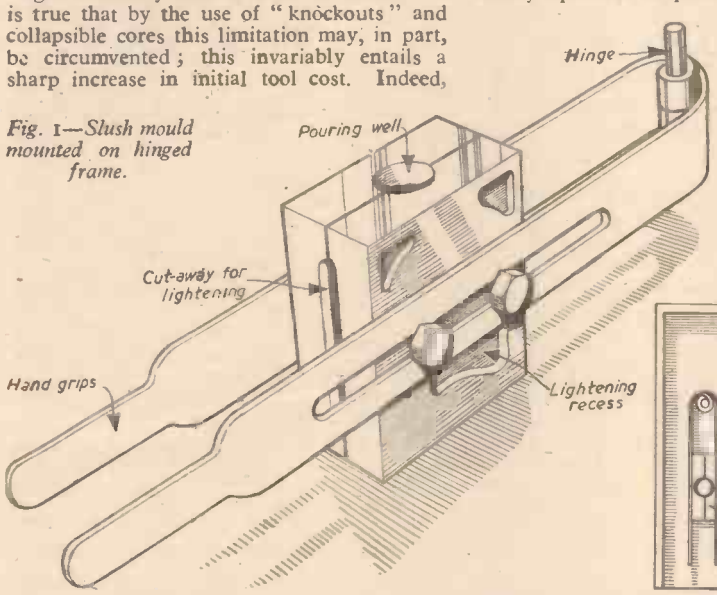


Fig. 1—Slush mould mounted on hinged frame.

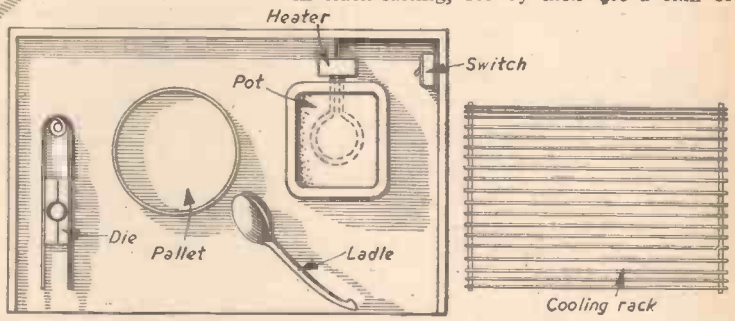


Fig. 2 (Below)—Layout of bench for slush-casting.

There are many types of article, particularly in the field of toys and novelties, which though of complex form and intricately cored, are of too transient an appeal to justify the laying-out of large sums for tools. Normally, great strength is not expected of such articles; where this is so it is often advantageous to produce them by the slush-casting process, using metals of low-melting point instead of the commercial zinc or aluminium alloys utilised in diecasting proper. Slush-casting differs from diecasting in that the internal shape may be just as intricate as the external, but is entirely lacking in precision since it is not formed against any constraining surface.

Simple Process

In theory at least, slush-casting is a very simple process; molten metal is ladled into a mould shaped internally to the desired outward form of the article and, after a judicious pause, the mould is inverted and the metal tipped out again. Some of it, naturally, has chilled on the cool mould wall; if the casting temperature of the metal, the mould temperature and the duration of the pause for cooling have all been correctly assessed, the skin of metal left in the mould ranges from 1/32in. to 3/32in. thick, is complete and unbroken, and forms a perfect replica of the finest details of the cavity. If the rather critical conditions have varied appreciably from the optimum, it is more likely that thin sections of the casting will have filled up solid, the skin of thick section deep in the cavity will have fallen away from the mould surface, and parts of the casting near the gate will probably have slushed out together with the surplus metal.

Slush-casting, in fact, is a craft in a way that diecasting is not; it depends almost wholly upon the acquisition through experience of a successful technique, rather than upon strict attention to the control of a limited number of variables as in the operation of a machine. In slush-casting, should the metal in the pot become too hot, the operator allows it to cool a second or so in the ladle before pouring; as the temperature of the mould varies the pause for cooling is changed in compensation. The technique of slush-casting, accordingly, can only be acquired by practice; here it is only possible to describe the various methods adopted and the type of equipment required.

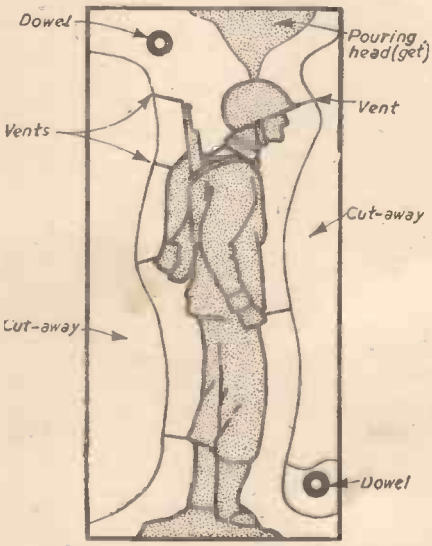


Fig. 3—Details of a typical toy-mould.

Use of Suitable Alloy

The first essential to the successful production of slush-casting is the use of a suitable alloy, and it must necessarily be one with a wide freezing range between liquidus and solidus. This follows from the manner in which a metal solidifies in contact with a cool surface. At the instant of contact a thin skin of fine grain is formed, and on the inside of this is built up more slowly a network of needle-shaped and branching crystals, very like frost patterns on a window. In an alloy of small freezing range the formation of this dendritic network is closely followed by the onset of complete solidification, but where the freezing range is wide the network can become locked and ramified whilst the bulk of the metal still remains fluid. It is this property that commends such alloys for use in slush-casting, for by their use a skin of sufficient rigidity to support itself is formed at the cavity surface, while the internal portions of the charge are still fluid enough to be slushed out.

Lead-antimony-tin Alloys

Lead-antimony-tin alloys are used almost exclusively, and though only when slush-casting is carried out on a large commercial scale is any attempt made to hold to a fixed specification, the alloys most often used are similar in composition to printers' type metal. Indeed, discarded metal type is often used by small-scale operators. The best for the purpose is founders' type, which contains more than 10 per cent. of tin and around 24 per cent. antimony (remainder lead) but this is now seldom obtainable. Most of the loose type (separate letters) now in circulation is "Monotype," and has a lower tin and antimony content. Additions of block tin and, occasionally, antimony are necessary until a melt is arrived at which does not fall away from the cavity surface when the mould is inverted. The occurrence of dull "orange-peel" patches in the hotter parts of the mould usually indicates that more antimony is needed.

Book-form Slush Mould

The simplest type of slush mould is that of book form, which can be used whenever the cavity is shallow enough. In deep cavities the swinging apart (instead of a straight pull) sometimes causes distortion of the casting. In order to simplify mould construction it

is desirable not to hinge the actual blocks, but to bolt them to a hinged frame as indicated in Fig. 1. The frame members are slotted, both to accommodate moulds of different size and to allow them to be located at different distances from the hinge. If near the hinge

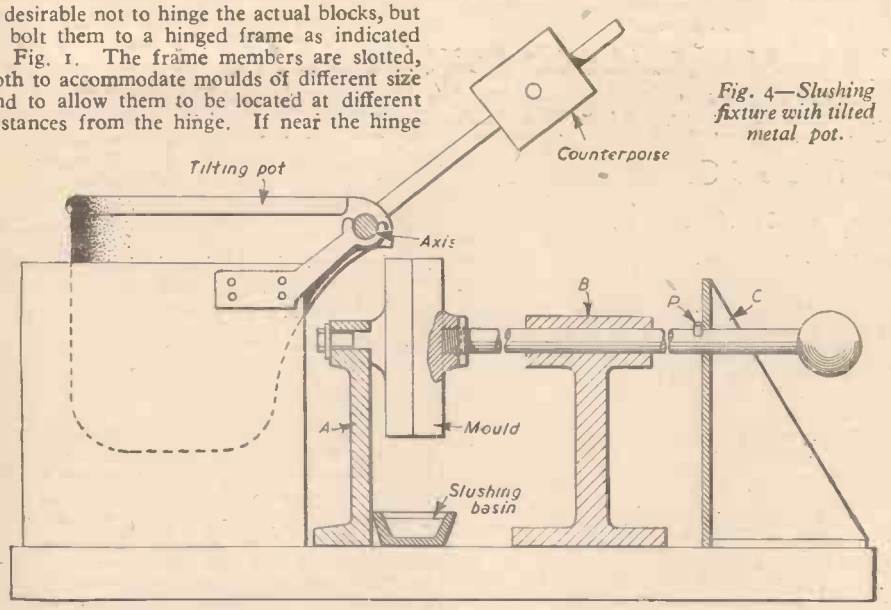


Fig. 4—Slushing fixture with tilted metal pot.

the clamping pressure is greater, but further away a nearer approach to a straight draw is obtained.

Slush-casting Bench

A convenient layout for a slush-casting bench is shown in Fig. 2; the melting pot, fitted with an immersion-type heating coil, is at the right. Adjacent to it is a cast-iron pallet—a heavy, shallow dish—into which the slushings are tipped. The melting pot is sunk into a cutaway portion of the sheet-metal bench with its rim resting on a thick asbestos gasket. Beneath the bench the pot is surrounded by heavy lagging. To the right of the bench is a rack upon which the castings are placed to cool. The operator dips metal from the pot with a small ladle, steadily fills up the closed mould, holding the clamping frame together with his left hand, pours any surplus metal left in the ladle back into the pot, and almost simultaneously inverts the mould over the pallet, slushing out the surplus metal and allowing the edge of the mould to tap lightly on the side of the pallet. The mould is now opened with both hands and the casting removed, either with a pair of tweezers or by means of an awl carefully inserted into the hollow pip at the gate. Gates for slush-moulds differ considerably from those used in either gravity or pressure diecasting, the usual form being a more or less hemispherical cup with a short channel of pencil-lead diameter joining it to the cavity.

Typical Mould

A typical mould is shown in Fig. 3. The vents are V-shaped slots cut with a hack-saw held obliquely. Either aluminium or bronze may be used for moulds; the former is particularly suitable for book moulds on account of its lightness, but bronze moulds hold fine detail better. Either can be cast to form, needing only to have the joint faces filed to a match and the cavity surfaces polished.

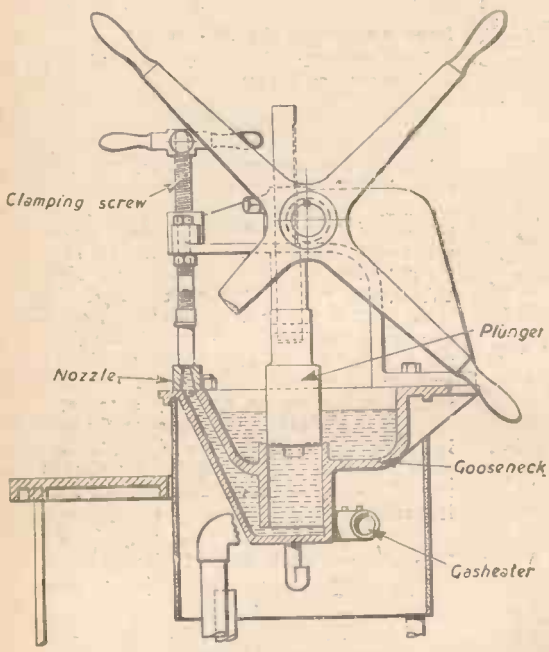
The method of slush-casting described above is applicable primarily to small articles, but quite large statuary and other similar work can be produced by the process. If, however, the weight of the mould when filled with metal exceeds three or four pounds, it is necessary for ease of working to provide non-manual means of supporting and tipping.

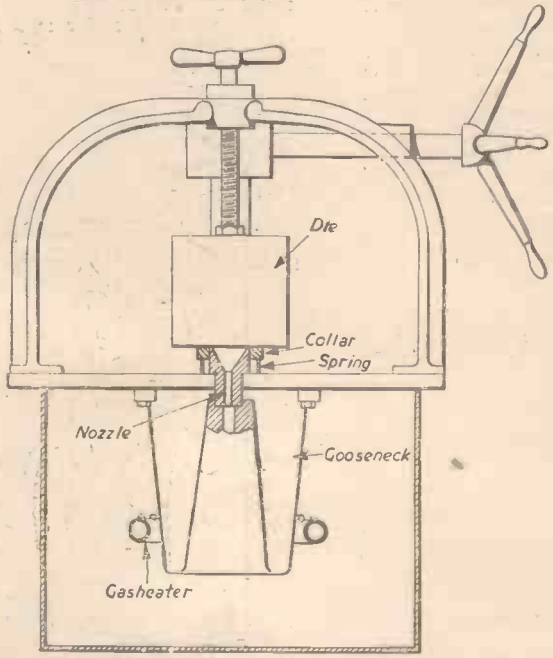
Slushing Fixture

A fixture—it can hardly be termed a machine—for this purpose is illustrated in Fig. 4. It consists of a fabricated base with a sheet-metal furnace housing on the left. The metal-pot is fitted with brackets so as to be lip-tilting, the nearer axle being fitted with a handwheel and the further one with a projecting crank carrying an adjustable counterpoise. Immediately in front of the metal pot (i.e., to the right in the figure) is a bracket *A* carrying the fixed mould member. This is pivotally mounted so that it can be freely rotated in a vertical plane. The moving member is similarly attached to a steel rod, which can both slide and rotate in the fixed mounting *B*. At the rear of *B* is a thinner angle-plate *C*, strutted at the sides, with a keyhole opening through which the rod passes. The end of the rod is fitted with a plastic knob. With this arrangement the moving member is brought forward until it meets and registers with the fixed one, the two then being rotated until the pouring-cup of the mould is immediately below the lip of the pot. The latter is now tipped forward to fill the mould. After the appropriate pause, the knob on the left is swung to invert the mould, the slushed metal falling into a miniature ingot mould placed beneath. Further rotation of the mould now brings a projecting peg *P* into line with the keyhole slot, and so allows the moving member to be drawn back. The purpose of this peg is, of course, to prevent the mould members from coming apart during pouring.

Hand-operated Machine

In addition to special fixtures of the same general nature as that discussed above—which can be taken as typical—some use has been made of true diecasting machines for slush-casting. These have been of hand-operated, upflow type, the use of an upflow machine having the advantage that it obviates the necessity for inverting the mould. The old Dorman machines (Fig. 5), once much used in railway maintenance shops for the castings of bearings are admirable for the purpose. (*Continued on page 198*)





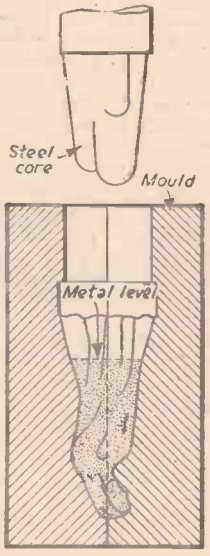


Fig. 5 (Left)—Sectional view of Dorman hand-operated plunger type machine. Fig. 6 (Centre).—The machine as modified for slush-casting. Fig. 7 (Right).—The Cothias method of coring hollow articles after pouring.

How Police Drivers are Trained

Afterthoughts on a Visit by the House of Lords Motor Club to the Police Driving School at Hendon

By THE MARQUIS OF DONEGALL

Lord Waleran, secretary of the House of Lords Motor Club, in full pursuit of the "bandit car" on the skid patch at the Police Driving School, Hendon. The surface is a mixture of oil and water and marks are deducted for knocking these strategically placed quoits, which are actually old motor tyres.

WHAT the Police Driving School actually got on this extremely interesting visit were twelve peers—road-racing drivers and/or pilots, plus a few quite able-bodied and knowledgeable types.

The Metropolitan Police Driving School is adjacent to the Hendon Police College. All the premises were formerly part of Graham White's Airport Country Club.

They consist of a large building of class-rooms and canteen, a garage-workshop, a private test-road and a skid-patch about the size of the Round Pond on Hampstead Heath.

The Police Driving School was formed on January 1st, 1935, under the auspices of Captain Minchin, formerly of the Royal Artillery and Royal Tank Corps. At that time, starting in a small way, the school turned out 42 trained police drivers every five weeks. To-day the intake is 100 a month, and the rate of police accidents has fallen from one in 8,000 in 1934 to one in 68,000 in 1950. One in ten of 999 calls results in an arrest; the ordinary bus accident rate is one-and-a-half in 10,000.

The greatest cause of accidents is lack of concentration—having words with the wife or girl friend being a recurrent contributory circumstance. Conversely, there is nothing to show that listening to the radio plays any part in the accident graph, although tuning-in would strike the citizen as an obvious source of accidents, to be compared with the occasional coughing or sneezing fit that sometimes flurries a driver. However, statistics, which as we all know can lie, do not support the citizen's view.

The Raw Recruit

The system of intake at the Police Motor School is somewhat complicated, and I do not think that we need to go into it in great detail. Let us concentrate rather on P.C. 50 who is sent to the school. He immediately comes under the wing of Chief Superintendent W. M. Taylor and Chief Inspector Walker.

P.C. 50, they hope, has never in his life attempted to take a motor-car to pieces let alone drive one. They like to get them raw on the principle that it is far easier to instil good habits than break bad ones. He spends one week in the classrooms learning the Highway Code, and getting an idea of what goes on under the bonnet.

The other four weeks of his course start on the private motor road, gravitate to quiet public roads, and gradually to more difficult roads and night driving.

By the end of his five-weeks course, P.C. 50 will have had about 800 miles at the wheel and about 1,200 miles hearing the other two drivers of the team of three in one car being guided by the allotted instructor.

At the end of this he gets a written examination on the Highway Code, skidding, driving test, maintenance examination, and he becomes a general divisional driver.

Captain Minchin manages to keep an individual check on the mileage of his graduates. If a graduate has, through no fault of his own, not accumulated sufficient mileage, he is hauled back to the school for further practice. The doubtfuls are also noted and come up for further tuition.

Driving the Black Maria

Now here is a thing that surprised me. The next promotion is to drive a police van—a small Black Maria?—so P.C. 50 comes to the school to learn how to drive a van in the approved manner.

If he is brilliant, he is removed from this Eldorado of Black Maria driving and comes back again to the school for advanced training for another five weeks. (Coach driving and high-powered cars.)

Leaving the coaches to bulldoze their way through the English country lanes, P.C. 50 is told, when he gets on to the high-powered cars, that "ramming" is old stuff. Now the technique is to follow close on the bandit's tail thus producing a psychological effect. In the meantime, you are, of course, "calling all cars," and he will eventually be trapped in an inextricable maze of converging R.T. Police cars.

The advance wing of the Hendon Driving School uses at present a Super Snipe, 4½ Lagonda, 25 Speed Alvis, 2½ Riley, 6-cylinder Citroën, 38 Buick, 4½ Bentley, Javelin, Triumph, 6-80 Wolseley, Chevrolet and Bedford Coach.

There is yet another course dedicated to the Traffic Patrol Wing who are commonly known as the "Courtesy Cops." They have special courses in public address system and legal peculiarities of their job. There are a number of Police Motor Schools in the country including Lancashire and Essex.

All the instructors for these schools were trained at Hendon and in the "bag" Captain Minchin has graduates from the Gold Coast, Palestine, Singapore, Iraq, West Indies, Ministry of Transport, Marine Officers, Army, Air Ministry Examiners and 12 lady Police Drivers.

As to the training, it may be that Captain

The House of Lords Motor Club visit to the Police Driving School, Hendon. Left to right: (front row) Chief Superintendent W. M. Taylor, M.M.; Lord Gifford, R.N.; Captain R. P. Minchin, O.B.E.; Lord Sandhurst, O.B.E.; Lord Moynihan, O.B.E., T.D.; Lord Waleran; Chief Inspector Walker; (back row) Lord Camden.; Inspector Tisdall; Lord Swaythling, O.B.E.; Lord Keyes, R.N.; Lord Buckinghamshire; Mr. Dudley Ryder (House of Lords official), and an onlooker.

Minchin and his team were expecting their Lordships of the House of Lords Motor Club to be argumentative.

The method of turning out of traffic to the right is eminently sensible:—(1) decide the right-lane of traffic, (2) check speed if necessary and change into lower gear, (3) put out your hand to indicate turning right, having looked in your mirror, (4) pull in your hand and stick up your traffic indicator, (5) stop, wait for a suitable opportunity and then get on with it.

"Really, Minchin, you must have a very heavy brake-lining bill, if you don't teach your students the value of combining the change-down with applying the brake-pedal. Furthermore, according to your theory, your student is never in the right gear for an unexpected break-through."

"Donegall, this is rather like taking one sentence out of a two-hour speech. Of course, they learn to combine the brake-pedal and the change-down, but you must surely remember that when you first got a fast car your one desire was to see whether it was possible to change-down at 80 m.p.h. Human nature does not change, and I cannot afford to have my gear-boxes ruined by youthful enthusiasm."

The Skid Patch

They put us on the skid-patch, covered in oil and water, with quoits sticking up. Every quoit knocked counted a mark against their Lordships.

Nothing exciting occurred during this little test as far as I was concerned; I knocked four quoits out of 25 and can only excuse myself on the basis that I was driving a 38 h.p. Sedan Buick and did make the circuit in the specified time (22 m.p.h.)

The remarkable thing was that Lord Waleran, secretary of the H. of L. Motor Club, driving his Citroën Six, try as he would, could not skid at all. All that happened when he tried to skid was that one of his front tyres went right down on to the rim. Of course, he was seconds within the allotted time for the circuit because he never had to bother about skidding and simply wove his way between the quoits as though he had been driving down Piccadilly.

The visiting House of Lords Motor Club pauses for a breather during a road demonstration near the Police Driving School, Hendon.

To sum up, I forgot to mention that one basic principle that the Hendon School teaches its pupils is never to risk becoming "the meat in the sandwich." In other words, on a three vehicle road never overtake a vehicle going the same way as yourself if you will be alongside it at exactly the same moment as the vehicle coming in the opposite direction. If one vehicle has to swerve for a bicycle, you will probably get away with it. But there will come a day when both your opponents have to swerve for bicycles, or other hazards. That means disaster!

As far as the House of Lords Motor Club is concerned, we had a most instructive day, and it emerges a hundred per cent.—if only by the fact of the staggering reduction in Police-driven accidents—that the Hendon Police Driving School is doing a great service to all roadfarers both in this country and in the British Commonwealth beyond the seas.

Items of Interest

End of a Pioneer Railway Line

A SMALL railway line that made history is to be closed down because it no longer pays its way. It is the Canterbury and Whitstable line, 6½ miles long with an 828-yard tunnel, the first railway to haul fare-paying passengers regularly by a steam locomotive.

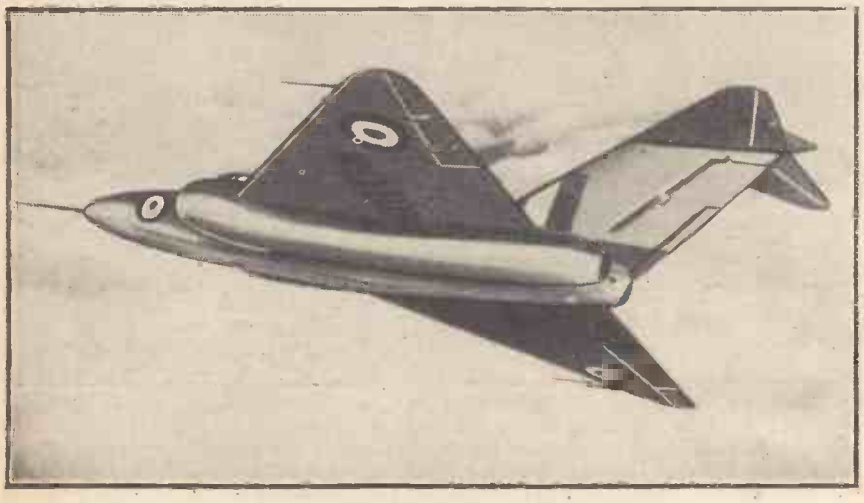
Opened in 1830, the railway used Stephenson's locomotive, "Invicta." This was five years after the Stockton and Darlington line was inaugurated, but that railway was then pulling its passenger coaches by horses.

In 1832 the C.W.R. ran Sunday trains, which were well patronised, till the clergy of Canterbury protested, and the Sunday trains were cancelled after two months. In 1834 this little railway issued the world's first season tickets.

It is claimed that the brick bridge which carries the line over the road at Whitstable is the world's oldest railway bridge.

New Twin-jet Delta Fighter

THE accompanying illustration shows Britain's first operational twin-jet Delta fighter, the new Gloster GA5 aircraft of the Hawker-Siddeley group. Although its speed, range, armament and radar gear are secret, it is claimed that the GA5 is better qualified than any other aircraft in the world to destroy atom bombers from any country that might declare itself the enemy of the free world.



The new Gloster GA5 fighter in flight.

SLUSH-CASTING

(*Continued from page* 196)

As may be seen from Fig. 6, which shows the machine somewhat modified for its new task, the gooseneck and metal pot are mounted beneath a flat metal table. Through this the nozzle projects, and the assembled die, locked with C-clamps, is aligned above it. Around the nozzle is a short powerful spring, with a turned collar surmounting it, and it is upon this that the die is placed, gate downward. Above the table is an arch carrying a vertical screw, this being fed down until the die is forced into firm contact with the nozzle. The rack-and-pinion operated plunger is now depressed by swinging the capstan-wheel, thus filling the die, but is immediately drawn back again. Simultaneously, the clamping screw is slackened off to break the nozzle seal, and the surplus metal runs back through the cup-shaped nozzle into the gooseneck. The free entry of air is essential to the quick running off of the slushed metal.

Cothias Process

For completeness, this brief survey of slush-casting methods and equipment must include a reference to the related Cothias process, which falls half-way between slush-casting and gravity-casting. In the Cothias process, which is virtually restricted to the casting of pedestalled statuary, the metal is poured into a wide-mouthed inverted mould, partly filling it (Fig. 7), and a steel core is brought down quickly into the mould. This displaces the metal, which fills the cavity and overflows. When the casting has cooled the core is stripped out and the mould dissembled. The only equipment required is a mandrel press to carry the combined core and plunger. Cores used in the Cothias process are subject to the same limitations as those in diecasting dies; they must be free from undercuts. In consequence, the wall thickness of Cothias-cast statuary is inevitably non-uniform.

Porcelain Enamelling

Details of the Process Simply Explained

By F. SPICER

IN recent years there has been a considerable increase in the use of porcelain enamel as a finish for many domestic articles such as refrigerators, boilers, cookers, etc. Originally, porcelain enamel was purely decorative, but now we look for many other qualities in the porcelain coat.

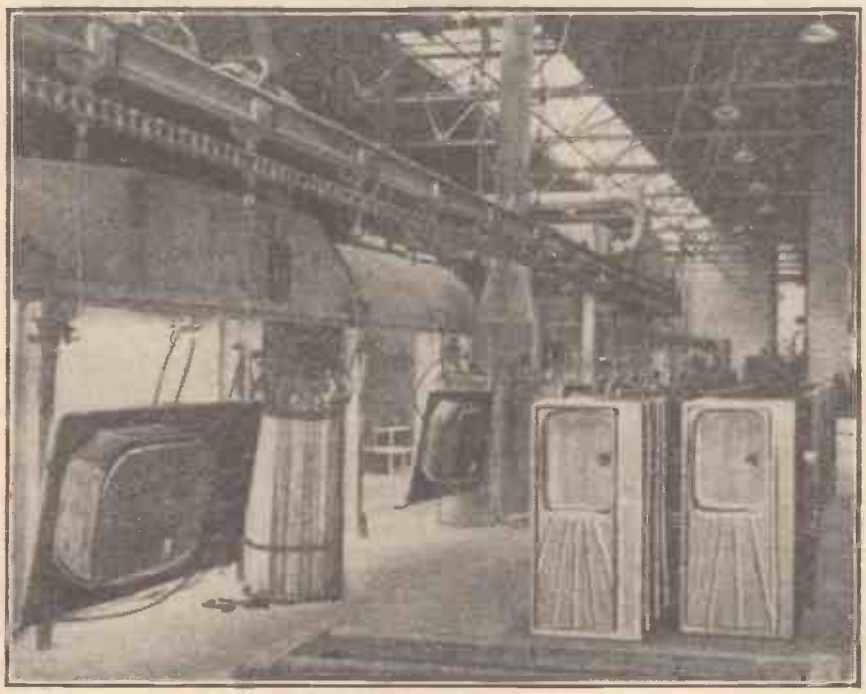


Fig. 1.—Spray booths in the enamelling department. (By courtesy of Rubery Owen and Co., Ltd.)

Observing a piece of enamel-ware we see a triumph of chemistry and engineering—the welding of glass to steel. What goes to the making of such a complex weld? In the last decade improvements in porcelain enamelling have been numerous, due to close co-operation between the steelmaker, the enamel manufacturer and the actual enamel user. The steelmaker helped considerably when he introduced small amounts of titanium into his steel. Enamels have been developed that fuse at lower temperatures, and that can be applied in thinner coats. Acid-resisting enamels have been introduced. The equipment used has been improved. The industrial market has opened up new fields such as a coating for marine and aircraft exhaust systems, electrical resistors with the resistance wire embedded in the enamel.

Vitreous or porcelain enamelling is a process consisting of six main divisions:

1. The manufacture of the enamel frit.
2. Preparation from the frit of wet enamel ready for processing.
3. Cleaning of the metal surface of the articles to receive the enamel.
4. Application of the enamel.
5. Drying of the coated articles.
6. Firing of the enamel to produce the final finish.

Manufacture of Frit

This is a process for reducing many complex ingredients into a uniform mass possessing glass-like properties, bringing this, by smelting, to a molten mass and then discharging it into cold water. The thermal shock results in the shattering of the mass into particles suitable for milling. Chemically, porcelain enamel frits may be considered as alkali-alumino-fluoboro-silicates, although they will contain many other ingredients.

Mixing should be accomplished mechanically to ensure intimate association of the refractory and flux materials.

Many types of enamel frit are produced, such as:—

Ground Coats

(a) Cobalt ground coats. (b) Acid-resisting ground coats. (c) Coloured ground coats. (d) White ground coats.

Cover Coats

Non acid-resisting enamels:—

(a) Clear enamels. (b) White enamels (zircon). (c) White enamels (antimony).

Acid-resisting enamels:—

(a) Clear A.R. enamels. (b) White A.R. enamels.

Preparing of Enamel

The manufacture of enamels consists of mixing and grinding enamel frits, clays, opacifiers, colour, electrolytes and water. The frit used will depend upon many factors such as base metal, whether for acid resisting, for decoration or protection, etc. Taken in sequence the other mill additions are:—

(a) *Clays*:—Clays are added for many reasons, including its facility for keeping in suspension small particles of milled enamels. It also acts as a binder and influences the fusing temperature and physical structure, and the coefficient of expansion. It also has a bearing upon the final appearance of the enamel with regard to opacity, colour and brilliance.

(b) *Opacifying Agents*:—The opacity of white enamel frit is in itself not high enough, and some opacifying agent is added to bring up the opacity to the required standards. These opacifiers fall into three groups: (a) the insoluble types, such as tin oxide, (b) crystallites, such as antimony peroxide, fluorides and zirconia, and (c) gas opacifiers. These are usually organic compounds that form microscopic bubbles which act as opacifiers.

(c) *Colour Oxides*:—These are added to the frit to produce the desired shade of colour, and belong mainly to the metallic oxides group as follows:—

Blue enamels are derived from cobalt oxides. *Yellows* and *oranges* from cadmium sulphide compounds. *Browns* from chromium, iron and manganese. *Reds* from cadmium and selenium compounds. *Greens* from chromates. *Blue-greens* are a mixture of chromium and cobalt compounds. *Black* is derived from the calcined compounds of iron manganese, cobalt, chromium and occasionally nickel.

(d) *Electrolytes* are dissolved salts which are added to act as flocculating agents, helping the clay to keep the particles of fine enamel in suspension. Some of these salts

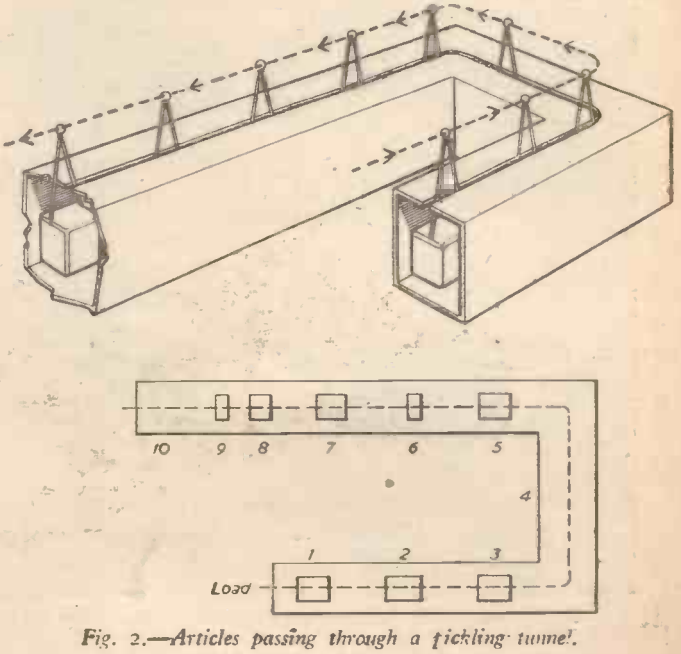


Fig. 2.—Articles passing through a pickling tunnel.

are shown in Table I, although this represents only a few.

(e) *Water* is an important factor which will depend upon the nature of the frit and other additions, size of mill, etc. The type of water used has a great bearing upon the final result.

Milling

The correct milling of the materials has been the subject of many discussions and many technical papers and each investigator has his own theory of what is correct with regard to angle of nip, pebble charge, pebble size, frit charge, water content and mill speed.

Mills are usually of monolithic porcelain construction or are lined with porcelain. Grinding efficiency depends upon many factors, all of which can be varied. One authority outlines these as: the total charge; the volume of balls ; size of balls ; speed of rotation of the mill; viscosity of the batch being wet ground; order of grinding; duration of grinding; initial grain size of charge.

The ball or pebble charge, consisting of either selected flint pebbles or porcelain balls, should occupy at least 50 per cent. to give efficient results. The size of the balls will vary from 1in. to 2in. but whichever size is used, they only should be used in the load. A mixture will give uneven grinding of the slip. The load of frit, etc., should occupy a further quarter of the mill.

The speed of the mill will have an important bearing upon the size and quality of the slip being ground, and will vary from 17 r.p.m. for a 7ft. 6in. diameter mill to 40 r.p.m. for a 1ft. diameter mill. The degree of grinding will depend upon the job the enamel has to do, but it must be ground to conform to standards of fineness and specific gravity. After milling the slip is screened to eliminate coarse particles which would interfere with spraying operations to follow.

Preparation of the Metal Surface

The preparation of the metal surface to receive the enamel is one of the utmost importance in all industrial finishing operations. It is particularly so in enamelling. Sheet metal should be degreased, cleaned and pickled, and, if desired, nickel dipped to promote cohesion of the enamel, while cast iron, due to its structure, should be shot blasted only. Pickling usually means a messy kind of job with water and acid everywhere, but this need not be so. The plant shown in Fig. 2 was developed by Metalwash Machinery Corporation of America in conjunction with Landers, Fray and Clark. This machine is so designed that it can be placed directly in the enamel set up, no fumes escaping, and the articles are kept wet (preventing rusting) until they emerge from the drying chamber.

Shot blasting is well known, and these machines are a part of every enameller's set up.

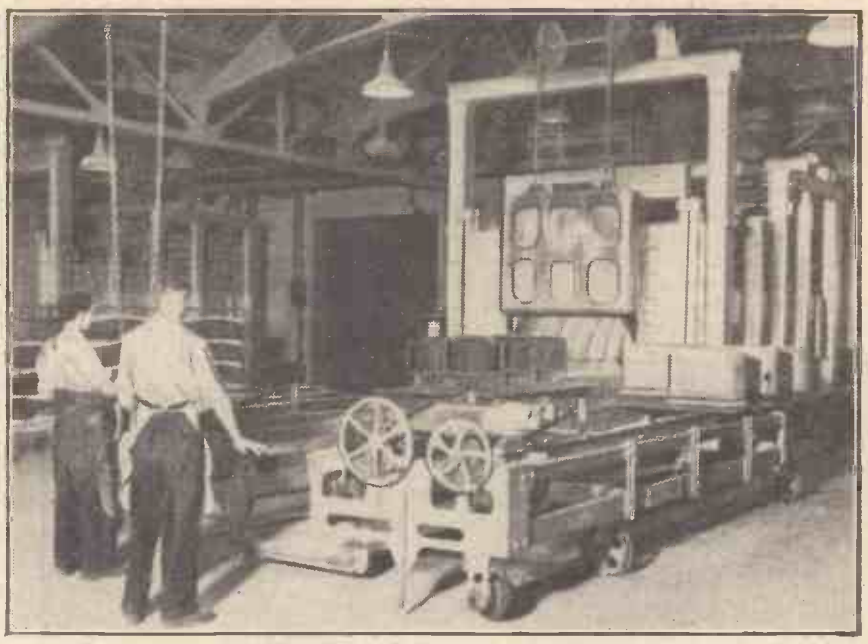


Fig. 4.—A batch type furnace.
(By courtesy of Incandescent Heat Co., Ltd.

TABLE I: USES OF VARIOUS SALTS

Salt	Use	Quantity
Magnesium Sulphate ..	To prevent settling of tough particles of frit. If used in excess is harmful causing sponginess and loss of gloss.	1-4oz. per 100lb.
Sodium Aluminate ..	Used mainly in acid-resisting enamels. Used in excess results in loss of gloss and "orange peel surface."	Up to 4oz. per 100lb.
Calcium Chloride ..	Helps to prevent scumming of acid-resisting enamels.	2oz. per 100lb.
Sodium Nitrate	Improves set of enamel, minimises rust spotting. Lessens possibility of cracking.	Up to 2oz. per 100lb.

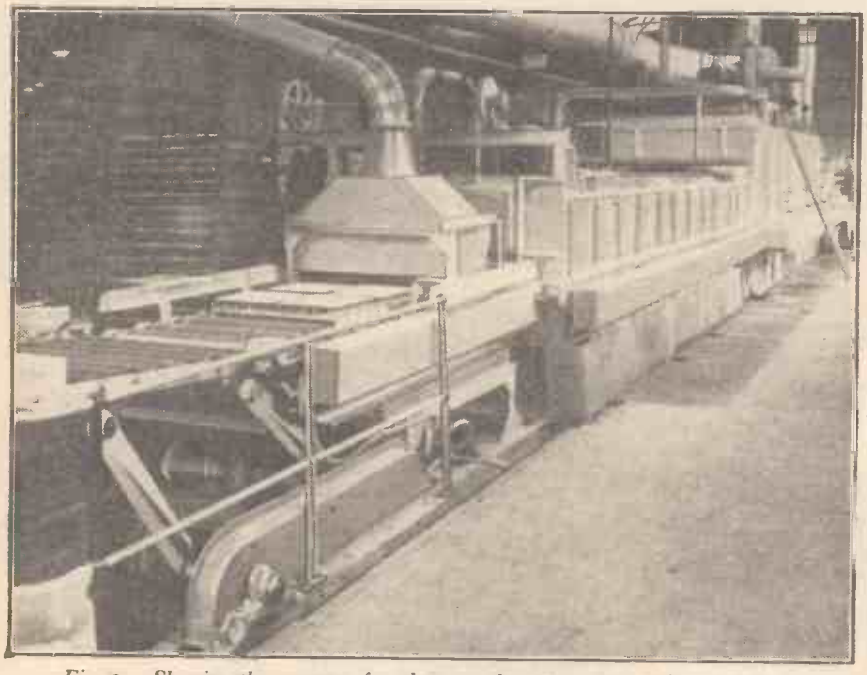


Fig. 3.—Showing the supports for plates as they enter the continuous furnace.
(By courtesy of Incandescent Heat Co., Ltd.)

Porcelain enamels consist mainly of two or more coats, a ground coat and a final or cover coat. A ground coat is applied for two reasons: (a) to provide good adherence, and (b) to prevent reactions between the base metal and the cover coat. The function of the ground coat has a great influence on the final result, having a direct bearing upon blistering, copper-heading, fish-scaling, etc.

Cover coats are, as their name implies, the final appearance of the article. It must be a closely adherent coat and resist corrosion, abrasion and damage.

Application of Enamel

Application of the enamel is usually carried out by dipping and slushing or by spraying. For small articles dipping is usually employed but where the parts being processed have pockets, etc., that are likely to retain enamel, they are sprayed.

Methods of dipping can only be determined at the dipping tank itself and will depend upon shape and size. If after dipping imperfections are visible, the article should be re-dipped at once. After draining they should be removed to the drying racks. Corners and edges likely to chip may be reinforced by a further dipping in the ground coat tank.

It is essential that enamel should be constantly stirred to maintain the correct specific gravity and to prevent enamel from settling

at the bottom of the tank. The temperature of the bath should be controlled to avoid waste of enamel. If allowed to exceed 70 deg. F., the enamel will tend to adhere in heavier coats.

Spraying is carried out by the atomization of the enamel slurry through spray guns. This method of applying a coat of material is so well known through the spraying of cellulose and synthetic enamels that I need not dwell upon it. (See Fig. 1.)

Drying

This is usually carried out in special drying rooms or continuous drying chambers. It is an important factor in enamelling and the speed of moisture removal from the surface should not be greater than the flow of water to the surface brought about by capillary action. Should the enamel surface dry and set before all the water has evaporated, the result will be chipping and erasing of the surface in the firing operation.

Firing the Enamel

This is the re-smelting of the small particles of enamel frit into a smooth and continuous layer. Time, temperature and methods applied all have a bearing on the final result and must be carefully controlled, otherwise "scrap" components will result.

All articles before introduction into the furnace should be perfectly supported to prevent sagging and deformation (see Fig. 3). The temperature must be pyrometrically controlled at, for sheet steels, between 840-880 deg. C., and for cast irons between 700-780 deg. C., depending upon which coat is being applied. Furnaces may be of the batch or of the continuous type and heated by either gas, electricity, oil or solid fuels. A batch type furnace is shown in Fig. 4. The continuous type furnaces have a pre-heating zone, fusing zone, and cooling zone, the time of fusing depending upon the speed of the conveyor belt. Sheets are usually hung parallel to the line of travel in large tunnel furnaces, although occasionally they are set at right angles to help circulate the heat in the fusing zone, giving more uniform and efficient fusing.

Small plates can be fired in the furnace shown in Fig. 3, supported on spikes.

Inspection

Inspection should be carried out visually for:—

Blistering or bubble formation.

Chipping: breaking away of enamel, exposing ground coat or bare enamel.

Copper heads: reddish brown spots, breaking up the surface of the enamel.

Crazing: fine, almost invisible lines in the surface enamel.

Fish scale: chips of enamel resembling fish scales, which leave the surface of the ground coat but usually only during the fusing of the final coat.

Gloss: Reflectance, lustre, etc.

Orange peel: a surface resembling the skin of an orange.

Sagging: sagging of the enamel in loops, etc.

Warping: Deformation of the original shape of the article, usually to the release of stresses set up in the metal during forming.

Experienced inspection can single out these defects and decide whether they can be salvaged by applying another coat or whether they must go for chipping and re-enamelling.

Testing of the Surface

B.S. 1344: 1947 lists the following as tests for determining the properties of enamels.

1. Acid resistance.
2. Alkali resistance.
3. Resistance to thermal shock.
4. Heat resistance of enamels on cast iron surfaces.
5. Abrasion resistance.

(1) Acid resistance tests are carried out only on enamels specified as acid resistant.

(2) Alkali resistance tests are carried out on such articles as wash boilers, sinks, baths, etc., where the surface will be subject to the action of sodas, soaps, etc.

(3) This is to determine the resistance of enamel to fluctuations in temperature, such as those met with in cookers, etc.

(4) Carried out for similar reasons as above.

(5) This is to determine the resistance of enamels to abrasion by scouring with cleaning powders, etc.

TABLE II: SPRAYING SOLUTIONS—STRENGTH AND TEMPERATURE

Station	Spray Solution	Strength	Temp.	Time Min.
1	Emulsion cleaner	—	160 deg. F.	1½
2	Cold water	—	—	1/3
3	Alkali clean	½ to 1½ oz./g.	160 deg. F.	1½
4	Cold water	—	—	1
5	Sulphuric acid	7 to 12 per cent.	150 deg. F.	2½
6	Cold water	—	—	1
7	Nickel dip (single salts)	1½ to 3 oz./g.	170 deg. F.	2½
8	Cold water	—	—	1
9	Neutraliser (soda ash plus borax)	0.45 to 0.55 per cent.	155 deg. F.	¾
10	Air blast	—	220 deg. F.	5

An Electric Lighter

By E. MISRAHI

THE accompanying sketches give details of an electric lighter which I found more simple and easier to make than those described in PRACTICAL MECHANICS during the past years. I have been using it for over ten years without trouble.

The list of materials required is as follows:

Part A.

1. Glass bottle or jar.
2. Two strips of brass or copper sheet.
3. Copper or brass wire, or brass nails.
4. Cork or wood plug.

Part B.

1. Two pieces of sheet brass or copper, filed or hacksawed as shown.
2. Mica or asbestos sheet.

Part C.

1. Insulated handle (wood or plastic).
2. Copper or brass tube with end filed at an angle.
3. Cotton wool packing.

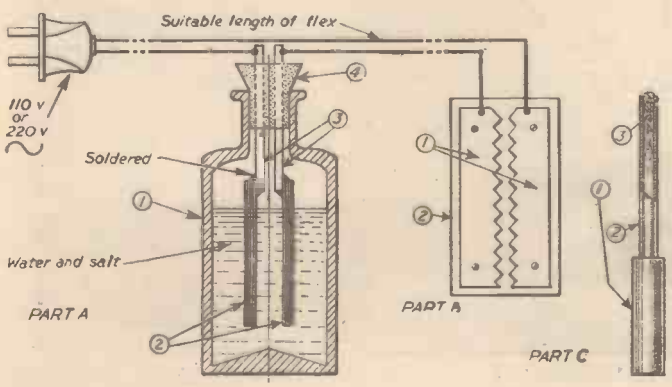


Fig. 1.—Details of the salt solution container and striker plate.

Partly fill the bottle or jar with water and dissolve in it a tiny quantity of table salt—about a quarter of a teaspoonful. Insert the cork and electrodes and connect to mains and part B as shown in Fig. 1. Dip part C in the petrol or methylated spirit and strike part B1 from top to bottom (Fig. 2). A spark will result, which will ignite the cotton wool packing (part C3).

Too much salt will blow the fuses and put part B1 out of action. The spark should be similar to the spark of a petrol lighter.

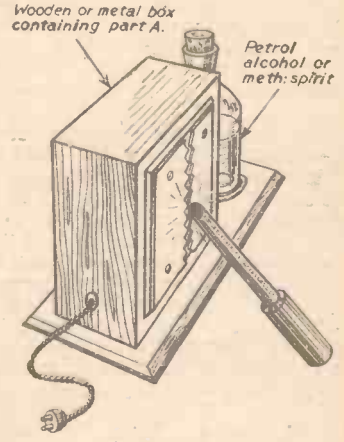


Fig. 2.—The lighter suitably housed in a casing.

Two typical "surface-active" agents. On the left is the liquid "Teepol," whilst on the right is seen a jar of the solid white "Perminal" material.

The Modern

The New Chemistry of "Soapless Soaps," Wetting Agents

FOR a century or more it has been one of the aims of the chemist to produce materials which possess all the good properties of soap without its inherent disadvantages. Up to recent times, however, such aims were denied a full or even a partial success, mainly on account of our not knowing exactly what happens when soap is made to exert its well-known traditional detergent action. When it became more clearly understood how soap acts in washing articles and in making them clean, it was at once possible for the chemist to produce materials in which the detergent properties of soap are, as it were, concentrated, heightened and in many ways reinforced.

To understand the detergent action of soap we must consider one of the important physical properties of all liquids, namely, that known as "surface-tension." All liquids tend to behave as if they carried on their surfaces a tightly-stretched elastic skin which has the effect of confining the mass of liquid within a certain space or volume, and which renders it difficult for the liquid to make a close and actual contact with the surface of any other material. If a liquid is freed from all external influences it tends to compact itself into a perfectly spherical mass, because, of all shapes, the globular one contains a maximum of matter having a minimum of external surface area. This is another way of saying that the inner attractions of the molecules existing within a mass of liquid combine together to prevent the liquid from spreading, and that the anti-spreading tendency is powerfully reinforced by the highly-stretched skin effect which closes down the liquid on itself and tends to resist the liquid's true surface contact with any other closely adjacent surface.

The Floating-needle Trick

This is the fundamental effect of surface-tension which underlies the old parlour trick of floating a steel needle on the surface of water in a tumbler or in a basin. The same effect is operative when we try to wet a metal plate with water, and especially when, as is so often the case, the metal surface has a slight and invisible film of grease on it. Instead of flowing uniformly on the surface of the plate, the latter surface appears actively to resist or oppose the spread of the water. The liquid simply rolls off the plate like "water on a duck's back" (which, incidentally, is still another effect produced by the same underlying cause). The water breaks up into countless globules or droplets, and if these are examined under a lens they will all be seen tending to form the globular shape so far as they are able. In a word, the water exhibits a very strong unwillingness to flow or to spread in the thin, uniform, film which one would normally expect it to do. It will not wet the surface adequately.

The almost spherical nature of the raindrop gives us another example of the effect of surface-tension on liquids. The raindrop in falling through the air is freed from all external forces except that of gravity, and because this gravitational force is applied more strongly to the lower part of the drop the latter becomes somewhat elongated, or slightly pear-shaped, instead of being perfectly spherical as it would otherwise be.

Electrical Forces

In all liquids there are, indeed, powerful molecular and, in fact, essentially electrical forces existing in the liquid surface which, so far as they can, resist what would otherwise be the natural fluid-flow and spread of the liquid. It is because of these forces of surface-tension that any liquid behaves like a nervous individual forever shrinking into himself and being unwilling to make contact with other people unless absolutely forced to do so.

To a greater or less extent the same surface-tension effects are in evidence whenever textile fabrics are immersed in water. If they carry the slightest trace of oil, grease or similar substance they are always difficult to wet adequately. The water, as it were, cannot get at the surface of the fabric. If the fabric surface is soiled with dirt particles the water is unable to loosen them, to soften and to penetrate beyond them. It cannot float them off and thus remove them. The interfacial tension between the liquid surface and the surface of the fabric is too great.

The Mechanics of Washing

When, however, the water is made soapy, or when soap is rubbed on to the fabric surface, the soap itself is able to lower this molecular tension in both surfaces. Contact between the water and the fabric to be cleaned becomes more readily achieved. And not only this, but, by a lowering of its "skin" effect or surface-tension, the water solution of soap is able to be brought into a condition of surface bubbles or lather which has a powerful mechanical effect in dislodging the extremely fine particles of dirt and grime which may have become partially embedded in the surface interstices of the material which is being washed.

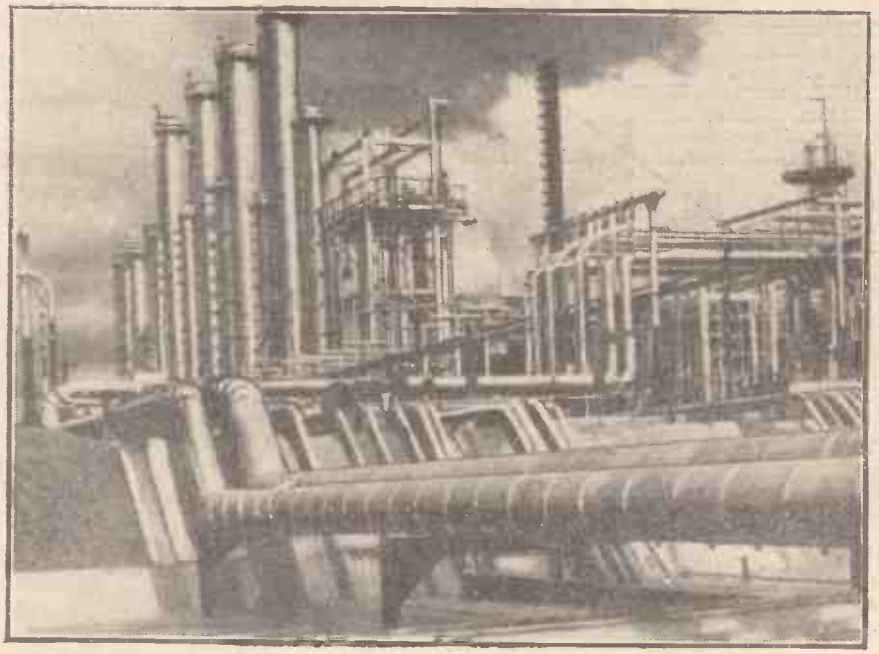
Another effect of the soap is to form a weak emulsifying solution which, although it cannot actually dissolve the insoluble dirt particles, holds them in suspension in the water and so permits of their ready removal from the fabric surface by subsequent rinsing.

Here, in short, is an outline picture of the true mechanics of washing from which it will be seen that the soap performs many operations, among which are those of wetter, softener, latherer, penetrator and emulsifier.

Although soap has been known to civilisation at least since the time of the Romans and, perhaps, considerably before that era, it has been left to modern chemistry to ferret out just why it is able to function as such an effective washing-agent or detergent, and especially why it is so well able to lessen the interfacial tension between the water surface and the surface of the material to be washed.

Hydrophobic and Hydrophilic

Regarded chemically, soap is a rather peculiar material. Perhaps it is unnecessary in



An industrial vista at Stanlow, Cheshire. This new plant, which is concerned with the production of wetting agents, detergents and surface-active materials, is owned and operated by the Shell organisation.

Detergents

and Surface-active Compounds

By J. F. STIRLING

these days to stress the fact that ordinary soap is the product of the interaction between a strong alkali and a fatty-acid, and, therefore, that it is essentially the fatty-acid salt of an alkali metal such as sodium or potassium. There are other metallic soaps, but, since these are all insoluble in water and have no detergent action, they do not concern us.

In our mind's eye, we see a single molecule of soap as having an extended backbone of carbon atoms, and, like a fish, to have a head and a tail. The head of the soap molecule comprises a special group of atoms which are powerfully *hydrophilic* (water-loving). Its tail, on the contrary, consists of another group of atoms which is equally strongly *hydrophobic* (water-fearing). It is the intense affinity of the water-loving head of the soap molecule which enables the soap seemingly to take a grip on the water and to interfere with its surface forces, and thus to reduce the surface-tension of the liquid.

The soap, you see, acts as a material which enables the water to spread itself more freely and more readily over an otherwise water-resisting surface. It functions, in modern parlance, as a "wetting agent."

Turkey-red Oil

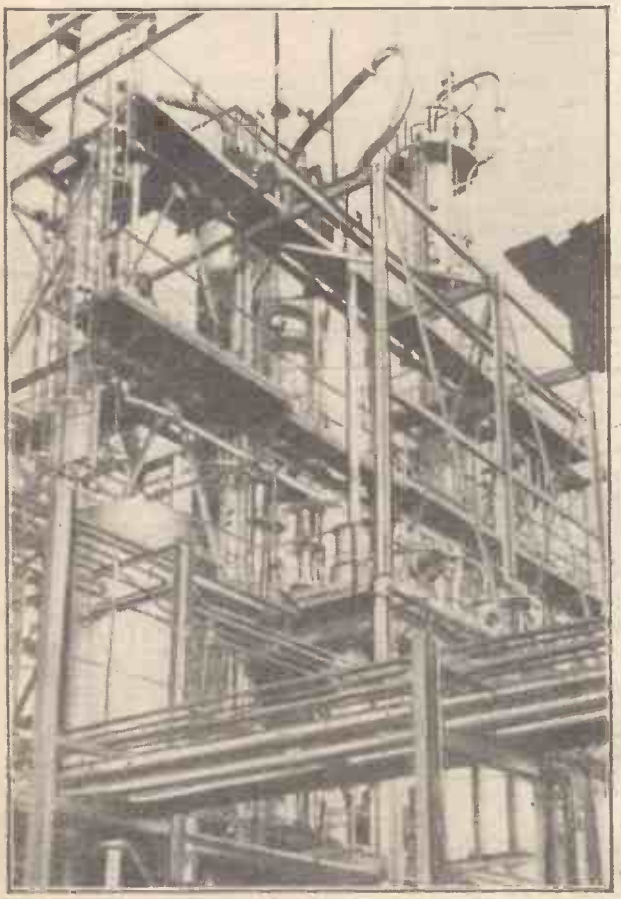
About 1860 a liquid was discovered which, for the first time in chemical history, had similar wetting powers to those of a soap solution. This was the famous Turkey-red oil, made by the action of sulphuric acid on castor oil and so named because it was at once taken into use industrially for the dyeing of Turkey-red on cotton fabrics.

Although castor oil is quite insoluble in water, Turkey-red oil is perfectly soluble therein, and it has been used in the dyeing industry very extensively as a wetting and a penetrating agent to enable "difficult" but brilliant and fast dyes to penetrate the yarn or fabric to which they are applied.

During World War I, when the Germans became acutely short of fats and had to choose between their utilisation either for soapmaking or for foodstuff production, they developed certain synthetic materials based on the original Turkey-red oil. These included mainly the "Nekals," the "Igepons" and the "Gardinols" of the Ruhr dye-manufacturers, all of which were of theoretical interest and, as it happened, of certain specialised industrial use, but which were mostly far too costly in those days for ordinary household and domestic employment.

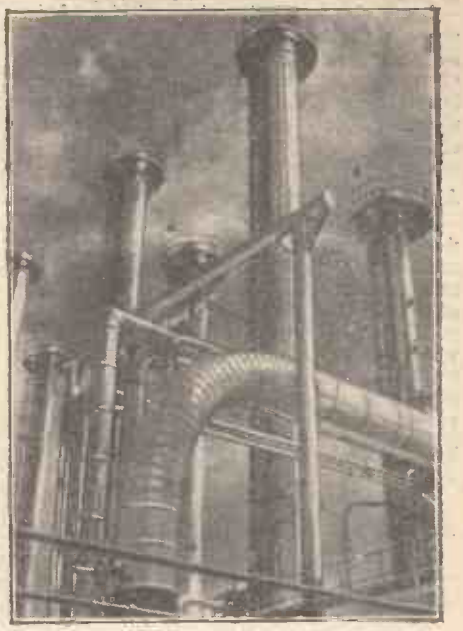
Petroleum Products

Just prior to World War II, it was discovered that a readily available and relatively non-costly source of materials for synthetic detergent manufacture was at hand among the products of petroleum refining. This led to a complete overhaul of the chemical technology of these materials, and to the rapid development of their production from petroleum sources. Research went on in three countries—Britain, America, Germany—but probably the greatest developments took place in America. In that country alone, the year's output of the various "soapless soaps" was 6,000 tons for 1940. Ten years afterwards (1950) the annual American output was estimated at no less than 500,000 tons, more than 60 per cent. of which was destined for the domestic market.



An industrial plant at Stanlow, Cheshire, for the recovery of solvents used in the extraction of "Teepol" wetting agent from the crude petroleum residue used for its manufacture.

British production of these "surface-active" compounds, as they are now categorically designated; has, since the war, been increasing by leaps and bounds, this production rate being closely followed on the Continent. Nowadays, there is hardly an industrialised nation which does not commercially produce its own compounds of this type, since, from a purely economic standpoint, to say nothing of a national one, much is to be gained by the resulting savings in natural fats, a large proportion of which may now be devoted entirely to essential foodstuffs production.



The tall fractionating towers of the new petroleum plant engaged in the manufacture of surface-active agents at Stanlow, Cheshire.

The present-day surface-active compounds (which comprise the wetting agents pure and simple, and those new materials which have been developed more specifically as soap substitutes, or, at least, as "soap-assistants" in consequence of their powerful detergent properties) may be divided into several distinct classes. The most prominent of these in this country are the higher alkyl sulphates, a complex mixture of which, in the form of a thick, yellow liquid, is now produced extensively by the Shell organisation under the name of "Teepol." Wide and varied are the uses of this material. It has become well-nigh indispensable over a wide range of textile, engineering and other activities both as an efficient wetting agent and as a detergent compound. Materials of this general type are produced from the olefine by-products of petroleum refining, these being treated with sulphuric acid and then purified from the crude reaction materials by solvent-extraction.

On the other hand, there is another class of wetting agent and surface-active compounds known under the title of the "Perminals." These take the form of a white powder. The material can be produced in various types and modifications, but, chemically, it is a "substituted alkyl naphthalene sulphonate," or, in ordinary terminology, a mixture of compounds made by treating naphthalene derivatives with sulphuric acid.

A third class of these products is to be seen in the Sulphonated Lorels and the Gardinols which are sulphonated fatty alcohols. Other synthetic detergents are Cetyl pyridinium bromide ("Fixanol C") and cetyl trimethylammonium bromide ("Lissolamine A"). These are of special interest in that, in addition to being powerfully detergent and surface-active, they possess bactericidal and bacteriostatic properties. Up to the present, their development has been undertaken mainly in America.

Added to the ever-growing list of these surface-active compounds we may note the various alkyl aryl sulphonates ("Nacconol," "Santomerse"), the fatty-acid sulphonated compounds ("Mersolate"), the sulphonated alkyl amides ("Igepon T"), sulphonated fatty-acid esters ("Igepon A"), the sulphosuccinic esters ("Aerosols"), and the various petroleum sulphonates, such as "Petrosol."

It will be noted that the majority of the above classes of compounds depend essentially for their properties on the introduction of the sulphuric acid radical into them, just, indeed, as was the first of these materials—the nowadays "old-fashioned" Turkey-red oil.

Advances in Laundry

In the laundering industry the use of these compounds has produced many important changes. It has made possible the low-temperature washing of fabrics, particularly of woollens and silks, thus making more practicable the washing of materials dyed with delicate and fugitive colours. To ensure full efficiency of the many specialised laundering processes, these surface-active compounds, detergents or wetting-agents may nowadays be combined by admixture with various alkalis—known in the trade as "builders"—which enable the work of washing to be done at high speed and with the minimum of risk.

Uses in Engineering Technology

In the dyeing, bleaching, textile-finishing, and in the various anti-shrink processes, modern wetting-agents are now playing an enormous part. In engineering, too, these compounds have risen to a rank of similiar importance, being nowadays often indispensable in aqueous degreasing, pickling, wet-grinding and electro-deposition processes. The powerful wetting properties which they possess have been utilised to increase the efficiency (and also to lessen the amount) of the water used for dust-laying purposes in mines, tunnels and quarries.

In the cosmetic and the pharmaceutical trades the detergent, wetting and emulsifying properties of these new compounds are now being widely exploited, as witness the numerous proprietary "soapless shampoos," whilst their penetrating action is, on the pharmaceutical side, being made use of in various cleansing and remedial pastes and lotions.

At the risk of wearying even the avowedly technical reader, it would be possible to extend the present enumeration of the various industries in whose techniques and processes, one or other of the new surface-active and detergent synthetics has achieved a degree of high importance. One might, for instance, refer to the application of these modern substances in the food industries of our country in which they lend a powerful aid to the maintenance of strict cleanliness of processing plant and equipment, not to mention their help in increasing the effectiveness of sterilisation. In the paper, rubber, paint, as well as in the cement, concrete and even leather and allied industries, these surface-active compounds are of equal importance. Even in the domain of agriculture and horticulture wetting agents are now being brought into use to increase the efficiency with which various insecticides and fungicides are able to attack plant and tree pests by increasing the penetration or ensuring the more active, rapid and even-spreading of the toxic solution which are applied.

Illustrating the effect of "surface-tension": what happens to a film of water when it is applied to a greasy plate. The thin layer of water breaks up into innumerable globules, each being drawn up and separated from its neighbours by the forces of surface tension.

Truly, indeed, are the modern "soapless soaps" and the various active-materials in general to be classed among the wonders of modern synthetical chemistry. Although their introduction to our civilisation has lacked the spectacular element of drama which has been accorded to many of the new drugs and similar chemical compounds, the utilisation of the "surface actives" has, on all sides, been quite as eagerly grasped at, whilst their possibilities are such that no individual can predict the future developments to which they may lead.

BOOKS REVIEWED

Model Railway Power Signalling. By E. F. Carter. Published by Percival Marshall and Co., Ltd. 142 pages. Price 9s. 6d. net.

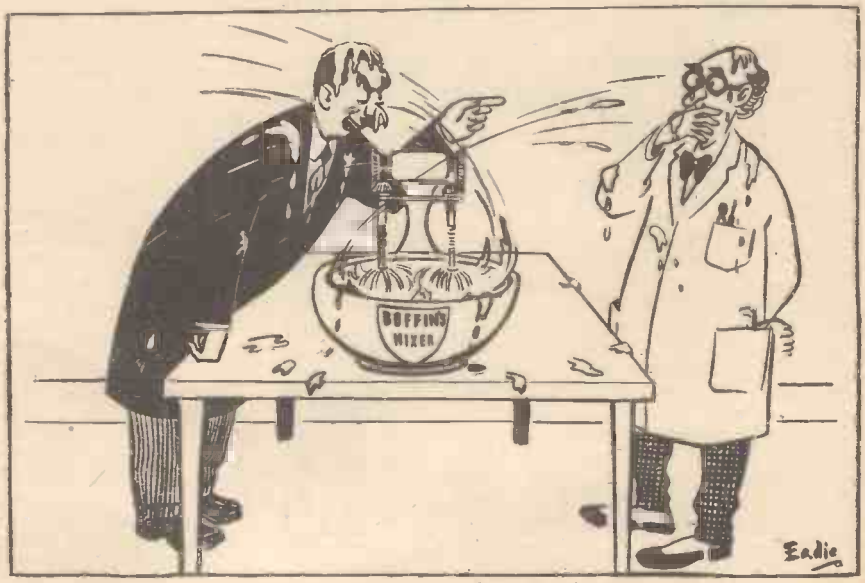
THE author of this book, who is an expert on model railway work, deals with the subject of model railway power signalling in a very comprehensive manner. The whole field of power signalling and point operation is covered in non-technical language so that the novice should have no difficulty in understanding how to make and wire into his lay-out the necessary apparatus to enable points and signals to be operated by power. Included in this informative book is a chapter on the possibility of electronic "light ray" control, especially for operating engine whistles. The book is illustrated with numerous diagrams.

The Motor Manual. Published by Temple Press, Ltd. 272 pages. Price 6s. net.

THIS practical handbook, now in its thirty-fourth edition, deals with the working principles, construction, maintenance and economical running of the motor-car. In this new edition, which has been entirely rewritten, comprehensive information is given covering the design and working principles of modern cars and their accessories, and the reader is shown how to ensure efficient trouble-free running, and economical maintenance of his motor vehicle. The book is well illustrated in line and half tone.

Puffin Building Books. PC7a, PC8, PC9. With notes and drawings by Margaret and Alexander Potter. Published by Penguin Books, Harmondsworth, Middlesex. Price 4s. 4d. each.

THESE three books contain thin card sheets of coloured designs for cutting out and making a Half-timbered Village. No paste or other adhesive is required. Part 1 (PC7a) contains designs for a Hall House, Tiled Cottage, House with Gable, House built on Crucks, and a Market Hall. Part 2 (PC8) contains designs for a Pair of Cottages with Outshut; a Coaching Inn, and a Row of Shops. Part 3 (PC9) contains patterns for a Manor House, Tithe Barn, Cottage Row, and Farmhouse with Outbuilding. Each book also contains full instructions for cutting out and putting the models together.



"I seem to recall your saying this was one mixer that DIDN'T need a cover."

Overcoming Supply Voltage Fluctuations

Bridge Circuits and Negative Feed-back

By A. M. ST. CLAIR

A GREAT deal of the electronic test equipment made and used by amateurs is excellent, both in design and workmanship, provided that its supply voltages do not vary. This latter is, however, a condition not frequently met with. Not only is there the regulation of transformers and power packs to contend with, but in many areas the constancy of the public supply mains, owing to prevailing conditions, is not what it used to be. Even the two per cent.

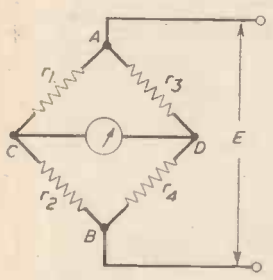


Fig. 1.—Diagram of a Wheatstone bridge.

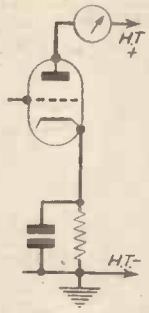


Fig. 2.—Simple single-valve circuit.

tolerance of a fairly well-regulated A.C. line is sometimes a variation to be reckoned with.

For the amateur of limited purse, the cost of an elaborate power pack is something to be avoided if at all possible; and a fully stabilised pack, versatile enough to run each or several of a varied selection of test-units, is both elaborate and costly. There are, fortunately, alternatives.

First, we may adopt means to render our equipment more or less independent of supply voltage. There are two chief methods.

Utilising a Bridge Circuit

The first is by the use of a bridge circuit. In Fig. 1, we have a conventional Wheatstone bridge. Across points C and D a meter is connected and across A and B a voltage E is applied. The condition for balance, i.e., for no current in the meter, is that $\frac{r_1}{r_2} = \frac{r_3}{r_4}$. This is independent of E. For conditions not very far removed from balance, the actual current in the meter is not greatly affected by small changes in E. Hence, if we can design an instrument to use a bridge as its measuring circuit, we shall, for positions near balance, be independent of the bridge voltage at least.

Consider the circuit of Fig. 2, it might be a part, for example, of a simple valve-voltmeter, or a signal tracer. It is obvious that any change in H.T. volts will seriously affect the indications on the meter. This applies to any circuit where a meter is run directly in an anode or a cathode lead. The change-over to a bridge can be simply made. In Fig. 3, r_1, r_2 and r_4 have been added. The valve itself becomes r_3. The meter is now connected between the anode and the junction of r_2 and r_4, and reads the off-balance current of the bridge. Resistances r_1 and r_2 are equal, and r_4 is slightly greater than the D.C. resistance of the valve. It is made variable in order that the bridge may be brought to balance before taking a reading. It will, in many cases, be found necessary to fit a more sensitive meter.

While in this simple circuit a measure of immunity from voltage variation is obtained, it has the disadvantage that a change in H.T. affects the dynamic curve of the valve, hence the effective value of r_3. This can be overcome as in Fig. 4. Here we have a second valve, V_2, acting as r_4. It is operated under the same conditions of bias and anode load as the measuring valve, and hence its characteristics change in such a manner as to compensate for any changes in those of V_1 due to voltage fluctuations. It now becomes necessary to make one or other of the anode loads variable for balancing purposes. This circuit, using a double triode such as the 6SL7 or 6SN7, can be made very compact and reliable. The variable to be measured must be presented at the grid of V_1 as a D.C. voltage. As a D.C. valve-voltmeter, using 6SL7, with anode loads of 1.2 megohms, it is only necessary to provide a suitable switched range-resistor in the grid circuit of V_1. Having calibrated on D.C., the addition of a diode probe or rectifying stage makes the instrument into a peak valve-voltmeter. If amplifying stages are added, to increase sensitivity, or as a part of a signal tracer or signal-level checker, separate means must be adopted to immunise these from voltage fluctuations. The bridge method is readily applicable only to the measuring stage.

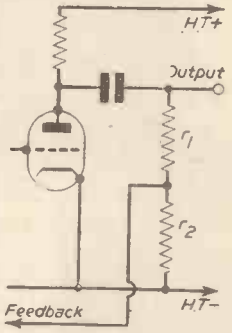


Fig. 5.—Simple amplifier circuit with negative feedback.

Negative Feed-back

This brings us to the second principle—negative feed-back.

The uses of negative feed-back to eliminate distortion are well known. It is perhaps not so widely realised that negative feed-back also confers upon apparatus employing it, a greater or less degree of independence from changes, not only in supply voltage, but also in value characteristics due to ageing or deterioration, and even changes in component values (unstable resistors, etc.). It is obviously, therefore, a desirable feature in any instrument amplifying stage.

If β is the fraction of the output of an amplifier which is fed back negatively, and Ao is the gain of the amplifier without feed-back, its gain with feed-back is given by $A = \frac{Ao}{1 - \beta.Ao}$. Now, if Ao is very large, $\frac{Ao}{1 - \beta.Ao}$ is very nearly equal to $-\frac{1}{\beta}$. For example, if we start with a gain of 10,000, and feed-back 1/10th of our output, $A = \frac{10{,}000}{1 - \frac{1}{10} \times 10{,}000} = \frac{10{,}000}{1 - 1{,}000}$, which is very nearly equal to -10. But $\beta = \frac{1}{10}$, so that Ao is approximately equal to $\frac{-1}{\beta}$. (The negative sign indicates 180° phase-shift). If the basic gain of the amplifier falls to 5,000, due to any cause whatsoever, including mains voltage drop, the gain with feed-back becomes $\frac{5{,}000}{1 - \frac{1}{10} \times 5{,}000} = -\frac{5{,}000}{499}$, still approximately 10. Hence, an instrument amplifier, for stability, having a required gain of a certain value, should be constructed to have a very high gain, and given negative feed-back equal to $\frac{1}{\text{required gain}}$. Schematically, this is shown in Fig. 5. The amplifier, whose output stage is shown in "skeleton" fashion, will have a gain of $\frac{r_1}{r_2}$, and a phase reversal, since the portion of the output fed back is $\frac{r_2}{r_1}$.

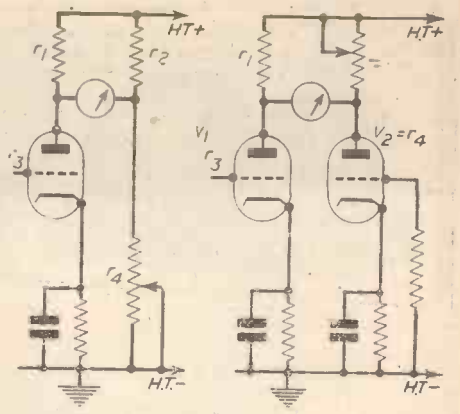


Fig. 3.—Modifying a simple circuit to a bridge.

Fig. 4.—Adding a valve to compensate for voltage fluctuations.

Stabilised Power Pack

It is not always easy to feed-back a large fraction of the output of an amplifier in a negative sense. If the amplifier has a wide pass-band, and possesses, as most do, differing phase shifts at differing frequencies, considerable experiment may be required before the maximum possible feed-back fraction for stable operation, and the best method of applying it, are found. For these and other reasons, a simple form of stabilised power pack is a useful article to supplement the measures already suggested. A suitable circuit is shown in Fig. 6.

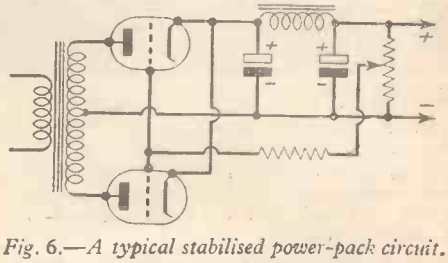


Fig. 6.—A typical stabilised power-pack circuit.

The valves are of the power-triode type. PX4s are suitable, and most of us can dig up an old pair of some such valves. The bleeder and the grid resistor are 1 megohm. The grids are returned to a point which is negative with respect to the cathodes; if the output volts tend to drop, the bias drops, "opening up" the valves, and thereby boosting the output. The adjustment of the bleeder will give a point where good compensation is obtained.

THE WORLD OF MODELS

By "MOTILUS"

Exhibition Model 00 Gauge Railway : The "Commodore Vanderbilt" : Scale Model Bucket Dredge

DURING 1950, two members of the Leipzig Model Railway Club, Germany, toured many of the large towns in their country displaying a most picturesque and interesting model railway, combined with an exhibition of pictures of the German State Railways. It is the first time that this kind of exhibition has toured Germany, so it is not surprising that during a stay in Berlin these enthusiasts gave 2,500 demonstrations.

One of the members, Mr. G. Arndt, recently sent me some photographs of the railway, taken when the exhibition was in the Museum at Eisenach. The model railway was built entirely by members of the Leipzig Club. It is OO gauge, operated by the 2-rail electrical system, with pantograph connections. The whole layout measures about 19ft. 6in. by 6ft. 6in., so it must be quite an imposing display. The use of realistic mountain scenery makes it most attractive, with tunnels, bridges, roads with traffic and wayside villages, numerous station buildings, and the track ingeniously laid at various levels.

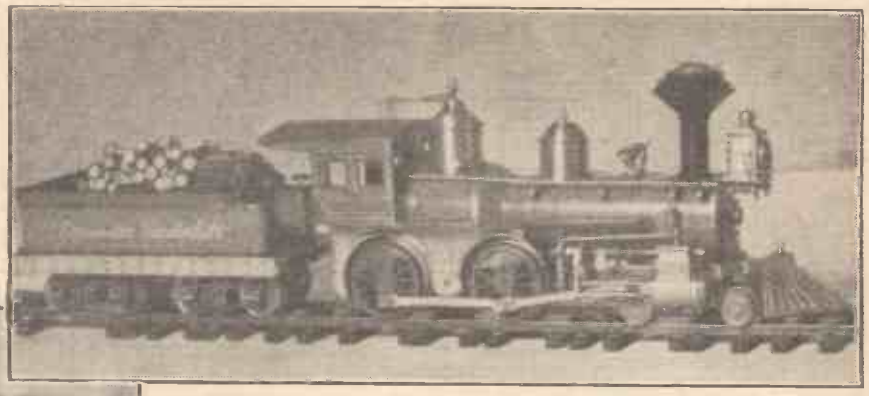


Fig. 1.—(Left.) Part of the large OO gauge model railway built by members of the Leipzig Model Railway Club, showing a mixed goods train just entering a tunnel.

Fig. 2.—(Above.) The "Commodore Vanderbilt" : a hand-made gauge O model of an American locomotive of 1885.

The "Commodore Vanderbilt"

Readers will remember my previous references to the gauge O models of old-time American steam locomotives in the collection of Mr. H. Buhlimann of Zürich, Switzerland. I have just received a new photograph (Fig. 2) from Mr. Buhlimann showing one of the latest additions to his collection: the "Commodore Vanderbilt," an American old-timer of 1885. The model is entirely hand-made and shows an improved design on the 1880 model featured in PRACTICAL MECHANICS last October.

Model Bucket Dredge

Those who have spent a few idle moments watching a bucket dredge at work in some canal or harbour may not have regarded the squat, dark vessels as an attractive subject for a model. These dredges are usually painted in drab colours which are suitable for the clearance work on which they are engaged.

Nevertheless, readers will see from the accompanying illustration (Fig. 3) that, disregarding the dirt imposed by working conditions, and with contrasting paintwork, a bucket dredge can make a most interesting model subject. The machinery on the model has been painted to give a smart appearance, but otherwise the model is accurate to the finest detail. The decks are painted white, superstructure is grey and black, machinery is electro-plated, with silver gears and black framework.

The model illustrated is of the *Ham III*, a non-propelling bucket dredge, built by Messrs. Lobnitz and Co., Ltd., of Renfrew, Scotland, in 1947. A dredge of this type is towed into position for operation and then anchored. Although it is non-propelled, when the anchors are down the anchor hawsers run to manœuvring winches on the decks, which allow the vessel a certain amount of limited movement. The ladder over which the buckets move is controlled by a crane, which raises or lowers the ladder to the required depth, the maximum depth for dredging being 60ft. 750 cu. yd. of spoil can be collected per hour, bucket capacity being 28 cu. ft.

This model was built to the order of Messrs. Lobnitz and Co., Ltd., by Messrs. Bassett-Lowke, Ltd., of Northampton. It is to a scale of ¼in. to 1ft., and is to be used for exhibition purposes.

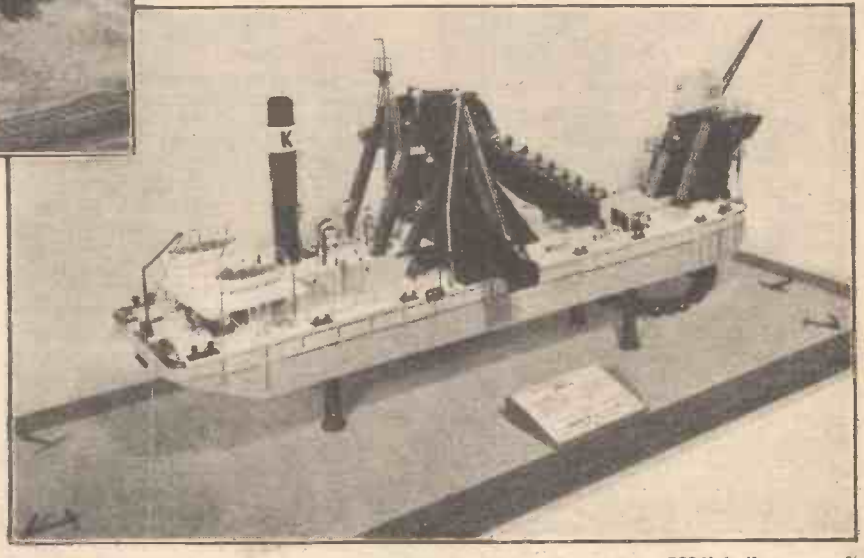


Fig. 3.—Exhibition model of a non-propelling bucket dredge, "Ham III," built to a scale of ¼in. to 1ft.

Miniature Scale Indoor Railways

Constructional Details of a Novel System Utilising Auxiliary Loco-motors

By E. W. TWINING

(*Concluded from page 168, February issue*)

AN enlarged plan of switches 2 and 3 is given in Fig. 7; here the lower diagram indicates how two such switches can be made to fit together so as to have both up and down lines open simultaneously. It will be noted that no switches appear on the surface of the model; they are fitted in the channels to guide and deflect the slides.

Referring back to Fig. 6, the reader may ask what the other switches, 4 and 5, are required for. The answer is: that an up train may, if the up platform is occupied, have to be run into the down platform, and would need a crossover of this direction. That is the reason why switches 2 and 4 cannot be other than mechanically controlled.

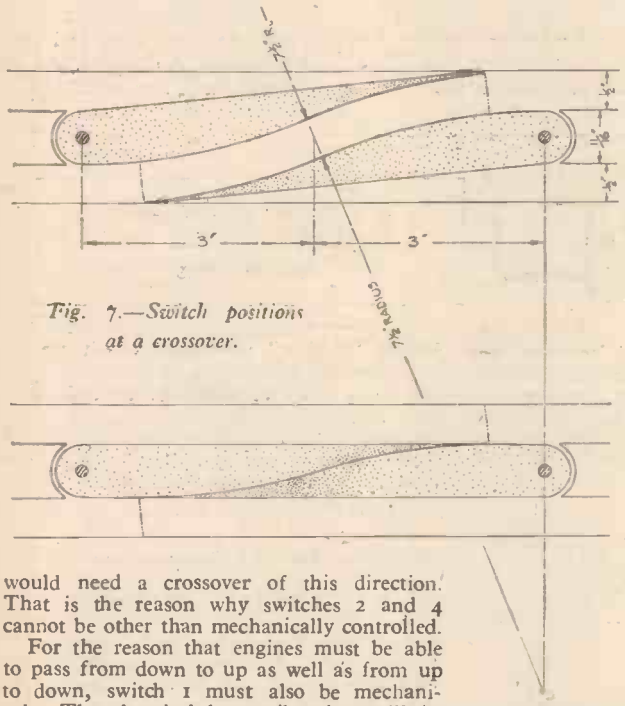


Fig. 7.—Switch positions at a crossover.

For the reason that engines must be able to pass from down to up as well as from up to down, switch 1 must also be mechanical. The electrical base-rail points will be operated to correspond with the slide switches, free or sprung or mechanical, and those mechanical, above and below, can be coupled together. It must be noted that the channel, or slide, switches cannot be worked from the surface. Each mechanical slide switch must have a stout wire shaft for a pivot, running down to the foundation shelf below; a very simple matter. In Fig. 6 M.C. is mechanical control; S.C. is spring control in one direction only; and F.A. means freely automatic, moved as required by the slides.

A Main-line Junction

A plan of an up and down main-line junction is shown in Fig. 8. In this only one switch needs to be mechanically controlled and that, of course, is a facing point. The working of the remaining three is explained on the drawing.

There is one little matter regarding these switches which I might mention and that concerns those left open for one track by springs. Although it is possible to get a spring of a certain type up on the switch level, I think it would be very advisable to carry shafts for them down to the base board, like those for the mechanical type, and put the springs—which can be rubber bands—down there on the lower level, each spring pulling on a short lever soldered to the shaft. These shafts can be straight lengths of wire of about No. 16 S.W.G. The freely automatic switches need no shafts, just pins.

In Fig. 9 I have drawn a cross-section of the track in open country. This shows, on the right-hand side, a cutting ending in a tunnel front, or portal, and on the left a portion of an embankment. In both cases the woodwork construction is suggested. Although the dimensions figured are for one-tenth of an inch to the foot the channels, slides and track centres will be the same, whatever the scale. The tunnel opening can be much smaller for the one-sixteenth inch and, of course, smaller still for the one-twentieth scale.

Obviously bridges, like tunnels, can span the railway but there can be no underbridges or viaducts; this is perhaps a pity, although I do not think these will be missed very much. I have always advocated concentrating on landscape and letting earthworks be the principal engineering features.

Before the top surface plywood is put down finally the whole of the insides of the channels, the switches and the slides should be well blackleaded and polished to reduce wear and friction, and it may be well to make some unobtrusive portion of the top surface removable for later access to the slides.

Ballast, Sleepers and Permanent Way

I have suggested that the surface plywood be faced with cartridge-drawing paper; the idea of this is to provide a smooth and white surface for painting on. This paper need only be a strip or band of width equal to the "permanent way," including the ballast; it can be stuck down after all the woodwork construction is completed as one broad band and then cut away with a razor blade where the upper slots occur in the plywood, letting the edges of the slot serve as a guide for the blade.

Since there will be no flanges on the wheels of the trains and no actual rails in relief, both sleepers and rails will be drawn on the cartridge paper. Either flat oil paint or water colour can be used, but I am inclined to advocate water colour. First wash over the whole surface of the paper with a tint of colour for the ballast. Sepia, with a little body white added, will give the desired result; then with the same colour, without the white added, neatly paint in the sleepers. These can be drawn singly with a water-colour brush or by cutting a little stencil to do, say, a dozen or more at a time. A stencil, if properly set out and cut, ensures that the spacing and sleeper lengths are true and uniform.

When all sleepers are in, the rails have to be drawn, and for these I think that draughtsmen's waterproof ink will be the best. There are several ways of drawing these lines truly; the best would be to make a little wooden block to fit and slide in the top slot, such a block having clips to hold two ruling pens, correctly spaced to gauge. Another way is to use an ordinary bow compass for ink, preferably a spring bow. This can be applied in such a way that the point of the compass projects well down into the slot in the track. Fill the pen of the compass with Indian ink, introduce the point into the slot, pressing it up to one edge of the same; bring the pen down on to the paper and draw the line, letting the thickness of the line be regulated according to the scale of the railway and the opening of the compass according to the gauge; by this method only one rail is drawn at a time. When all is finished, including lines to represent switch tongues, frogs and check rails, give the whole of the paper a coat of some hard, colourless spirit lacquer of which celluloid, dissolved in amyl acetate, is the best.

Speeds

Now a few words regarding the speeds at which these miniature trains should be run. If the scale is 1/120th full size the model should run a scale mile in the same time as a full-size train. As shown in the table

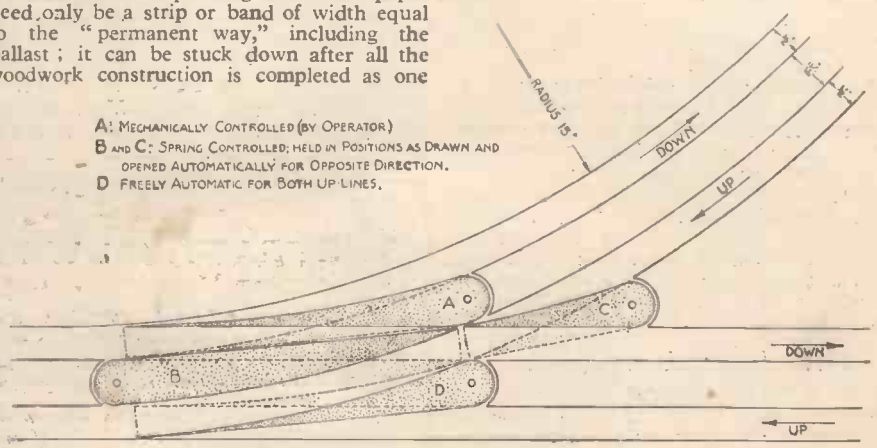


Fig. 8.—Track switches at a main-line junction.

in the February issue a one-hundred-and-twentieth scale mile measures 44ft., and if we assume that the prototype train is travelling, say, 60 miles an hour then our model should take one minute to cover 44ft. of track; in other words and figures its speed should be about 8.8in. per second. On the 1/16in. to the foot scale it will be 5.5in. per second, and on the 1/20in. scale 4.4in. per second.

A local stopping train, such as I have illustrated in Figs. 2 to 5, should not be run at much more than one-half the foregoing speeds, whilst expresses can have up to 50 per cent. inches-per-second added, representing 90 miles per hour.

I think it pretty safe to say that the majority of model trains are run too fast, and, for the sake of realism, excessively high speeds should be avoided. For this reason it will be found imperative that the gearing between the electric motor and the wheels of the motor truck should be altered so that the truck can be run with full current on and yet travel at a much more moderate speed than it was originally made for.

There are just a few other points that occur to me to mention in connection with the proposed model-railway scheme; one is that express tender engines cannot be run to the opposite end of a train in the way described for tank engines. Neither can they be turned on a turntable. If an engine is to be turned end for end it will have to be done either on a simple triangle of track or by running it around a loop. Both of these methods have been resorted to in full size practice when new engines were too long for existing turntables.

One other point: This scheme lends itself admirably to the adoption of early period and historic engines and trains. One of my correspondents wishes to model old London and South Western stock, including those extremely pretty engines of Joseph Beattie. This he can do quite well as can anyone else having a love for railway history. Even the Rainhill trials of 1829 on the Liverpool and Manchester Railway could be reproduced in miniature.

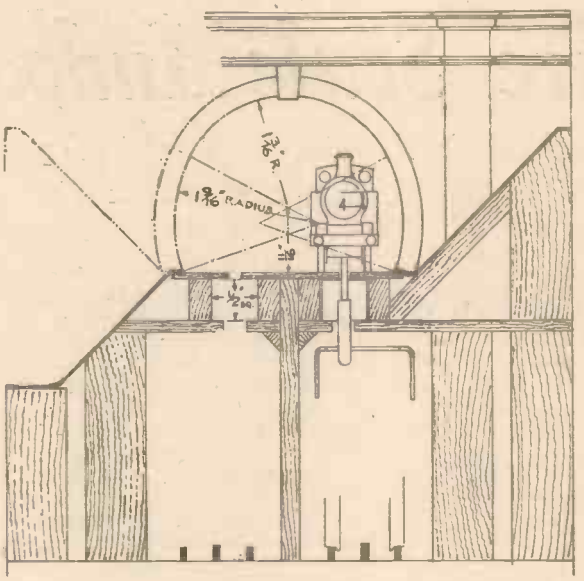


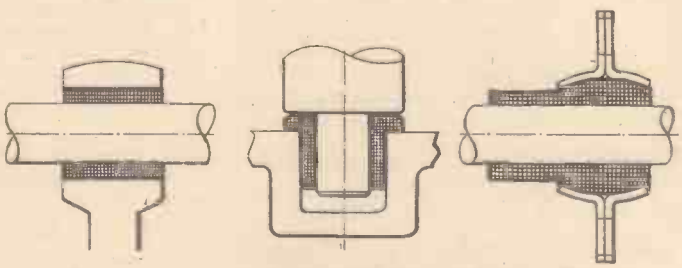
Fig. 9.—Cross-section of an embankment and cutting.

Trade Notes

A Review of the Latest Appliances, Tools and Accessories

"Reservoil" Oil-retaining Bearings

THE Morgan Crucible Company, Ltd., Battersea Church Road, London, S.W.11, have issued a brochure (SD40) giving complete technical information concerning their "Reservoil" bearings. An all-important factor in the smooth running of all types of machine is efficient lubrication. Bearings have to maintain continuous service, and failure of one of these small components may put a costly machine out of action with consequent loss of production. To reduce the risk of failure much labour is involved in the routine oiling of bearings. "Reservoil" makes a substantial contribution towards solving this twin problem of bearing failure and expensive lubrication. The new "Reservoil" oil-retaining bearings are manufactured by powder metallurgy methods from carefully selected bronze or iron powders. These bearings are tool-made to precision limits, their special porous structure enabling them to hold up to 30 per cent., by volume, of oil. This reserve of oil provides sufficient lubrication for all but the most severe conditions of load, speed and temperature.



Three examples of "Reservoil" bushes—cylindrical, flanged and self-aligning.

A companion brochure (SD41) contains lists of the large number of standard size "Reservoil" bushes which are normally held in stock. Copies of both brochures are obtainable from the Morgan Crucible Company, Ltd., at the address given.

Ex-Government Radio Equipment

THE Clydesdale Supply Co., Ltd., have just issued the new list (No. 8) of ex-Government electronic and radio equipment. This useful list, which runs to 180 pages, includes such items as amplifier units, test equipment, plugs and sockets, various types of meters, electric motors, transformers, capacitors, and a variety of other components used by experimenters. The list, which is priced at 1s. 6d., is obtainable from the Clydesdale Supply Co., Ltd., at 2, Bridge Street, Glasgow, C.5.

Miniature Ball Bearings (A correction)

IN our January issue we published a note concerning the new catalogue issued by Miniature Bearings, Ltd., of Sloane Street, London, S.W.1. The catalogue should have been referred to as the R.M.B. English catalogue, but owing to a printer's error the letters "B.M.B." were used which are the initials of the British Manufactured Bearings and Co., Ltd., of Crawley, Sussex. This firm also issues a very comprehensive catalogue of miniature ball bearings for all purposes, the sole selling agents being B.M.B. (Sales), Ltd., 2, Balfour Place, Mount Street, London, W.1.

Spring Design and Calculations

WE understand that, owing to increased costs, the new edition of the book bearing the above title, and published by Herbert Terry and Sons, Ltd., Redditch, is now 12s. 6d., and not 10s. 6d., as formerly.

Aeronautical and General Instruments

AERO-SPARES Co., 70-71, High Holborn, London, W.C.1, have issued a new list (No. 500) of their ex-Government instruments of all kinds ranging from small electric motors and air blowers, to aeronautical and navigation instruments. The model engineer and experimentalist in want of such articles as transformers, rotary converters, pressure gauges, flexible drives or hydraulic pumps, will find a variety of these articles included in this comprehensive list, which also includes photographic and optical equipment. Most of the items listed are illustrated.

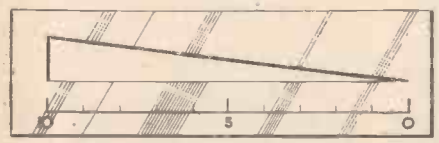
Glycerine for Anti-freeze Purposes

SIR,—We have recently had a number of enquiries for glycerine for anti-freeze purposes addressed to our associated company, Messrs. Jos. Crosfield and Sons, Ltd., Warrington, and we gather that in a recent issue of PRACTICAL MECHANICS you have recommended glycerine for anti-freeze purposes.

We would, however, point out that although in normal circumstances glycerine is used for anti-freeze, owing to the short supply position and the demands of essential industries we are unfortunately unable to make glycerine available on the home market for this purpose. —GLYCERINE, LIMITED (London, E.C.4).

Magnification of a Telescope

SIR,—With reference to the query and reply on the "Magnification of a Telescope" in the October issue of PRACTICAL MECHANICS, the determination of the focal length of a compound eyepiece is difficult,



A cut-out wedge 10 cm. x 1 cm. Graduations along the base represent mms.

and the calculation of the magnification from these methods is inaccurate. A very simple method which is quite accurate, especially in lower-powered telescopes and binoculars, is to measure the diameter of the entering and emerging rays.

To do this :—

1. Focus the telescope on a distant object.
2. Turn the instrument to a light or white object which fills the view
3. Hold the wedge, described farther on, 10in. from the eyepiece and measure the diameter of the disc of light.
4. Measure the diameter of the eyeglass and objective, then magnification

$$= \frac{\text{diameter of objective}}{\text{diameter of disc of light}}$$

A measuring wedge can be built up from brass or cut out from a 6in. × 2in. piece of metal. A micrometer, if available, can also be used, but it is advisable to clamp it in an unmovable position to avoid fatigue in measuring.—A. READER (Dundee).

Tricycles

SIR,—As a tricycle rider of 12 years' experience I was very interested in the notes on tricycles in your July and October issues. The writer in the July issue speaks of "quite large rallies of tricycles," in his boyhood. I can assure him that "The Tricycle Association" is a going concern in England. It now has 350 members of whom 250 are active, some being prominent speedmen.

My "Trike" is a racing model, which I took over from the late Albert Watson when he joined the R.A.F. in 1939. On this machine he broke the 50-mile British Road Record (unpaced) in 1936. That record still stands at two hours 40 seconds. A year later he broke the Edinburgh-York record on the same machine, and this record still stands, at 11 hours 10 minutes. This machine has a differential gear. These gears are not made now for tricycles, as the firm which produced them was blitzed in the war and did not resume production. Post-war tricyles have one-wheel drive. I believe this would partly explain why Watson's records have stood so long.

Re the notes in your October issue, the writer says how difficult it is to learn to ride a tricycle. It is for the large majority, but a few take to it quite quickly. Not being able to ride a bicycle is an advantage here, because the learner has nothing to unlearn; one who has been used to a bicycle begins on a tricycle by trying (unconsciously) to balance it. It balances itself. Your writer mentions certain disadvantages about tricycles. But these machines have some good points, too, viz :—

1. They are quite manageable on ice, where a cyclist would come to grief.
2. They are very handy in thick traffic—one has no need to dismount. I can reverse mine, it having a fixed wheel.
3. They do not wobble when climbing a steep gradient.

So, in spite of being a trifle slower, about two m.p.h., they are a practical proposition.—D. M. Ross (Turriff, Aberdeenshire).

Steam Buses

SIR,—Your correspondent, Mr. E. O. Crosse, recalls the "National" steam buses and wonders why that form of transport died out.

Having been connected with the development of the Nationals since 1897 I am able to give the facts.

It is correct that the National Steamers were the fastest and most comfortable buses of their time, maintenance costs, however, especially the boilers, were very heavy, and when at the end of the first World War competition became fiercer and costs higher it was found that 34-seater buses in London could not be made to pay.

Shortly before the war ended, Mr. W. J. Iden, who had a year or two earlier resigned from the position of Chief Engineer to the London General Omnibus Company, joined the National Company with a view to organising the manufacture of coke-fired lorries for the Army; the anticipated War Office order did not materialise and he turned his attention to negotiating an agreement with the L.G.O.C.

Under that agreement the L.G.O.C. undertook not to operate an agreed London radius and the National not to run inside; the L.G.O.C. took over the National garages in London.

Mr. Iden being somewhat "petrol-minded" the National Board decided to scrap the steam chassis and to mount the bodies, after enlarging them, to 42-45 seats, on ex-W.D. A.E.C. chassis; these, together with some ex-General B-types, were used to start up services in various South of England districts.

It is of interest to note that shortly before the changeover the troublesome boiler had, by following up suggestions made by members of the works staff, evolved into what came to be known as the "thimble tube" type, and that to the present day it is made and used for industrial steam supplies.

The "thimble tube" modification, however, arrived too late to save the steamers from being scrapped, and now they are only a memory.—W. J. MORISON, M.I.Mech.E. (Stornoway).

Painting Over Creosote

SIR,—Your correspondent A. Holdsworth need not worry at all. All he need do is to give his creosoted surface a coat of "Rotarista" paint, and then he can carry on with any paint, cellulose, or whatever he likes, and the creosote just won't come through.

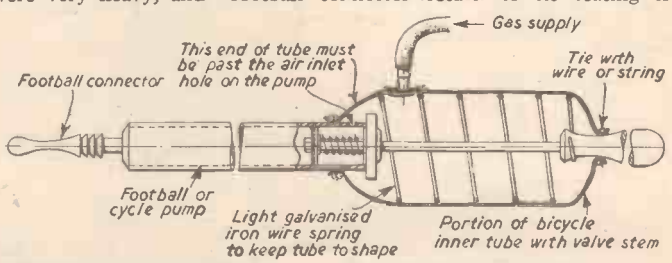
This paint is a sort of bitumen material and is turned out in three or four colours and an aluminium finish.

I have had personal experience of painting Rotarista over creosote, soot-stains, knots, rusty steel, brand new asbestos, brand new galvanised iron, and all sorts of troublesome surfaces, and I have never known a failure. I have used it for about three years.

I get it from my local paint suppliers and I have no interest in it whatever except as a satisfied user. I have passed on the good news to many of my friends and they all agree that it is a real undercoat with, apparently, no disadvantage whatever. The manufacturers, Dennis and Roberts, Ltd., 14A, Clumber Street, Nottingham, issue a brochure on the paint which can be obtained from the address given.—W. E. BRYAN (Derby).

Inflating Toy Balloons

SIR,—I have noticed that one of your readers, R. F. Borrill, desires to inflate toy balloons. I therefore enclose a sketch of my piece of apparatus which works quite satisfactorily. The only precaution necessary, once the apparatus is fitted up, is that whilst inflating, the pump should be held in an upwards, vertical position, as the pressure of gas in the balloon is not sufficient to make the ball valve in the football connector return to its seating if held vertically downwards.



Simple apparatus for inflating toy balloons from low-pressure gas supply

I might add that on New Year's Day, 1950, I released a balloon which was inflated by this apparatus, and the filling was ordinary domestic coal gas. On January 5, 1950, this balloon was picked up in some fields outside Reggio, in Northern Italy.

It was returned to me in due course, along with the scrap of paper on which I had written my address.—G. LORD (Radcliffe).

An Aspect of Perpetual Motion

SIR,—The article written by Mr. D. A. Bell in the December, 1951, issue of PRACTICAL MECHANICS has opened up a new field of thought for obtaining "perpetual motion."

Let us first consider the basic principles on which his idea depends.

(1) The approximate resistance of mercury at a temperature t°C. is given by the equation

$$Rt = Ro(1 + at + \beta t^2)$$

where Ro = resistance at 0° C., Rt = resistance at temperature t° C., a and β are coefficients of increase in resistance with temperature.

When Rt = 0 ohms.

Then $1 + at + \beta t^2 = 0$. $\therefore$ at $+\beta t^2 = -1$.

For normal temperatures β is very small and a = 0.000879. Let us assume that the above equation holds for extreme temperature changes.

Then at $= -1$

$$\therefore t = \frac{-1}{0.000879} = -1138°C.$$

This temperature is very low indeed and to my knowledge a temperature lower than −273 deg. C. has not yet been reached. If a temperature within this region could be obtained, it would give a further guide as to whether mercury could have zero resistance.

(2) Consider the ring of mercury into which a bar magnet has been introduced. At a temperature of approx. −1138 deg. C. let us assume that the ring of Mercury has zero resistance. Then the induced emf. E. in the mercury ring, caused by a movement of the bar magnet, produces a current in the ring of:

$$I = \frac{E}{0} \times 10^{-8} \text{ amps.} = \text{infinite current.}$$

This infinite current would produce an opposing magnetic field of infinite strength.

We should find that any movement of the permanent magnet in a longitudinal direction would be impossible. No matter how slowly the magnet was removed, an induced emf would be formed in the mercury ring, causing an infinite opposing magnetic field which would form a "magnetic lock."—DENNIS TERRY (Oldbury).

Interplanetary Travel

SIR,—Whilst appreciating that many things are commonplace to-day which only a few decades ago would have appeared literally miraculous, I must confess my inability to accept the view that "some day" journeys may be made even to the planetary systems of "other stars" (sic!).

My knowledge of astronomy is perhaps elementary, but I remember Alpha Centauri as being the closest star to the solar system some four and a third light years away!

It seems reasonable to doubt whether a man-made vehicle will ever travel at the speed of light! (Certainly this velocity will not be exceeded.)

Supposing a speed of 18,600 m.p.sec. could be attained (relative to earth) by a rocket, a velocity beyond the comprehension of most people—including myself!—then the travellers inside would be more than 80 years older on their return from a non-stop visit to our nearest neighbour, which is a pretty insignificant star anyway.

From this point of view it seems to me we are bound to confine ourselves to our planetary neighbours, which surely gives us enough to accomplish.

It is as well to remember that we have to traverse a distance to Pluto forty times as great as from Earth to the sun!

Whilst on the subject, however, I would like some information concerning meteoric bombardment. We have no conception of the truly appalling effect of a collision with a body speeding towards us at from 10 to 50 m.p.sec. No projectile on earth comes near the lower figure in velocity!

Harvard Observatory once estimated that the Earth encounters over 100 billion every 24 hours, not including the regular meteoric showers—Perseids, Lyrids, Andromedes, etc. How is it proposed to guard against, or evade, these frightful bullets, ranging in size from a speck of sand to a chunk of rock?—W. E. HADFIELD (East Molesey).

Water Softening Data

SIR,—May I draw your attention to certain statements which appeared in the article "Making a Water Softener" (January issue).

1. To obtain the hardness in grains per imperial gallon, i.e., English degrees, it is necessary to take 70c.c. of sample in the shaking bottle, and not 60 as stated. Incidentally, as it is current practice nowadays to record hardness in parts per million (100c.c. of sample required), many laboratory furnishers no longer supply 70c.c. graduated shaking bottles.

2. Calcium carbonate, $CaCO_3$, is not really the cause of hardness in water, as it is only very slightly soluble. In fact, it is a common fallacy to say that tap water contains chalk. It does not. It contains calcium bicarbonate, $Ca(HCO_3)2$, which deposits chalk when the water is boiled, $Ca(HCO_3)2 = CaCO_3 + H_2O + CO_2$.

3. Likewise, no calcium carbonate is *absorbed* in the base exchange process. The calcium and magnesium ions take the place of sodium in the zeolite, and the sodium ions go into the water. Sodium zeolite (base exchange salt) + calcium sulphate (a typical hardness salt) = calcium zeolite + sodium sulphate (a soluble salt). When the softener requires regenerating, sodium chloride (common salt) is added to reverse this action thus: calcium zeolite + sodium chloride = sodium zeolite + calcium chloride, and we are back where we started.

I realise that the article referred to dealt primarily with water softener construction, an excellent idea. However, I mention the above facts as briefly as possible in case anyone should be misled on the technical side of the instructions.—D. A. BAYLISS (Enfield).

Club Reports

The Ramsgate and District Model Club

WITH the New Year well into its stride this club is looking forward to many interesting evenings. In February a social evening and film show was held on the 13th and a puppet show on the 27th. Our outdoor activities for the summer months are now being arranged and we are also preparing to hold our exhibition during the latter part of the year. We have an active membership of between 30 and 40 and are keen to increase this. The club is open every Wednesday and Friday when prospective members would be very welcome. Our interests cover most branches of model work. —Secretary: MR. E. CHURCH, "Avis," St. Mildred's Avenue, Ramsgate.

Harrow and Wembley Society of Model Engineers

THE above society held its annual general meeting on Wednesday, January 9th, at Heathfield School, College Road, Harrow.

Mr. F. Sedcole, the society's chairman, summarised the activities of the club, with a special reference to the healthy financial state of the club during the past year. Thanks were given to all members for the interest shown in the society's activities, particularly those who have helped in the construction of the club's elevated loco track at Headstone Lane.

On the election of officers for the present year, one or two changes took place, Mr. S. J. Hobson is now assistant secretary, a post that is not new to him, having held the position on a previous committee. Mr. S. L. Brown takes over the post of librarian, and the re-established office of entertainments and exhibition secretary has been entrusted to Mr. S. R. Emery. The committee also had a couple of changes. Mr. E. R. Uphill now takes charge of the general section, whilst Mr. F. A. Cottam takes over the loco section.

Future Programme

March 5th, committee meeting; March 12th, Mr. Fox on plating and finishing; March 26th, a talk on heavy transport.—Hon. Secretary: C. E. SALMON, 11, Brook Drive, Harrow.

Beaufoy Model Engineering Society

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

New members are cordially invited to make use of these facilities, and members of other clubs might find some use for our extensive workshops.—Hon. Sec., S. T. HUNT, Beaufoy Institute, 39, Black Prince Road, S.E.11.

Aylesbury and District Society of Model Engineers

THE annual general meeting of the club held on January 16th saw only one new face on the committee. Mr. C. Gill was elected in place of Mr. Gower, otherwise last year's officers and committee continue to serve.

For the club, 1951 was a very successful year, in which the commencement of the large-scale track, purchase of the "O" gauge track and visits by Mr. J. N. Maskelyne and Mr. G. Dow were only a few of the highlights. The members contributed a varied and very interesting collection of talks and demonstrations, which, with two model nights, completed a year of monthly meetings. —E. H. SMITH, hon. sec., Mulberry Tree Cottage, Devonshire Ave., Amersham, Bucks.

Kodak Recreation Society (Experimental Engineers and Craftsmen Section)

WE have pleasure in announcing that our next open exhibition will be held in the Kodak Hall, Wealdstone, Middlesex, on Saturday, March 29th, and Sunday, March 30th, 1952.

Further particulars regarding exhibition classes, etc., can be obtained from the Hon. Asst. Secretary, C. R. L. COLES, at the above address.

QUERIES and ENQUIRIES

A stamped, addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on page 48 (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.

Preserving and Dyeing Sheepskins

WHAT process is necessary to clean, preserve and dye sheepskins which have just been flesh-dressed and washed ?

I have some sheepskins in this condition and am desirous of treating them to prevent sweating, and wish to dye them for rugs.—D. G. Mainwaring (Swansea).

PREVIOUS to dyeing, the sheepskins must be cured or tawed by placing them in a preservative solution consisting of 1lb. of alum, ½lb. of common salt, and about ¼ peck of bran in 1 gallon of boiling water. This solution should be well stirred and covered for some time in order to allow the bran time to swell. The solution is allowed to cool before the skin is placed in it. The skin is then left in the solution for two or three days until the curing or tawing is completed, which latter may be known by a characteristic white line of skin being left when a part of the skin is folded up and pinched between the fingers. At this stage the skin is removed from the solution, stretched on a frame or over a door or board, and curried by scraping it in every direction with a blunt edge in order to remove the inner part or membrane of the skin. The skin is now allowed to dry slowly, and the scraping continued, being supplemented by shaking and by rubbing the skin between the fingers. The skin will now be ready for dyeing.

In order to dye the skin thus prepared, it is placed, wool side downwards, into the hot dye bath, and allowed to remain therein for about two hours. The dye bath depends largely in composition upon the type of dyeing which is required. A dye of the "basic" class should be used. An average strength of the bath would consist of about six parts of dye and three parts of sodium sulphate (Glauber's salt) dissolved in 91 parts of water. If the shade is not deep enough, the skin can be returned to the bath and re-dyed. Finally, the skin is well washed in warm water and allowed to dry in the air. It should be observed that this treatment will only dye the wool, and not the actual skin itself.

Drilling Holes in Glass

CAN you tell me how to drill small holes, about 1/16in. diameter, in glass about ⅛in. thick, and also in bone porcelain about 3/16in. thick ?

If special equipment is needed, where can it be obtained ?—T. L. Green (Rye).

THERE is nothing complicated about drilling small holes in glass. The only special commodity called for is an abundant supply of *patience*.

First of all, using a hard steel point, make a scratch on the glass at the place where the drill has to be started. The drill tip should be as hard as possible. Some recommend that it should previously be heated to dull red heat and then plunged into mercury, but we hardly think that this is necessary. The drill point should continually be moistened with genuine turpentine (not "turps. sub."). Do not press the drill too heavily and, if possible, work from both sides of the glass successively. Run the drill at an ordinary speed. It may take as much as one hour to drill a 1/16in. hole because, all the time, you will have to go so carefully. If you should want to enlarge the hole, use a rat-tailed file wetted with turpentine. In fact, whatever the size of hole you wish to drill, always start with the finest practicable drill and be content to enlarge the hole afterwards by the file method. As stated above, however, you should be able to drill a 1/16in. hole direct and without the necessity for subsequent enlargement.

Drilling in any sort of porcelain requires similar precautions, but it is much easier to carry out for, although porcelain has a very hard surface, it is often surprisingly soft and "drillable" inside.

In answering your query we have assumed that you do not wish to use a fine diamond-tipped drill, but, if so, these may be obtained from any wholesale firm of dealers in jewellers' tools as, for example, Messrs. Robert Pringle & Sons, Ltd., 40-42, Clerkenwell Road, London, E.C.1. Such tools, however, are not easy to use.

Running an I.C. Engine on Hydrogen

CAN you inform me if it is possible (with a few minor alterations) to run an internal-combustion engine on hydrogen ? Also, how much volume of hydrogen per minute would be needed to run, say, a Ford 8 engine ?—R. W. Fetting (Islington).

IT is possible, but not practicable, to run an ordinary car engine on hydrogen. In the first place, this gas is expensive. It has to be stored in heavy cylinders, and necessitates the use of a specially-designed "gas carburettor" (a gas valve). It actually detonates during combustion, its rate of burning being too high for ordinary engine purposes. Hence, you would always get back knocking. You would require a higher compression engine. This, too, would increase the tendency to knocking and the entire engine, under hydrogen running, would rapidly knock itself to pieces. Coal gas, of course, contains hydrogen, but it also contains carbon compounds which serve to diminish the too-energetic combustion of the pure hydrogen. Hence, under the proper conditions, coal gas can be used as an engine fuel.

It is quite impossible to determine accurately how much hydrogen would be required per minute to run your engine. We must know the type of engine, its output, compression-ratio under hydrogen working, capacity of cylinders, and other factors as well. But, to hazard a very rough estimation you would probably find that the engine would require 2:4 gallons of the gas per minute of normal running with ordinary loads. This consumption would be increased with heavier loads and greater speeds. You, perhaps, may be able to do the calculation better yourself when we tell you that 1lb. of hydrogen requires 8lb. of oxygen to combust it completely, the combustion product being water (in the form of steam).

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.

Making a "Stevenson's" Screen

PLEASE supply particulars for making a Stevenson's screen, including measurements.—R. Warnett (Uxbridge).

BY "Stevenson's" screen, we assume that you refer to the metecrological appliance of that name. This is simple enough in construction, and it can be made in any size according to your requirements. It is merely a sort of housing or sheltering device for meteorological instruments of various kinds. In its common form, it consists of a wooden box or enclosure having a double roof (with an air-space between) and louvered walls, these serving to protect the instruments from sun, rain and winds whilst, at the same time, permitting free ventilation.

The screen may be made in any size convenient for the accommodation of your instruments. It is best made in well-seasoned pine, painted dull black inside and a dull green on the outside. The screen should stand on four wooden legs, and the base or floor of the screen should be just 3ft. 6in. above the ground. The actual construction of the screen may be dictated according to your own methods. The wood might be from ¼in. to ⅜in. thick, and an air-space of about 1in. left between the double roof.

Matt Black Paint

I WISH to paint some photographic parts such as metallic slides, lens mountings, etc., and require a matt paint I have not found in the market.

Can you give me a formula, or supply me with the address of a firm that would supply it ?—J. Duarte Ferreira (Coimbra, Portugal).

YOU omit to state the actual colour which you wish the matt paint to be, but, since you require it for scientific apparatus, we presume that you will wish it to be black. Excellent matt black paints are manufactured for such scientific work by Messrs. Johnson & Sons, Ltd., Hendon, London, N.W.4, and, also, by Ilford, Ltd., Ilford, London. These can be obtained direct from the makers and also from any large firm of photographic dealers, such as Messrs. Wallace Heaton, Ltd., New Bond Street, London, W.1, or Messrs. Jonathan Fallowfield, Ltd., Newman Street, London, W.1.

Such a paint can readily be made by dissolving celluloid in a mixture of three parts acetone and one part amyl acetate, until a liquid of thin paint consistency is obtained. Into this liquid, ordinary carbon black or lampblack is ground until a paint with sufficient body is obtained. If this paints tends to dry out glossy, add a little more acetone to it.

Lime-Sand Bricks

CAN you supply me with particulars of the manufacture of lime-sand bricks, plain and coloured ?

I understand that these bricks, which are manufactured in the south of England, have a reasonable lasting quality and do not require one-quarter the "burning" of a clay brick.

I believe the main factor is the quality of the sand, and if this is so, an analysis of the best type would be appreciated.—S. L. Wears (Chester-le-Street).

LIME-SAND bricks are more difficult to make than ordinary clay bricks, despite their being fired at lower temperatures than the latter. Both the sand and the lime should be as free from iron as possible. The sand should comprise an approximately equal mixture of high-quality coarse and fine sands. This is mixed in about equal parts with high-grade slaked lime. The mixture is then damped and compressed. Finally, it is air dried and conveyed to electric kilns in which it is slowly heated up to about 1,000 deg. C. After baking, the bricks are slowly cooled and, usually, they are afterwards given a coating of glaze.

There are several textbooks in which you will find the details of lime-sand brick manufacture. One or other of these should be obtainable, on request, from your local County Library. We advise the following volumes:—A. B. Searle & E. Dobson: "A Rudimentary Treatise on the Manufacture of Bricks and Tiles," 1936. A. B. Searle: "Modern Brick-making." A. B. Searle: "Sands and Crushed Rocks." (2 vols.) A. B. Searle: "Clayworkers' Handbook." H. Wilson: "Ceramics: Clay Technology." A. W. Comber: "Magnesite as a Refractory," 1937.

Removing Stains from Porcelain-surfaced Bath

I HAVE been using a brown-coloured bath salt in my bath, with the result that a brown stain rings the bath which I am unable to remove with paraffin or bleach liquid.

The bath is almost new and has a high porcelain gloss which I do not wish to damage. The stain appears to be in the surface of the enamel.

Could you please suggest methods which I could try to remove the stain, now several weeks old, without harm to the porcelain enamel ?—S. Kremer (Manchester).

IT is one of the defects of the modern porcelain sanitary ware that its surface is often sufficiently porous to absorb stains and other contaminants which find their way underneath the surface glaze and resolutely resist chemical removal therefrom. There is no infallible method of removing the brown stain from your porcelain bath. You might, of course, try rubbing gently with a paste of soap, water and common whiting, or, alternatively, with a paraffin-whiting paste, taking great care not to abrade the porcelain surface. If this does not work, the alternative method is to bleach the stains away. For this purpose swab on to the surface of the porcelain enamel a clear solution made by grinding up chloride of lime with sufficient water to form a thin, creamy liquid. This is dabbed on to the bath enamel and is followed, almost immediately, by dabbing on of dilute acetic or hydrochloric acid (one in five). These two solutions can be dabbed on alternately and repeatedly until they

penetrate the porosity of the bath surface and thereby remove the stain. Afterwards, the bath should be filled with cold water so that any surplus solution which has penetrated the enamel may be leeched out by the water.

Strengthening and Veining Plaster Casts

I WILL be very grateful if you would kindly let me know how ornaments, etc., made from plaster of Paris can be made strong and rendered highly resistant to abrasion? Also, is it possible to "vein" plaster of Paris to resemble marble?—C. H. Downs (Johannesburg, S. Africa).

PLASTER-CAST objects cannot be made completely abrasion-resistant. You can make them much stronger by incorporating about 10 per cent. of fine asbestos powder into the plaster mix, and, also, by slaking the mix not with plain water, but with a solution of 10 parts of glue or gelatine in 90 parts of warm water. This solution will be practically solid at normal temperatures. Hence, it must be used warm. It will delay the setting of the mixture very considerably, for which reason it should not be used when quick-setting of the mixture is essential. Further hardening can be effected by brushing the above warm solution liberally over the already cast objects. This procedure "fills" the surface pores of the plaster with glue or gelatine. It not only makes the objects easier to paint and colour, but it also imparts a little extra strength to them.

Veins in plaster casts can be produced by partially building up the cast with ordinary plaster of Paris mixture and by inserting at intervals, on the semi-dry material, thin layers of a paste made by grinding the vein material with glue or gelatine solution. The best material for the necessary veins comprises various mixtures of inert mineral colours. One such mixture, for example, consists of Chromium Oxide (Green) and slate dust suitably proportioned to give the right colour. Other mixtures may consist of Yellow Ochre, Red Iron Oxide and Mineral Black or Lampblack.

We must say, however, that unless these veins in plaster casts are very expertly done they are seldom effective or lifelike.

Rug-binding Solution

CAN you inform me if there is a rubber or other solution made that can be sprayed on the underside of a home-made stair carpet to seal the wool and prevent it being pulled out? If this is not possible, could you supply me with names of the makers of a base that can be ironed on?—A. G. Partridge (Wrexham).

THE rug-binding product which you mention consists, usually, of stabilised rubber latex. This is brushed on to the underside of the rug or mat, on which surface it coagulates rapidly into an enduring film and thus seals the loose ends of the rug threads together. Such material, in liquid form, can be obtained from most wool shops and stores. A product of this description known to us is the "Airlync" Rugbinding Compound made by Airlyne Products, Abergele, North Wales.

If you want an actual adhesive film or membrane for your work, you would do best, we think, to apply to one or other of the big London stores. Alternatively, you could apply to one of our advertisers of plastic materials, or to Herts Pharmaceuticals, Ltd., Bessemer Road, Welwyn Garden City, Herts.

Ink Eradicator ; Window Cleaning Fluid

WHAT is the formula for an ink eradicator for ball-pen ink?

Also, could you suggest a formula for a window cleaning fluid. One which will not leave a smear?—N. G. Bouchier (Bridgwater).

A GOOD ink eradicator for ball-pen ink can readily be made by dissolving a teaspoonful each of common salt and washing soda in a cupful of cold water. Two dessertspoonfuls of bleaching powder (chloride of lime) are then thoroughly well ground up with the resulting solution and the milky liquid is then filtered through fine blotting paper until it becomes almost clear. This is the ink eradicator which you require. It will last in good condition in well-stoppered bottles for about six or eight weeks. It is best used by brushing or dabbing on to the writing to be removed, this being followed by a similar dabbing or rubbing on of dilute acetic acid (one in five).

An excellent window cleaning fluid can readily be prepared by dissolving two parts of Teepol or Tergitol in 98 parts of warm water. Unfortunately, however, the above ingredients are not easily procured, even from chemical suppliers such as Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2. If you cannot obtain these materials, you will be able to make a good window cleaning fluid on the following lines:

Strong ammonia 2 tablespoonfuls.
Whiting 4 tablespoonfuls.
Methylated spirit, 2 tablespoonfuls.
Water to 1 pint.

Apply thinly and uniformly to the glass. Allow to dry and then wipe off with soft paper or cloth.

The above preparation may be poured into a wet cloth for application to the window after most of the dirt has been previously wiped off the glass.

"Crystal" Paint

BEFORE the war, a paint was obtainable for use on glass. I believe it contained camphor, and sold under the trade name of Joy.

This paint was applied freely, and after running, set in a variegated crystal pattern.

Can you inform me where such a paint can be obtained to-day, whether the glass needs any form of preparation prior to painting, also the best method of removing same? I desire to paint some glass lampshades.—S. C. Male (Bristol).

WE think that the paint you mention contained about five per cent. of naphthalene, not camphor. This so-called "crystal" paint was not successful and, so far as we have been able to trace, is not now available. Confirmation on this point, however, may be obtained by inquiry to The National Paint Federation, Paint Industry House, 79/80, High Holborn, London, W.C.1.

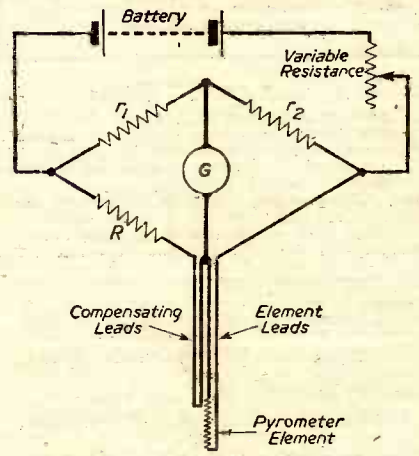
The glass should not need any special preparation prior to coating with this paint, other, of course, than an ordinary cleaning to render it reasonably grease-free.

The simplest method of removing the paint from glass would be to immerse the glass pieces bodily in a strong solution of caustic soda, say, one part in six parts of water. The solution should be used preferably warm, and the paint will become loosened almost immediately.

Modern paints for glass application can be obtained, we think, from Dryad, Ltd., St. Nicholas Street, Leicester. Here, of course, we are referring to the fine "artistic" paints, and not to the ordinary varieties of house paints.

Test Instrument for Temperatures

I WISH to make up a test instrument to read temperatures between 30 deg. and 100 deg. F. I have in mind the electrical resistance method for which is required a galvanometer and a nickel coil element operating the galvanometer.



A Wheatstone Bridge circuit for test instrument.

If I bought the element I understand the temperature resistance equivalent would be: at 30 deg. F. 99.5 ohms; 100 deg. F. 118.40 ms.

Can you advise me on a suitable instrument to obtain and also how to set up the equipment with cold junction, etc.—H. Fitch (Whetstone).

A COIL of nickel or pure platinum could be wound on a frame of mica or steatite. If required the coil could be protected by a steel tube.

The resistance measurement may be carried out by connecting the coil in one arm of a Wheatstone Bridge circuit. The bridge may have equal ratio arms and, preferably, a pair of compensating leads connected in the fourth arm. The compensating leads run parallel to the actual leads to the pyrometer coil, and compensate for changes of resistance in these leads.

The circuit is shown in the accompanying diagram; the out-of-balance current through the galvanometer gives the temperature directly if the scale is suitably calibrated. Initial setting may be done by adjustment of battery current until some definite deflection is obtained, when a standard resistance replaces the pyrometer in the bridge circuit. A suspended coil permanent magnet galvanometer would be suitable.

Liquid Glue

I WISH to make a cheap liquid glue, suitable for binding wood shavings. I can arrange to flow mould or pressure mould the mass. Can you please explain the method and state if formalin can be added to give an extra hardening effect?

Also, can you recommend any books on glues, adhesives and their uses?—A. R. Hiscock (Southbourne).

A GOOD liquid glue for your purpose can be made in the following manner: Boil together for several hours in a non-metallic vessel 25 parts of glue, 65 parts of water and four parts of nitric acid, stirring the liquid frequently. Then allow it to cool down and stir into it about 1/8 part of Lysol or carbolic acid.

This glue will be permanently liquid. It will make a good binder for wood-shavings or sawdust, the procedure being to spray the liquid glue over the material and then to pack it into metal moulds under light pressure.

The addition of formalin to the glue would ruin it. The formalin would insolubilise the glue and thus prevent it from having any bonding effect on the wood particles. Formalin can only be used on a glue after the glued joint has been made. Otherwise, the glue will be made too hard to have any adhesive effect.

The following books on adhesives would, we think, be of interest to you:

"Industrial Cold Adhesives," by E. Dulac; "Cements, Pastes, Glues and Gums," by H. C. Standage; "Modern Glues and Glue Testing," by C. H. Teesdale; "Glue and Gelatine, A Practical Treatise on Testing and Use," by R. L. Fernbach; "The Manufacture and Use of Plywood and Glue," by B. C. Boulton.

These volumes can be obtained through any good bookseller, and perhaps second-hand, from Messrs. W. and G. Foyle, Ltd., Charing Cross Road, London, W.C.2.

Heat Treatment of Metals

I WAS very interested in your article on coslettising, and shall be glad if you will tell me how much phosphate of iron per gallon of water would be needed, and how long the solution would keep at working strength.

Could you also inform me where I could obtain a book on chemical heat treatment?—J. A. Ingram (Wednesbury).

THE solution of sodium phosphate of which you speak can be of any strength—say 1 oz. dissolved in 1 pint of water. But whilst the immersion of iron or steel in such a solution is quite effective in phosphating the metal surface, it does not constitute a true coslettising. The latter process consists of passing the cleaned iron or steel article through a solution of acid zinc phosphate, which process develops on the surface of the metalwork a layer of zinc phosphate which is insoluble and non-hygroscopic and which, therefore, gives high protection to the metal. Again, the strength of the acid zinc phosphate solution is immaterial.

We recommend that you should adhere to the process, using the simpler solution of sodium phosphate which you mention, and that this solution should be used warm (at about 50-60 deg. C.). The article should not be rinsed after immersion in the solution, since the phosphate layer is formed on the metal surface during the subsequent drying of the article. The sodium phosphate solution will keep in good condition at working strength quite indefinitely. If it picks up dirt or impurities from the metalwork, it can readily be filtered.

There is really no such thing as the "chemical heat treatment" of metals. We can only assume that you refer to the chemical treatment of metals at elevated temperatures. Such processes will be found described in any textbook on the heat treatment of metals. Such a textbook will be available in your local County Library. There are numerous volumes on the subject as applied to various metals and alloys. As regards steel and the ferrous metals, the following volumes will be of interest:

F. Giolitti: "Heat Treatment of Soft and Medium Steels."

J. W. Urquhart: "Steel Thermal Treatment."

D. K. Bullens: "Steel and Its Heat Treatment" (2 vols.).

Paint Stripping and Wax Polishing

I WISH to change some heavily painted doors to the natural waxed wood finish. I have burned a great deal of the paint off but the surface is still greasy. Could you inform me of the correct procedure to follow, and whether the wood should be treated with linseed oil before being waxed? Is there a special wax for this purpose?—J. Russell, Sneddon (Glasgow).

YOU do not mention the nature of the wood from which you have removed the paint. Some woods are more naturally greasier than others. Hence, we are unable to say whether the wood still carries its own oil or whether the oil has been derived originally from the paint. In any case, it would have been better to have removed the paint from the wood by means of one of the orthodox paint-stripping compositions than by means of an ordinary blowlamp. Assuming, however, that the wood has been satisfactorily stripped of its paint, and that it is only at present merely "greasy," the best procedure for you to follow would be to scrub the naked surface of the wood over with a solution of caustic soda (1 in 10). After this, scrub the wood thoroughly with soap and warm water and then allow it to dry. The wood should then be sandpapered smooth. It will not be necessary to treat it with linseed oil before waxing the wood. Merely rub the wax mixture on the wood surface and then leave it overnight before finally polishing. A good wax mixture for the purpose would be a mixture of 70 per cent. prime yellow Carnauba wax and 30 per cent. yellow beeswax. Thirty per cent. of this mixture should be dissolved in 70 per cent. of warm white spirit. On cooling, the resultant solution will become solid and pasty and, thereby, eminently suitable for wood-waxing purposes.

It is, of course, much cheaper to use an ordinary white wax or paraffin wax for the purpose, but all such waxes are intrinsically soft and are much prone to persistent fingermarking.

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Comments of the Month

SOME PLAIN SPEAKING ABOUT ACCIDENTS

WHO IS TO BLAME ? CAN THEY BE REDUCED ?

By F. J. C.

THE villification of motorists and cyclists who are consistently blamed for the rising toll of the road, the invitation from high legal luminaries to magistrates to impose more severe sentences, the bleatings of those self-appointed representatives of pedestrians and cyclists, and ill-informed criticisms by those who know little of cause and effect have become main features of our daily newspapers. We deplore the comments of High Court judges, who wish to set aside the whole basis of courts of summary jurisdiction by inviting local magistrates to prejudge issues before the evidence has been heard. Local magistrates' courts were called into being so that they could exercise the quality of mercy.

Now the most savage fines and sentences are being imposed. Charges of dangerous driving are being brought where hitherto the milder one of driving without due care and attention more accurately fitted the offence. No one wishes to defend a motorist driving a car whilst he is drunk. But suppose he has sufficient wits to draw into a side road until the effect of alcohol has worn off? Sooner or later a constable arrives whilst the driver is still in his drunken stupor and charges him, as well as his passenger, if he has one, with being in charge of a car whilst under the influence of alcohol.

One might reasonably ask what he is expected to do. Is not the attitude of the authorities in this matter a direct invitation to the driver to " chance it " and drive on? In such a case he might seriously injure or kill someone. Should he abandon his car and endeavour to roll home, like the rolling English drunkard who made the rolling English roads? Even a cyclist who was too drunk to ride his bicycle was summoned for being drunk in charge of a bicycle!

What would be said of a tailor paid to make a suit of clothes who misappropriated the money for other purposes and then had the power to prosecute his unfortunate client because he was walking about nude? The plain fact is that millions of pounds over the past thirty years have been extracted from road users in the name of the Road Fund and from petrol tax to have our roads made adequate to accommodate the ever-growing volume of traffic. But the money has been used for other purposes, and now the State wishes to penalise road users because of the State's failure to do what it has been paid to do. In any ordinary business directors who misappropriate funds would find themselves in prison. The State, however, can do the most illegal and immoral things and get away with it, passing the buck, so to speak, to its victims.

In spite of the new zebra crossings accidents will not be materially reduced by them, nor will they be until their use is made compulsory. This, of course, will be quite unpalatable to that body known as The Pedestrians' Association, which seems to regard pedestrians as a class apart, and overlooks the fact that we are all pedestrians at some time.

For years writers on cycling have pressed for severer sentences on motorists convicted of dangerous or careless driving. They think that is the solution to the problem. If it is, then all road users guilty of dangerous use of the roads should be prosecuted and heavily fined. Pedestrians are a major cause of accidents by their carelessness on the roads. They more often than not escape injury themselves having caused a collision between two cars.

Road travel to-day has, in the name of road safety, been converted into a frustrating obstacle race at snail's pace, and yet accidents continue to rise. Surely someone at the Ministry of Transport with a scintilla of intelligence is able to draw the proper conclusion from that ? Everyone using the roads should be brought within the traffic laws. It is nonsense to talk about motorists and cyclists being in charge of lethal machines. A pedestrian can be lethal, far more so, for he can wander aimlessly on any side of the road, whereas traffic is compelled to keep to the near side.

As it is, the war goes on between motorists, cyclists and pedestrians, and the real cause of the holocaust is obscured in the quagmire of tangled verbiage and confused thinking.

The governments of the past thirty years are to blame for the inadequacy of our roads, which have failed to keep pace with the growth of traffic. They cannot plead shortage of funds. They have had the money in plenitude but have used it for other purposes. The Road Fund, when it was introduced by Lloyd George, was to be used for no other purpose than the making of new roads and the modernising and repair of old roads.

In order to make our antediluvian road system work we have introduced thousands of regulations and erected so-called safety devices which have done precisely nothing to reduce the toll of the roads. What would be said of the Thames Conservancy if, when the river is in spate, it put down more sluices instead of pulling existing ones up? That is exactly what has happened to the roads. Traffic is safer when kept fluid and apart than when coagulated into a mass proceeding along the road in a series of clots, with dozens of pedestrian crossings between the traffic lights. A very small percentage of accidents are due to speed according to official figures, yet most of the palliatives are based on the asinine belief that it is. The average speed through London, according to Scotland Yard figures, is seven miles an hour!

Out of 372 cases recently investigated blame was apportioned as follows:

Lack of, inadequate, or incorrectly sited sign-posting, 119; tram tracks, lack of white lines or cat's eyes, and dangerous road surfaces, 154; obscured visibility and congested areas, 34; kerbstones, badly laid out road junctions and miscellaneous, 22.

Over the last three years as a result of increased traffic the average monthly toll of killed and injured on the roads has risen from just under 13,000 to over 18,000, an increase of nearly 40 per cent. If this rate of increase is continued casualties this year may approach the pre-war annual total of 230,000. The Parliamentary Secretary to the Ministry of Transport has been discussing the matter with local road safety committees, but we fear he has learned little from this. Local road safety committees can only deal with the matter as it affects them locally. The matter needs to be discussed on a national scale. The Parliamentary Secretary could, however, save his time, for he has in the archives of his Ministry memoranda and reports by the dozen dealing with the subject, and advising him to take certain remedial measures. We suggest that he reads those reports.

Let the critics ponder over these matters!

Legality of Pedestrian Crossings

DOUBTS have been raised as to the legality of pedestrian crossings following reports of an unsuccessful prosecution at Bristol on January 24th, but the Ministry of Transport considers that nothing in that decision detracts from the legality of any crossing marked with stripes, beacons and studs in accordance with the new Pedestrian Crossing Regulations. It must be remembered, however, that the courts must decide the legality or otherwise of particular crossings. It is not a matter for the Ministry of Transport to issue statements of this sort for the guidance of magistrates. If they feel that the decision at Bristol was a wrong one, they have every means of appealing against the judgment.

Restriction on Hire Purchase Agreements

A RECENT Board of Trade Order restricts the terms for initial deposit and repayment period in the hire purchase agreements related to the purchase of bicycles. For bicycles the deposit is 25 per cent., and the maximum period within which the balance of the price must be paid is one year.

Building a Cycle Frame

Construction, Brazing and Finishing

By W. HILL

(*Continued from page 35, February issue.*)

WHEN red heat is reached, warm the end of the brazing rod and dip it into the flux, some will adhere to the heated end of the rod and the rod should be touched lightly against the tube just above the edge of the lug.

If the heat is correct and all cleaning operations have been carried out, the rod will melt and flow into the gap between tube and lug. Feed the brass into the joint until it runs through and just shows at the side of the head tube. Make sure that it runs through all round the tube, then whilst still hot, turn the job on its side so that the head tube is vertical and complete this joint in a similar manner. Some makers prefer to clean up the joint at this stage as it is easier to handle.

The rest of the "diamond" can be assembled with flux and the straight edge Fig. 2B bolted through the bottom bracket shell. Next, the down and seat tubes are lined up parallel with the straight edge and then drilled and pegged to hold firm. The test bar, Fig. 2C, is inserted through the head tube and lined up with the seat tube by taking comparative measurements from the straight edge, Fig. 2A, which is held across the down and seat tubes. Drill and peg all joints even if the tubes are a tight fit in the lugs. Check again with the straight edges for alignment. All tubes should be in the same plane the C/L bisecting all tubes irrespective of diameter. Proceed to braze the remaining joints as before, turning the job round so that the metal flows "downhand." If the edges of the lugs start to curl up (for example the ends of scroll or spear point pattern cutouts) tap them down gently on to the tube whilst they are still warm; do not attempt to fill up the gap with brass—the lug should touch the tube. After brazing and before the chain and seat stays are assembled, file up and polish behind the seat lug and bottom bracket shell as these are very difficult places to clean up once the stays are in position.

Chain and Seat Stays, etc.

The next operation is the fitting and brazing of the rear fork ends to the chain stays. These should be cleaned, fluxed and pegged like the main joints, taking great care to see that the angles of the wheel slots in the fork ends are identical, as correct rear wheel alignment is impossible if they are not alike. An alternative method of brazing these joints is to load the end of the tube with flux and powdered brass and then heat the joint until the brass flows through.

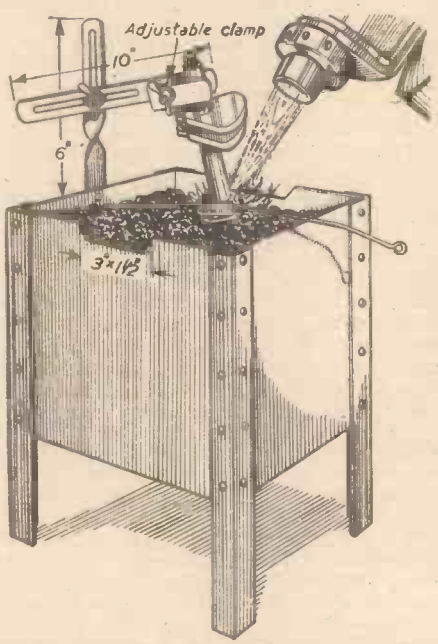
After brazing and cleaning up, the fork ends should be set so that they will be parallel when in position, next fit the chain stays into the bottom bracket, fluxing and pegging as usual. Care must be taken to get chain stays identical in length so that the wheel will line up correctly. A rear wheel should be tried in the rear fork ends and when it is held to the back of the slot, the rim should be central between the chain stays. An ordinary cycle rear spindle fitted with cones and nuts should be used as a distance piece between the rear fork ends and it should be adjusted so that the distance between the inside faces of the fork ends is ¼in. wider than the finished size, as the operation of brazing in the chain stay and seat stay bridges causes slight distortion and the fork end opening becomes narrower. This spindle helps to locate the chain stays whilst the seat stays are attached.

The seat stays should have a small air hole drilled near the top on the underside, and brazing can then be proceeded with as before, turning the job over to obtain "downhand" conditions.

There now only remains the chain and seat stays bridges and other bits and pieces such as pump pegs, mudguard eyes, etc., to be located and brazed to the frame and the frame is then ready for tracking up, filing and polishing.

The Front Forks

The front fork should next be dealt with and the same routine followed, that is, cut the tubes to length, clean them and the crown,



A light forge suitable for brazing small cycle and engine parts.

etc., apply flux and assemble. Remember that the fork column is butted or reinforced at the bottom and this butted portion must not all be cut away.

Some manufacturers prefer to braze in the fork ends first and then fit the blades to the crown, others prefer the crown brazing to be done first and the fork ends lined up with a suitable spindle. No matter which method is used the front wheel must fit centrally between the blades. Furthermore, the blades must be parallel, that is one fork end must not be in front of the other and air holes must be drilled to relieve the pressure inside the fork blades. It is best to set the fork as accurately as possible before brazing and as with the frame there must be no misalignment or straining or serious distortion will take place.

If building without a jig, an easy way of lining up the blades is to fit a straight piece of 5/16 in. diameter bright steel bar in the fork ends and place a similar bar on the front of the blades just below the crown and then "sighting" them, any discrepancy will be shown greatly exaggerated by the two bars. Brazing should be carried out as previously described, the spelter should flow right through the crown and show on the column. Do not, however, hold the job at a high temperature for longer than necesary.

The "bits," i.e., lamp bracket boss, and mudguard eyes should next be added. The type that locates in a hole drilled in the tube are the handiest to use unless jigs are made.

Tracking Up

After brazing the next operation is tracking up. It may be argued by some persons that, as all parts were assembled and pegged before brazing in perfect alignment, this should not be necessary. In practice, however, slight distortion usually takes place, so both frame and fork should be checked with the straight edges and fixtures and any errors corrected. Taking the front fork first, it will be seen from the drawing that the inside face of each fork end is equidistant from the centre line and the axis of the front wheel spindle is parallel to the front face of the crown. That is, one blade must not be in front of the other. Check this latter dimension by inserting one of the 5/16in. diameter bars in the fork ends and "sighting" its position relative to another placed on the front of the blades just below the crown, as previously described. If any error is found the crown should be held in a vice and the blades set correctly. Small errors can be rectified cold, but if the discrepancy is great, local heat must be applied before setting. Next the blades should be lined up with the aid of the fixture, Fig. 2D. The fork should be placed front downwards with the column between the locating blocks and the position of the front fork ends noted. The width of the fork ends is determined by the width of the front hub used and this should have been marked out on the fixture previously. The fork ends should be set ⅛in. wider than this and the inside face of each fork end must be equidistant from the centre line. The fork should be held in the vice and each blade set to the correct line on the fixture, local heat being applied if necesary. Finally, try the front wheel in the fork, it should fit in without having to spring the fork blades, and it should fit centrally between the blades.

To track up the frame the fixture Fig. 2B should be bolted through the bottom bracket and then held in the vice. Start with the down tube, by checking with a pair of calipers the alignment of the tube. A reading should be taken near the bottom bracket and another at the other end of the tube. If these measurements from the tube to the straight edge are not identical distortion has taken place, and it must be corrected in a similar manner to the fork blades, only it must be remembered that the gauge of the down tube is much thinner than fork blades, so if heat has to be applied it should not be excessive.

When the down tube is parallel to the straight edge, the fixture should be slackened off and rotated until the straight edge lies alongside the seat tube. Comparative measurements should be made from the tube

to the straight edge and any errors corrected as before.

Both tubes will now be in the same plane and at right angles to the axis of the bottom bracket axle. The fixture can now be removed and the test bar for aligning the head and seat tubes should next be fitted into the head tube. If the head tube is true with the seat tube there will be a gap of 1/16in. between the bottom of the test bar and a straight edge, which should be laid alongside the down and seat tubes about 6in. from the bottom bracket. It is absolutely vital that correct alignment with the seat tube is obtained or the machine will not steer correctly. Therefore, check with the straight edge on both sides of the tube and set the head tube if necessary by holding the head on a bar held in the vice and twisting the frame into alignment. If care has been taken during the building, with drilling and pegging very little rectification is necessary, in fact, a few minutes spent on making sure during the preliminary stages of construction can save an hour or more later.

Now that the "diamond" is true there only remains the chain stays to be tracked up. This is done by first checking with the long straight edge which should be held touching the head and seat tubes. The little pointer should be set so that it just touches on the inside face of the rear fork end. Then the straight edge should be tried on the other side of the tubes and, if the chain stays are correct, the small pointer should touch the other fork end. If there is any error the chain stays must be pulled only half the distance shown by the pointer. They should be set so that the rear fork end opening is $\frac{1}{8}$in. wider than the width of the hub used and the fork ends set so that they are parallel.

Filling and Polishing

The final operations of filing and polishing can make or mar the appearance of the finished machine. File marks show up very badly on plated and coloured enamel finishes, so great care should be taken to eliminate them.

The lugs should be filed thin at the edges, all cutouts cleaned out and most important of all there must be no undercutting of the frame tubes at any point or this will seriously weaken the frame. If chrome plating is included in the specification, fine files and emery tape must be used intelligently to prepare the surface for the polishing.

The crown ballrace should be fitted at this stage and it should be a light driving fit on to the seating. Bottom bracket threads should be retapped and a cup tried in each side, all lubricator holes drilled and tapped and the head race seatings reamered true. It is best to do these operations before enamelling as it is very difficult to avoid marking the enamel if much work has to be done afterwards. Another job which is best done before enamelling is to make sure that the seat pillar will fit in the seat tube.

After filing up and all drilling and tapping is completed, the frame should be polished with emery tape all over and the frame is ready for enamelling.

Best quality work is usually treated with some form of rust preventative such as "bonderising" before enamelling, so have this carried out by a reputable firm who specialises in stove enamelling.

The Modern Bicycle and Motor-cycle

A Few Facts and Figures Concerning the Machines of Pioneer Days and the Present Time

By THE MARQUIS OF DONEGALL

SO far as I am aware the Russians have not yet invented the bicycle. Nor do they use it as much as we do for, in 1943, there were under a million in use in Russia as compared with 12,000,000 in the U.S.A. and 10,000,000 in this country.

We are, in fact, incomparably the greatest users, makers and exporters of bicycles in the world. The same applies to motor-cycles and now looks like being followed by mechanically assisted bicycles of which I counted 18 different makes at the Earls Court show.

But before we proceed, let us assist the Russians—when they have finished appropriating the airplane, television, the atom bomb, radio, penicillin, radium, the submarine, photography and almost everything else—to invent the bicycle.

They will have to ante-date Mr. Kirkpatrick Macmillan of Dumfries who, in 1839, made the first proper bicycle (see last month's issue). He was even fined for furious riding. Macmillan's *rear* wheel was the larger.

It was the fortuitous outbreak of the Franco-Prussian war that threw some 500 bicycles intended for France on to the British market and laid the foundation of British supremacy in this field.

Front wheels grew in size and the "penny-farthing" was known as the "Ordinary." What we would call the ordinary was called the "Safety" and came into being when H. J. Lawson, in 1876, thought up the idea of propelling the bicycle by a geared-up transmission on to the rear wheel. The boom came in the '90s with the advent of the Dunlop pneumatic tyre. This can be illustrated by the simple fact that in the Exhibition of 1890 98.6 per cent. of the "bikes" had solid tyres, whereas in 1894, 89.5 per cent. already had pneumatic tyres. At this period there was a bicycling school in Long Acre; 76 weeklies and 14 monthlies were devoted to the sport. Machines weighed up to 50lb. as compared with to-day's 30lb. average.

In the old days, a bicycle cost about £30. Between the wars the cost went down to the £5 level and now—for the luxury types—we are rapidly getting back to the pioneer prices.

Nowadays there is a tendency towards the mass use of flamboyant colour schemes, many of them very attractive, and an increase in the use of alloys such as duralumin.

It is not the custom of makers to give the weight of their machines, but they vary between 30 and 40lb., and the tendency is towards lightweights.

The remaining marked tendency is towards a decrease in chromium-plating with consequent increase of paint area, as during the war. Undoubtedly, the highly ingenious "Derailleur" type of gear is catching on increasingly in this country.

Motor-assisted Bicycles

To describe the tiny motor, attached to a bicycle, as the greatest locomotive innovation since the invention of the wheel, would be an exaggeration.

It has existed for a very long time and I had one at the end of the first World War. It involved an auxiliary back wheel which the motor drove and was a somewhat clumsy, though efficient, contraption.

But when no fewer than 14 separate manufacturers displayed auxiliary engines at Earls Court, and the National Federation of Motorised Cyclists has been formed, the movement and its implications can hardly be ignored.

It is inevitable, whether these new-type roadfarers like it or not, that they will be known as "Poppers," and it is a somewhat frightening thought that any one of them who has passed the test on a pop-cycle is fully entitled to ride at 120 m.p.h. up the Great North Road on a Vincent £504 "Black Lightning" having achieved that speed—if still alive—in 44 seconds.

Another sobering thought in connection with Poppers is that they are increasing the number of law-breakers in direct proportion to their own recruiting figure of 800 per week. As far as I know they all run on a mixture of petrol-and-oil and it is against the law to fill them up with such a mixture.

On the other hand, ancient motorised cyclists, such as I, have a rooted aversion from putting in the necessary ingredients separately. Good mixing is part of our art just as much as the brewing of a secret wax is alchemy-in-excelsis to the ski-runner. Thus, only by breaking the law, is the best popping achieved and something will have to be done about it.

As a graduate during War Correspondent days—(2nd World War, please!)—from a motorised cycle to an Autobyk, ("Excelsior" is now very smart and grown-up at about £80), I am still a Popper at heart and have the same morality problem over fuel.

But I am in the position of a very light-skinned coloured person and so able to "pass": in my case, to be accepted without too much sniggering into the great brotherhood of real motor-cyclists.

Not so the 100 per cent. Popper whom neither the pedalling cyclist nor the goggled and crash-helmeted fraternity will condescend to own.

But this world is full of rough justice, and if we go on breeding at the rate of 800 a week, we Poppers will soon be in a position to turn the social tables on all other roadfarers. Let the National Cyclists' Union, the Cyclists' Touring Club, the R.A.C. and the A.A. think again.

In the transition stage between the Popper and the motor-cycle we must mention the power-wheel and the Scooter-type. The power-wheel, by Tube Investments Ltd., incorporates a rotary two-stroke engine in the hub of the rear wheel. The petrol tank is combined with the luggage-carrier. The Lambretta is an example of the Scooter-type and claims 140 m.p.g. as opposed to the power-wheel's 220-300 m.p.g. It incorporates a pillion saddle and spare wheel.

Motor-cycles

As in the case of bicycles, this country produces and exports by far the greatest number of motor-cycles of any nation in the world. Although we cannot be said to have a monopoly of world leadership in motor-racing, the Continent has for years been trying to take the motor-cycling supremacy from us. It is estimated that the number of motor-cycles on Britain's roads to-day has increased by about a quarter of a million since 1939 to about three-quarters of a million. Part of this increase can, of course, be attributed to the increasing cost of running a car. But quite a proportion of it can be attributed to the improved mechanical smoothness in running and all-round comfort of motor-cycle riding.

(*Continued on page 47*)

Around the Wheelworld

By ICARUS

Raising the Prestige of Cycling

A SPEAKER at a club luncheon recently made seven suggestions for raising the prestige of cycling. Chief of them were that a club for cyclists should exist in London, each manufacturer should produce a really super de luxe machine, H.M. Stationery Office should publish a Blue Book on cycling, and there should be a University half-blue for cycling.

There was a club for cyclists in London in the early part of the present century ; it had spacious rooms for meetings, a restaurant and a bar. Prominent cyclists like C. A. Smith and S. F. Edge subscribed the money to bring it into existence, but it failed within a year. At that time there was a similar call for a club on the lines of the R.A.C. When it was created, however, those who had asked for it did not support it, and I do not believe such would be any more successful to-day, probably less, because cycling in those days was the hobby of the rich. It was not a utilitarian vehicle as it is to-day.

Cyclists in general do not patronise expensive clubs, and it would be impossible to start a club for cyclists in London which could provide meals and amenities at a price they are willing to pay. That is why the cycling organisations have lists of recommended tea houses. Cyclists in general have not a lot of money to spend.

Regarding the super de luxe machine I do not know what specification the speaker had in mind, but most manufacturers I thought have a machine which would answer to that sobriquet. Yet to-day no manufacturer could depart from his manufacturing programme, and even if he could the demand for such a machine in view of the ruling high prices of even standard roadsters would be very small, probably in the region of £40 or more.

Regarding the Blue Book, here again I doubt whether H.M. Stationery Office are best equipped to produce such a volume. I should have thought that was a matter best tackled by those already in the publishing trade with experience of cycling and its history. The Stationery Office has not the means of distribution which ordinary publishers have. If they produced a Blue Book on cycling they would be pressed to produce one on boating, and all other sports.

Motorised Bicycles

A READER sets me a poser. He possesses a motorised bicycle, and wants me to recommend a suitable club which he may join. I do not know of one. The motor cycling clubs do not accept motorised bicyclists as members, and they are frowned upon by the Cyclists' Touring Club, the secretary of which has already expressed his views concerning them. He thinks they are neither flesh nor fish.

As the use of motorised bicycles is growing and will continue to grow, the moment seems right for someone to form a Motor Bicyclists' Association. This might mean a secession from the ranks of the C.T.C., some of whose members own motorised bicycles, and because of that are denied legal aid. It is not possible to form a very accurate estimate of the number of motorised bicycles now on the roads. Possibly it is of the order of 50,000, and from this pool can be drawn a sufficiently large nucleus to found a national body to watch the interests of its members. A motorised bicycle according to some is not a cycle, according to others it is a bicycle-assisted motor, others insist that it is not a motor cycle, but none can deny that it is a two-wheeler, and as such it should have some body to watch its interests.

The C.T.C. with its unfriendly attitude towards it and mechanical-propelled vehicles generally is obviously not the body to start it, even though it were minded to alter its Articles of Association to do so. In any case, its general outlook is archaic and sour, and confined to "fahting for sarclists's rahts!"

B.L.R.C. and Manufacturers' Union

W. C. RAINS, hon. general secretary of the B.L.R.C., tells me that the League welcomes the offer of the Manufacturers' Union to mediate on the question of road racing control. In the interests of the sport nationally, and in view of the rapid approach of the 1952 season the League stresses the urgency of the matter.

The fact that the Manufacturers' Union has had to make this offer to mediate, indicates that none of the national bodies is able or capable of doing so.

The Late Horace Cunnington

I DEEPLY regret the passing of my old colleague, Horace Cunnington, the well-known London Clubman and Press Photographer, who worked for *The Cyclist* up to 1940. He was keen as a clubman and a willing and ready helper, particularly on record attempts, as Heppleston and Earnshaw will testify. He was a member of the Tooting Bicycle Club, and last year was elected president. His interest in the club was such that last year he resumed racing. In his second race after 13 years he rode a "12" covering 230 miles—the best result. His photographs of cycling events were expert.

Sir Arthur Du Cros Married

MY congratulations to Sir Arthur Du Cros, Bart, on his marriage to Miss Mary Louis Joan Beaumont, which took place on December 22nd at the British Consulate in Nice. Sir Arthur is the sole surviving member of the famous Du Cros family which founded the original Pneumatic Tyre Company which later became the Dunlop Rubber Company. Miss Beaumont was for many years secretary and family companion to the late Lady Du Cros. She is a linguist, and they motored extensively in Japan, China, Korea, Australia, Africa, and the Americas. They drove their own cars on Service in London during the last two wars.

Sir Arthur was himself a famous racing cyclist, and was present when Hume won the first races ever to be run on pneumatics at the Queen's College Sports, Belfast, in 1889. He has often shown to me the various trophies and prizes, including inscribed gold watches, which he has won on the track. Although over 80 years of age he is still extremely athletic. He was the guest of honour at the Roadfarers' Club Dinner two years ago when the diamond jubilee of the marketing of pneumatic tyres was celebrated. Harvey Du Cros, Senior, and his four sons, Harvey, George, William and Arthur (now Sir Arthur) between them founded the famous company.

At that dinner I was delighted to meet Lord Courtauld-Thomson, K.B.E., C.B., son of R. W. Thomson who patented the principle of the pneumatic tyre in 1845, six years after Macmillan had produced the first pedal cycle.

Reflector Studs—Centre or Side of Road?

DISCUSSIONS are taking place as to whether the cat's eye studs would be better located at the nearside of the road instead of the centre as at present. In the latter position they tend to keep motorists to the centre of the road and thus away from the nearside kerb, which is a definite advantage for cyclists, especially in fog.

On the other hand cyclists would welcome the nearside location where they are more readily picked up by the headlamps of bicycles which are nearly always ridden on the nearside of the road. The danger with the nearside location is that parked vehicles would block them out for considerable distances, especially on main roads which carry considerable volume of night traffic—Birmingham-Coventry to London, for example.

Personally, I favour the central position.

A magnificent panorama of Dale country seen from the ancient Stone Circle of Arbor Low, looking across High Rake to Fin Cop with the High Peak country in the far distance.

GROOMBRIDGE
KENT.
A corner of this picturesque little Kentish village standing in lovely wooded country near Tunbridge Wells.

Wayside Thoughts

By F. J. URRY

And So it Goes

"IT'S all very well for you, but I can't do it. I'm too old and tired." This from a man nearly ten years my junior who was once a fine cyclist, and is now in the sere and yellow with a vengeance. I don't say it is his own fault for none of us can or should condemn the other fellow's way of living, but I am certain the ease of these modern times have had their effect on him and made some difference between what should be a mellow autumn instead of the chilly winter. It makes one feel very sad, this dropping away from a bright and lively youth to a dodderingness long before the count of time has justified it—if ever it does in any of us. My friend had been unwise and regretted it now, and I was arguing it was not too late to repair some of the lost activity by quietly riding a bicycle. But he shook his head; not only had the muscles suffered but the nerves also, and the press of traffic just frightened him. I report this incident because I feel so many people of my generation have fallen into the same ploy of inactivity through developing the easy habits without considering the later years of life and all they can mean to a man if he retains a reasonable fitness, and what better for this purpose than cycling? It is something worth more than a passing thought among the active cyclists of to-day. So many of them do not see the results of inactivity until it comes their way, and then it is too late. My advocacy to remain a cyclist in the full sense of that term holds for the individual far more than a liking for the pastime, for verily I believe it means a full life and a happy one.

The Way to Comfort

IT so happens that occasion arises when the muscles are not too kindly disposed to undertake the task allotted to them. That is a reminder of the years, and as such I accept it. If I never had an ache or felt a stiff tendon creak it would, I suppose, be unnatural, and when this occurs the use of a little lower gear and a mile of very quiet progress has always restored the muscular performance to normality. People are in too much of a hurry to admit they are too old, when really they are too lazy to rid themselves of the ancient creak; it disappears so easily if you will let it, and then the rest of the day is restored to you, if not so young as it once was, at least to desirable pleasantness. I know it is difficult to persuade people of the truth of these things, as difficult as it is to get them to "train" for their cycling pleasures when they have given up the game for so many years. But once you can convert, and the individual is willing to follow advice, such folk become the greatest cycling advocates extant, sometimes to the extent of becoming a nuisance to their friends. I once asked one such why he so forcibly rammed his enthusiasm down other people's throats. "Because," he said, "I know how much better I am, happy in the feeling and in my cycling," and really what can you say in criticism? Occasionally I am taken to task as an ultra enthusiast, but most of my critics overstep the mark by insisting on my dislike of other modes of travel as an excuse for themselves. They, of course, are entitled to their opinions, but apparently because the means of fulfilling mine are cheap and simple, they are not publicly popular. Yet I maintain if you like a thing, say so, and as I presume everyone likes good health, and since in my view cycling is one excellent way to obtain and retain it, I am bound to keep on saying so.

Making Converts

IT is true we are in the dull season of the year, and following on a rather dreary summer and autumn, outdoor wanderings are not everyone's desire. Yet the worst of the weather (excluding snow and icy road surfaces) is never as bad and not nearly so uncomfortable as it looks from the inside of a warm room. I took a man for a ride on a recent Sunday morning because the local golf course was closed owing to the rain-soaked turf. I loaned him a bicycle, saw that the position was right, draped him in a big cape and away we went. In eight miles a farmer friend gave us a farm-kitchen greeting and half an hour's yarn; a little farther down the road I collected a rabbit on his behalf from a keeper friend. In a little less than twenty-four miles we came home with nothing worse than dampened shoes and stockings, and his comment was, the exercise, despite a slightly uncomfortable seating department, had done him far more good than yarning in a club house and drinking liquid he did not really require. I told him the saddle trouble would quickly disappear with regular riding, and as an old cyclist he believed me; but he wanted to buy the bicycle, saying he had never ridden a better or one that fitted him so perfectly. That, of course, was the result of moderate gearing and proper positioning. I do not sell bicycles, but am told that one will not be returned to me until the delivery of a new one made to its specification; a wise man, I think, to mix his games, to bite off his quota of fresh air under exercise and occasionally change his visions. It is so easy to get into the habit of going the same way and tramping the same sward when we have the whole of an area to choose from. That indeed is another value cycling carries, you really see and know your countryside without galloping the miles away.

A Good Protector

I THINK I mentioned some months ago that I bought a plastic cape guaranteed to be tough and not to leak at the seams, and sure enough it has carried itself bravely. I have given it great use—or rather the weather has—and have not taken any particular care with it, for it has been used as a roadside carpet on numerous occasions, and often enough jammed into the bag after a shake to remove the surface water. Naturally it does not stick and that is a real gain over the oilskin; and it seems to be less hot on a long, rainy ride, but possibly that notion is due to the cool weather of summer and autumn. Anyhow I am glad to have it now so many mornings are draped with rain, and at twenty-five shillings it is a cheap line. (Perhaps the price has risen since I bought it—I do not know.) The only weakness was the thumb tapes which pulled from their anchorage very early on, but as I seldom use them that was little loss. Now a good cape is a good thing for a regular rider, one he can slip on and climb out of instantly, and which, when not wanted, can be treated very casually without hurt to its properties; and that is why I mention it here. The name of the maker is not given on the cape, but if I remember rightly it was "Polus," or some such name; anyhow, a title in the mackintosh world I had not before heard. And while on this subject of capes, when will someone give us a pair of leggings similar in design to those made by Brooks of saddle fame some years ago, the backs of the legs open, but the thigh pieces similar to the all-in leggings? Perhaps the answer is that, with shorts the main cycling wear, the need for leggings of any kind has largely disappeared, but there are still hundreds of thousands of us riding to work who would welcome nether protection.

THE MODERN BICYCLE AND MOTOR-CYCLE

(*Continued from page* 43)

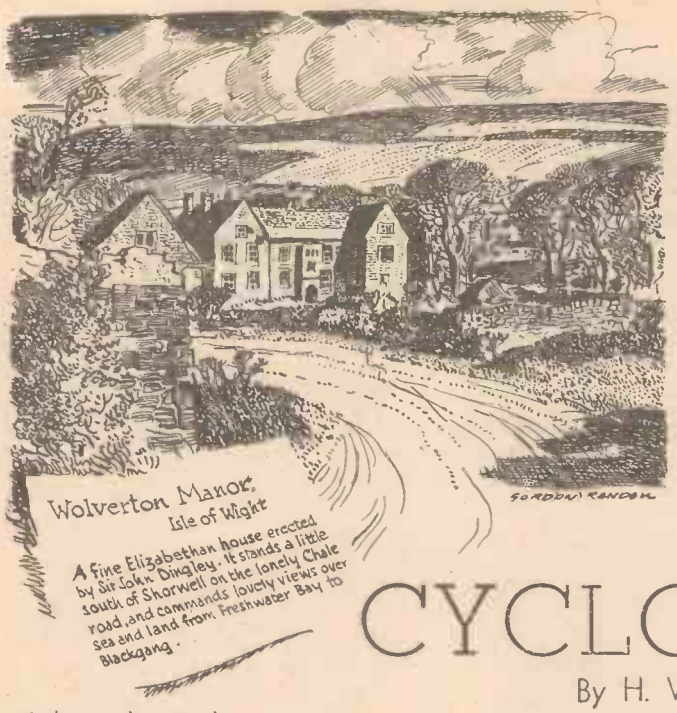
Historically, it is interesting to note that the "Petrol-Cycle" ante-dates the "Ordinary" bicycle in that Edward Butler, of Erith, took out a patent for the mechanical propulsion of cycles in 1884.

Before the Act of 1896 which abolished the man with the red flag, Butler had constructed a tricycle contraption with two front wheels and a water-cooled driving wheel at the rear. Steering was by two levers and the hub incorporated an epicyclic 6-1 reduction gear.

It is difficult to mention particular makes of motor-cycles without giving an impression of favouritism, but a few facts can do no harm.

A.J.S. motor-cycles, for instance, hold more world records than any other British make and they made, among their famous winners, the machine ridden by Hugh Viney in the International 6-days' trial. The B.S.A. Company have recently completed the shipment of their hundred-thousandth export machine since the war. Australia bought 51 per cent. of their overseas output, and they claim one-third of British motor-cycles exported to the U.S.A.

Australasia is likewise Royal Enfield's best market overseas, and Triumph are supplying more than 70 police forces throughout the world, apart from a recent order for the Icelandic post and telegraph service. Unless the Icelandic tracks—you can hardly call most of them roads—are greatly improved since I was there in 1941, this will certainly be a mass machine-rattling test.



CYCLORAMA

By H. W. ELEY

Wind On the Heath

NOT always is a month true to its traditional character . . . "February Filldyke" may be dry, and "Merry May" be far from merry, and bring us cruel frosts, blasting our orchards, and ruining our apple crops. And March . . . the month of high winds, of cleansing breezes over the wide commons; sometimes she lives up to her traditional character, and there is nothing I love better than a good, long tramp over the high-lands, on a March morning, when the wind blows hard, and the scudding clouds make patterns in the sky, and the snow-white clothes, hanging on lines in cottage gardens, dance gaily in the breeze, as if glad to join in the frolics of "Mad March." I climb to the top of the eminence near my village known as "The Knob"—and have difficulty in keeping on my feet, so strong is the wind. But what a glorious view I get from that little hill! The Derbyshire countryside stretches out like a green and brown panorama. I pick out church towers and spires, watch black-and-white cattle moving leisurely over the wide fields, and, to complete my joy, a lark sings high overhead. March morning! And thanks be for a cleansing, hearty breeze. . . .

Boon and Blessing

MANY men, by their skill in invention, have earned the blessings of the human race — and not all have had monuments erected to their memory. I always breathe a silent blessing on the pioneers who invented and perfected the three-speed gear . . . when, on my cycling trips, I reach a stiff hill. What ease this device has brought to millions of cyclists! How good to be able to "change down" when approaching that "rise." Time was when I thought little of hills, but the passing years bring a realisation that limbs are not so strong, nor muscles so supple, as in the carefree days of youth, and as I take my rides through Derbyshire lanes I bless my Sturmey-Archer, and ponder upon the good things which we enjoy in this year of grace, 1952. As I ride easily up that hill which brings me, in due course, to the inn known as "The Pack Horse," I feel a glow of good will to all men who have—by patient thought and ceaseless experiment — made life easier and more full of comfort. And my feelings are strengthened when, in the inn, I find that the good landlord has a TV set . . . and I can sip my ale in a little parlour, in a remote country village, and at the same time watch the screen and revel in the moving drama of a rugger match!

Dancing Daffodils

THOSE golden trumpets which wave so gaily in the breeze in the Rectory garden delight me a lot: Poets have sung the praises of the daffodil, and in truth there are few more glorious flowers. Beneath the ilex tree in the Rectory garden there is a veritable carpet of them, and those bulbs I planted in the border of my own garden have come to fine fruition, and make a splendid show. I like to think of them as Easter flowers, and I know that on Easter Day bunches of them will grace the altar in our village church, breathing the message of new life, and the re-birth of beauty in every garden and field and hedgerow. Not all the roses which will bloom in June delight me more than these golden blooms which are the queens of spring and the heralds of summer sunshine which I hope will follow.

Village Signs

FROM time to time one sees letters in the Press about the desirability of erecting signs in our villages, portraying the name of the village prominently and giving facts about its history, its points of interest, and its place in the annals of our chequered story. I seem to remember that the late Ed. J. Burrow, who loved the English scene quite passionately, was a strong advocate of the village sign, and, in conjunction with the Dunlop Company, he did something towards the erection of a number of signs. I suppose the war killed the scheme, but I am all in favour of such signs. How often does one approach a village, see little or no indication of its name, and nothing to show that it possesses something of genuine interest to the historian or the antiquarian? And we must not forget what a boon signs would be to the tourist from overseas! Bright and colourful signs, gay with crests or pictures of items of interest, would be a fine thing. Maybe our "planners" might be persuaded to do something about it!

A Word from Wiltshire

ONE of those good correspondents of mine, writing to me about the English scene, and mentioning places of interest discovered on cycle tours, sends me greetings from the ancient town of Malmesbury, in Wiltshire. Do I know the fine Market Cross of the 14th century? Am I aware that Malmesbury is the site of a great abbey, founded as far back as A.D. 680? Well, I was aware of these facts, and I do know something of this old Wiltshire town. I recall a summer's day many years ago when, touring Wiltshire (with the main object of a visit to Stonehenge), I stopped at Malmesbury, admired the ancient Cross, consumed a mammoth lunch at "The Bell"—and came away with a feeling of affection for the place and its people. Wiltshire is not as well known as it deserves to be: myself, I love its rolling uplands and its thatched cottages, and I ever have awesome thoughts of Stonehenge and its unfathomable mystery.

Many "Breeds"

IT was outside a little inn called "The Contented Man" that I saw the collection of cycles and discovered that every one was of a different make. The machines belonged to a bunch of fine young fellows and girls from a neighbouring manufacturing town . . . out for a spin in the green countryside. I like examining bikes, and I found when I looked at these well-kept machines that the collection contained a Royal Enfield, a Hercules, a Raleigh, a Sun, a Robin Hood, a B.S.A., a Coventry Eagle, and an Armstrong! Mixed breeds . . . but each bearing a famous name, and a worthy example of British cycle-manufacture. In the inn, chatting with the members of this town club, I talked of bicycle names and cycling, and I enjoyed the company of these factory lads and lassies . . . happy in their freedom of the road. In fact, I suggested that the name of the inn might well be changed to "The Contented Cyclists"!

Holiday Vista

ON this chill March day, with the wind blowing through the trees which are not yet garbed in green, it seems a far cry to summer holidays, but I am thinking of them because on my desk there is a kindly invitation to spend a week in July with an old cycling friend who now lives in peace and quietness in "silly Suffolk." Well, it would be no bad plan to ride slowly down quiet Suffolk lanes and visit Clare and Long Melford, and, maybe, ride to the coast and do a bit of fishing with some old East Anglian worthy in Sole Bay. Quite pleasant to visualise a trip to ancient Ipswich, where stands the "Great White Horse" of Dickensian fame, and where the hum and bustle of modern industrial life rubs shoulders with the slow and stately past. And there is all the magic of Constable to lure one . . . yes! perhaps I will accept that invitation, and—when high summer comes—sojourn in Suffolk.

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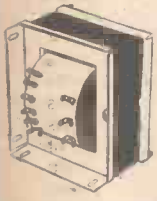

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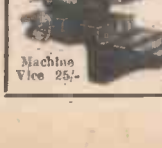

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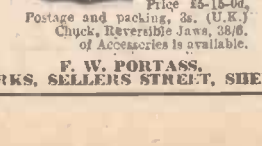

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